Université de Montréal

Designing companions, designing tools:
Social robots, developers, and the elderly in Japan

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Mémoire présenté
en vue de l'obtention du grade de maîtrise
en anthropologie

Janvier 2018

Abstract

This master's thesis traces a genealogy of a social robot through its conception to its various uses and the ways users interact with it. Drawing on six months of fieldwork in a start-up and two nursing homes in Japan, I first investigate the genesis of a social robot created by SoftBank, a Japanese multinational telecommunications company. This social robot is quite humanlike, made to be cute and have an adorable personality. While developers constitute one of the user populations, this robot, along with several others, is also used by elderly residents in nursing homes. By analyzing the uses of these populations, I underline the tension between the social robot as a companion and a tool. Drawing on ontological anthropology and phenomenology I look at how the robot is constructed as an entity that can be interacted with, through its conception as an ontologically ambiguous, social actor, that can express affect. Looking at multimodal interaction, and especially touch, I then classify three functions they fulfill: discovery, control, and the expression of affect, before questioning whether this *acting towards* the robot that does not imply *acting from* the robot, can be considered a form of interaction. I argue that interaction is the exchange of meaning between embodied, engaged participants. Meaning can be exchanged between robots and humans and the robot can be seen as embodied, but only the appearance of intersubjectivity is enough, rather than its actual presence.

Keywords: social robot, interaction, touch, companion, communication robot, tool, phenomenology, ontology

Résumé

Ce mémoire de maîtrise trace la généalogie d'un robot social, de sa conception à ses différentes utilisations et la manière dont les utilisateurs interagissent avec. A partir d'un terrain de six mois dans une start-up et deux maisons de retraite au Japon, j'interroge la création de Pepper, un robot social crée par la compagnie japonais SoftBank. Pepper a été créé de façon à être humanoïde mais pas trop, ainsi que perçu comme adorable et charmant. Par la suite, je décris comment Pepper et d'autres robots sociaux sont utilisés, à la fois par des développeurs, mais aussi par des personnes âgées, et je souligne une tension existante entre leur utilisation comme des compagnons et des outils. En me basant sur l'anthropologie ontologique et la phénoménologie, j'examine la construction du robot comme une entité avec laquelle il est possible d'interagir, notamment à cause de sa conception en tant qu'acteur social, ontologiquement ambigu, et qui peut exprimer de l'affect. En m'intéressant aux interactions multimodales, et en particulier le toucher, je classifie trois fonctions remplies par l'interaction : découverte, contrôle, et l'expression de l'affect. Par la suite, je questionne ces actes *d'agir vers* et s'ils peuvent être compris comme une interaction, puisqu'ils n'impliquent pas que le robot soit engagé. J'argumente qu'une interaction est un échange de sens entre des agents engagés et incarnés. Il y a effectivement parfois un échange de sens entre le robot et son utilisateur, et le robot est un artefact incarné. Cependant, seule l'impression d'intersubjectivité est nécessaire à l'interaction, plutôt que sa réelle présence.

Mots-clés : robot social, interaction, toucher, compagnon, robot de communication, outil, phénoménologie, ontologie.

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List of abbreviations

AI: Artificial Intelligence

AMED: Japan Agency for Medical Research and Development

ANT: actor-network theory

HCI: Human-Computer Interaction

HRI: Human-Robot Interaction

LTCI: Long-Term Care Insurance

METI: Japanese Ministry of Economy, Trade and Industry (formerly MITI)

MHLW: Japanese Ministry of Health, Labour and Welfare

MITI: Japanese Ministry of International Trade and Industry (until 2001)

NOC hypothesis: New Ontological Category hypothesis

R&D: research and development

Acknowledgments

First and foremost, I would like to deeply thank everyone who made this research possible. Either you were a participant (and that includes enduring my *gaijin* self on your workplace and answering my constant questions), or you were just simply there when I needed you. You gave me access to your contact list and introduced me to new people, you took me around and fed me, talked to me, but most importantly, you shared some everyday, simple, or even intense moments of your life with me. Thank you. I would also underline the support of the Japanese Ministry of Education, Culture, Sports, Science, and Technology, which made this research possible thanks to a research scholarship.

Looking back at the beginning of this process, I realize that this research could not have been done without the help and support of many. Thank you to everyone who pointed me in a direction or another, I could not have conducted my fieldwork without you. A thank you from the bottom of my heart—accompanied by the lowest bow I can do— for the whole team at Fubright Communications. These six months were immensely formative, and I learnt more than just about robots. I felt welcome and accepted, and I will always remember your hospitality, all these times you brought me around with you only for me to ask as many questions as I could think of and probably bother you a little bit. また頑張りましょう. Thank you to the two nursing homes' staff, as you all very patiently and kindly told me everything I needed to know and let me be an intrusion. Thank you for allowing me to be there during your work hours, and your social life. My deepest thanks to the facilities' residents as well, who very warmly accepted my presence among them, and took me under their wings more times than I can remember. I am very touched I was fortunate enough have such moments, and I will definitely teach my future children a Japanese lullaby or two.

To my mentor, Pierre Minn, I would like to express how grateful I am, although I am not sure I can find words strong enough to convey my appreciation. Thank you for your guidance, your advice, and your presence. I always felt very fortunate to have someone give me that much freedom but also challenge me to always do better. You helped me grow and find some confidence. You taught me so much more than just about fieldwork and anthropology, and I strive to be one day as good a teacher to others as you were to me.

I am also indebted to two of my biggest anchors during this process. Aglaé, you were there every step of the way, and I could not have done it without the friendship and mental support you provided. You know my elevator speech better than I do. I have been and always shall be your friend. Ken, for being by my side for so long, helping me as much as you could every time I needed it (usually it was urgent and last minute), I am sorry. But also thank you. Getting to spend time with you in Japan was the best medicine one could need.

Another shout-out is due to all my colleagues at the University of Montreal! Our writing group (or was it a therapy group? I forget) was the best place to grow and ponder about the writing process but also about what it means to be an anthropologist. Anais, Annick, Cassandre, Catherine, Julien, Mathilde, and people I forget—thank you. Manu and Mariette, with your everyday support, our transcribing sessions and pomodoros, you helped me have the necessary discipline to write all this.

Thank you to all the friends who were there at some time or another and made this whole process easier: Adam, Arthur, Ena, Félix, Isaac, Kenny, Mike, Sakinah. Nobuko, thank you for being so accommodating and giving me both flexibility and stability through my job. A final thanks to Anne, Henri, and Lou, for always supporting me, despite distance.

Thank you to the creators of the following Pages: Classical Art Memes, Disturbing Quotes, PhD Comics, Philosophy Matters, Sassy Socialist Memes, Shit Academics Say, and Writing about Writing. Dark and inappropriate humor about anything, but especially about writing, being a graduate student, and academia, is very meta and satisfying. People who are behind these pages, you da real MVP. A final mention to every X-Factor fail video and RuPaul's Drag Race compilation on YouTube. You brought joy to my life.

Introduction

The contemporary world's population ageing has never been so critical, driven by an increase in longevity and a decrease in fertility. This trend is strongest in Europe and North America, although Japan has the largest portion of people over 60 (United Nations 2017). Fewer workers thus come to replace those who leave the workforce. It is estimated that the cost of aging for these regions will keep on augmenting and take an ever-increasing toll on their economies. Furthermore, a devaluation of care work, including low wages and often precarious situations (Dyer, McDowell, and Batnitzky 2008) begs one to ask who will care for the growing elderly population. Technology is often perceived as a way to help caregivers, but robots, and social robots, have in recent years actually been proposed as a potential solution to mitigate the lack of workers by governmental organizations (see for instance METI 2013, 2017) and academics (Jenkins and Draper 2015, Kachouie et al. 2014, Taggart, Turkle, and Kidd 2005) alike. According to them, various types of robots can be used in nursing, from support to surveillance as well as communication robots and social robots[1].

The development of these technologies creates hopes, fears, and myths. What attracted me to studying the social robot, and especially robots that are humanlike, is how they play with founding dichotomies: subject/object, human/machine, companion/tool. Suchman wonderfully explains how exactly robots are perceived as being able to cross barriers:

> (…) the figure of the humanoid robot sits provocatively on the boundary of subjects and objects, threatening its breakdown at the same time that it reiterates its founding identities and differences. Whether as a promise to subjectify the world of the Object, or a threat to objectify the sanctity of the Subject, the robot's potential is perpetually mobilised within both technical and popular imaginaries. At the same time, the material assemblage of the robot is in complex intra-action with its accompanying stories, never quite realising its promise but always also exceeding the narratives that animate it (2011, 133)

The social robot is indeed a provocative object. This becomes evident in discussions about ethical issues concerning their presence in nursing homes. Scholars express a variety of opinions, arguing on the one hand that the ethical cost could be managed and the elderly's lives improved if robots

[1] While not every social robot is a communication robot, every communication robot is a social robot. Although this research is about studying social robots that can talk, their ability to produce speech is limited. As such I mostly use the term "social robot" in this thesis.

were introduced with close supervision and guidelines (Sharkey and Sharkey 2012). On the other hand, others believe that introducing robots would not only threaten caregivers' positions, but also that robots cannot fulfill the elderly's emotional needs, and that interaction with a robot is only a "simulacra" of social interaction (Sparrow and Sparrow 2006).

Although controversial, social robots are already present in nursing homes. There are not many studies about them however, and I believe that before making claims for or against their presence in a care setting, the parameters of the interaction between robots and users should be closely investigated[2]. My research question is thus the following: what makes the robot an entity that can be interacted with, and what kind of exchanges ensue between robots and humans? In this thesis, inspired by Kopytoff (1986), I am thus interested in tracing the genealogy of a social robot, from the choices guiding its conception to how it is adapted for nursing homes and used in a care environment. As such, instead of doing an in-depth ethnography of a single space, or a single type of user, my approach is to cultivate a transversal view of the phenomenon that is the social robot. The goal of this research is to better understand the ways in which various types of users relate to and interact with the robot.

The first chapter looks at the theoretical endeavours and frameworks informing this research. Anthropology has looked at technology through the lens of medical anthropology, and concentrated its early efforts on biosciences and biotechnologies. They are often framed under a body of techniques and machines operated by an expert, which does not accurately represent everyday life with a social robot in a nursing homes. Studies on care also inform this research and show that technology and care are not opposed to one another, and can actually work together. However, studies on care often occult or ignore the endless adjustments necessary to make technology work. The second section looks at how technology is constructed as nonhuman. Postcognitivist theories in psychology legitimize the perception of technology and artifacts as actors, and refuse cognitivism, arguing that technologies possess various qualities traditionally attributed to human agents, like agency, and question the necessity of taking their ontologies into account in studies of human-technology interactions. Ontological anthropology puts nonhuman actors at the center of its focus, arguing that individuals develop and maintain meaningful social

[2] I am not interested to explore in this thesis the ethics of the use of social robots in nursing homes, but rather to investigate interactions between elderly individuals and robots. Similarly, although I understand the question of automation and the replacement of workers is critical while talking about robotics, it is not this thesis' subject.

relationships with them. The intersection between these two frameworks leads me to see technology as nonhuman, and it is on this premise that I build upon later in the thesis. Finally, interactionism and the field of human-robot interaction look specifically at how humans and robots as nonhumans interact, looking at what mental processes allow people to interact with a nonhuman, and describing various ways humans interact with robots.

The second chapter introduces Japan as the context for this research. Historically, Japan pushed forward the development of technologies in partnership with its industries. More recently, robotics is envisioned as a potential solution for various social problems, including the lack of caregivers in nursing homes. I then present the various spaces in which I conducted fieldwork, and describe the population in Japanese nursing homes. Then, I turn to the methodological background of the thesis, an ethnography of a start-up and two nursing homes, and question my position as a researcher, underlining my identity as an outsider, that proved both useful and tricky to negotiate.

The third chapter introduces Pepper, a social robot created by Softbank and released in 2014 across Japan. I investigate the reasoning behind making the robot humanoid but not too much. According to interviewees, a humanlike robot is more engaging. However, SoftBank deliberately keeps the robot looking artificial, so as not to confuse users about its nature. Because the robot has human and artificial characteristics, it is crucial to manage user expectations and make users understand the extent of the robot's proximity to human beings as well as the ways in which it differs. When a mobile, anthropomorphic artifact resembles humans but fails to act properly, it falls in the "uncanny valley" (Mori, MacDorman, and Kageki 2012), and creates a feeling of uncanniness in users that could hinder potential interaction. Here, Pepper is not too humanlike. This physical appearance serves two purposes: it helps the robot eschew the valley, and it informs users that they cannot interact with the robot like they would with other humans. In the second part of the chapter, I look at the creation of Pepper as a robot that can be loved. Pepper is based on ideas of what is considered cute and on characteristics of what makes someone lovable. Making Pepper endearing is meant to favorably influence the robot's acceptance by humans and to make ensuing interactions pleasant. The idea of Pepper as lovable originally stems from a perception of the robot as a potential companion, which proved difficult to realize. As such, instead of making Pepper one's best friend, Softbank decided to use it as a marketing device

In the fourth chapter, I turn to two different types of users: Fubright Communications, a start-up that develops applications for Pepper. Fubright serves as an intermediary between Softbank and its end users, and looks at how the nursing home staff makes use of the robot and how they interact with it. They mostly consider the robot as a business opportunity and a tool to help foster wellbeing among the elderly, and this vision is translated into how they develop applications for Pepper. But some of Fubright's staff also develop feelings of affection towards the robot, which shows that its use as both a tool and a companion are maybe not incompatible. In nursing homes, the tensions between social robots used both as a tool and for companionship are also apparent. Here, I introduce two more robots, Palro and Robohon, that were used along with Pepper in the field. These robots are used in various but similar ways, as they have almost identical skills (talking, singing, dancing). When these robots are used, most of the exchanges I observed where vocal and tactile. Social robots are not perfect however, and unexpected events such as breakdowns and computer bugs can not only hinder interactions but also push users to critically analyze the robot and find meaningful explanations for its behavior.

In the fifth chapter, I analyze the construction of the robot as an interaction partner through three types of processes: ontologically, socially, and mentally. While Descola (2005)'s conception of naturalism suggests that the robot has a very precise, different ontological status from human beings, the robot is actually ontologically ambiguous, sharing characteristics with both machines and humans. The robot is understood by its users as having a different ontological status than them. The robot's ontological ambiguity is experienced as confusion by the user. In turn, while users understand that the robot is an artifact, confusion leads them to understand the robot as a social actor, too. This phenomenon is fostered by the humanlike appearance of the robot, that functions as an affordance (Gibson 1979) and thus legitimizes the robot as an interaction partner. The humanlike characteristics of the robot influence users to anthropomorphize it and interact with it as they would with other humans. To put it simply, the robot's appearance fosters its recognition as a social agent. Finally, I turn to the construction of Pepper as having an interiority. Although Descola (2005)'s naturalism argues against the presence of an interiority in machines, anthropomorphism fosters the attribution of mental states to agents like the robot. Through its programming, the robot can express emotions, and theories about cognitive heterogeneity support the possibility of cognition among nonhumans, including machines.

The sixth and final chapter investigates the ways users interact with social robots. I argue that instead of looking at vocal interactions that are rather limited with these robots, it is more meaningful to analyze how users touch them. I classify three functions that touch fulfills: discovery, control, and the expression of affect. Verbal interactions as well as other non-verbal interactions support this classification. Then, building upon the realization that many of the interactions described in this thesis, including touch, are actions from the user towards the robot and do not necessarily need *acting from* the robot, I question whether this *acting towards* can be considered a form of interaction. I define interaction as the exchange of meaning between embodied participants engaged with each other. There can be meaning exchanged through control: when a user uses the robot with a purpose, their actions are stimuli to the robot, which then, in turn, reacts. However, meaning, as underlined earlier, is not always exchanged nor necessary. I then argue that the robot is embodied. Not only the robot has in fact a body, it is also situated in a particular context and made to participate in everyday life. As for intersubjectivity, it is possible to argue that it can be present between a robot and a human being. It is possible for users to understand or make sense of the robot's actions. However, I believe that only the appearance of intersubjectivity matters to define *acting towards* as a form of interaction. Users do not always have the possibility to question whether intersubjectivity is present. As they assume that there is intersubjectivity, I then argue that this *acting towards* can be understood as an interaction.

Because, in part, of its conception, the social, humanlike robot is ontologically ambiguous. As an opaque artifact it pushes users to perceive it through a framework they are familiar with and to anthropomorphize the robot, while still remaining conscious of its status as a machine. It creates an ontological confusion in the user. People interact in various ways with robots, but it is touch that is the most interesting to look at in the present situation. Touch as interaction can fulfill three functions: discovery, or apprehending the entity that is constituted by the robot; control, or handling and manipulation; and the expression of affect. Three things further make touch as interaction possible: the exchange of meaning between human and robot, the robot as being embodied, and the appearance of intersubjectivity.

Through this master's thesis, I aspire to create a strong basis to build on for further research on robotics, aging, and care. I believe continuing research at the intersection of these areas is critical, especially in a context where the population of elderly individuals is growing. In part because of a growing lack of nursing care workers (Aoki 2016) and the devaluation of care work (Dyer, McDowell, and Batnitzky 2008), what is now at stake, at least in Japan, is the ability to not only provide care, but adequate care. I believe that analyzing the ways individuals use and interact with social robots in care settings is a first step to later understand what care is and what care can be when social robots are involved.

1 Chapter I – Theorizing the robot as a nonhuman

In this chapter, I will present the various disciplines, frameworks, theories, and concepts that influenced this thesis. Different disciplines and currents have distinctive ways of apprehending technologies, and as such I believe that an interdisciplinary perspective is necessary to have a better understanding of my fieldwork and data. This chapter's first section looks at how anthropology, and especially medical anthropology, theorizes and studies technology. During my preliminary readings I was trying to define the robot as a technical object, and medical anthropology proved valuable to better understand what is at stake when looking at technologies in a medical environment. I was also deeply impacted by studies on care, as they encompass both the technical and human aspect of care work and they focus on relations: not only on the relation between humans, but also between humans and technologies. This chapter's next two sections concern the construction of nonhumans. Postcognitivist theories and ontological anthropology legitimate technology's understanding as an agent by stressing its importance in their analysis. In the last section, I am interested to look at how interaction with nonhumans is defined and made possible, and what the field of human-robot interaction tells us about robot and human behaviors.

1.1 Anthropology cares for technology

1.1.1 Technology, biotechnologies

Although long relegated to a secondary position behind ritualistic and symbolic interests (Pfaffenberger 1992), the study of material culture (Miller 2003)and technology has a place in anthropology. Archeology for instance, one of anthropology's subdisciplines, studies material culture and its production. This interest in objects and artifacts and their creation can also be found in ethnology, albeit with a different focus. Pfaffenberger (1992) in fact argues that while archeologists commonly distinguish form and function, in order "to recapture the sociality of human artifacts, it is necessary to turn this distinction upside down (…) by arguing that the supposedly 'hard' part of the artifact, its function, is in reality the 'softest,' the one that is most subject to cultural definition" (1992, 502-503). Pfaffenberger, following Appadurai (1986) thus defends a vision of the artifact as social, and of technology as a social phenomenon. Pfaffenberger (1988) argues against seeing technology as only a body of techniques. More precisely, according to him, there are two predominant visions of technology: technological somnambulism, that portrays technology as self-evident and neutral, and technological determinism, in which technology is the determinant of social life. Pfaffenberger refutes these two ideas and rather offers a vision of technology as a total social phenomenon, following Mauss. In a following article, Pfaffenberger (1992) refines his proposition and develops the concept of technology as a "sociotechnical system":

> (…) the sociotechnical system concept puts forward a universal conception of human technological activity, in which complex social structures, nonverbal activity systems, advanced linguistic communication, the ritual coordination of labor, advanced artifact manufacture, the linkage of phenomenally diverse social and nonsocial actors, and the social use of diverse artifacts are all recognized as parts of a single complex that is simultaneously adaptive and expressive (1992, 513).

For Pfaffenberger, technology is an integral part of social life and should be studied as such. However, undertaking the ethnography and analysis of whole sociotechnical systems is a colossal task in many cases. It is also a rather globalizing endeavour, to undertake over long periods. As such, for the present thesis, I decided to focus on the study of the use of an artifact, the social robot.

There is not much literature on robotics in anthropology. In fact, anthropology seems to have focused more on biotechnologies and how they influence, reshape, and question traditional definitions and frontiers of life and death (Franklin and Lock 2003, Lock 2001) and kinship (Strathern 1992), for instance. Often, studies about these technologies underline their perverse aspects. Authors interested in organ donation for instance explain the rhetoric of organ giving as a "gift of life"(Ikels 2013, Lock 2002), and the portrayal of donation as a moral choice. Technology can save lives and help families sometimes find meaning through a loved one's death (Lock 2002, 225). However, through this process, organs can become eventually commodified. There is a lot at stake financially, for insurance companies (Ikels 2013), but also for less privileged individuals who are in dire financial situations. The individual as well as the body can thus be commodified by technology:

> Commodification insists upon objectification in some form, transforming persons and their bodies from a human category into objects of economic desire. Thus, the presence of objectification in a host of forms is significant because it flags the possibility that commodification has occurred: The medicalization of life, the fragmentation of the body, and the subjectification of colonized subjects all potentially dehumanize individuals and categories of persons in the name of profit (Sharp 2000, 293)

Donors are sometimes reduced to the organs they can provide, and these organs to the functions they serve. Individuals can thus be perceived as "human body shops" (Sharp 1994, 297) or economic resources. This commodification of the body is linked to how bioeconomy and biocapital "(…) capture the new ways in which capital itself is being (re)conceptualized and (re)organized by virtue of imbrications with the biological sciences and technologies, including biomedicine, the megacorporate pharmaceutical industry, and so on" (Clarke and Shim 2011, 183). This example of how biotechnology is studied in anthropology underlines technology as reconceptualising various aspects of human existence and having potential adverse effects.

While these studies portray the more negative influence technology can have on people's lives, the field is actually diverse. In fact, academics also look at the ways technology can also be empowering, by for instance focusing on technology's influence on sociality and identity. Biotechnologies can create new types of identities, for example based on one's genome (Rapp 2003, Wailoo 2007), and thus foster the gathering of individuals of similar biologically-based identities, in a process called biosociality by Rabinow (2005). Wailoo (2007) looks at the construction of one's identity as heterozygote in the case of sickle cell anemia. He analyzes the various ways technologies and identities become entangled, and how technologies foster the emergence of new types of identities:

> As such, the heterozygote—whose origins stem from the technologies of modern genetics—becomes a cultural "work in progress". Disease identities become complex assemblages of technologies, practitioner's ideologies, and social relations. Medical technologies may help to generate historically specific forms of identity, but those technologies are always altered and reinterpreted by the users—whose notions of self, identity, suffering, memory, and cultural difference give new meanings to the technological findings (2007, 670)

While these authors all provide a very valuable perspective on biotechnologies and biosciences and their influence on social life, biotechnologies, by definition, manipulate biological processes. They have to do with the manipulation of one's body, and often of one's identity. It is not a technology that one uses, rather than a technology that one has to experience. As such, studies look at how individuals make sense of these biotechnologies, and how these biotechnologies influence their perceptions of identity, kinship, life and death and so on. But these studies are not interested so much by the relationship between biotechnologies and individuals, because of the way they conceptualize technology. Before, and during my time on my fieldwork, I could see that social robots were not just another type of technology, it was actually personified. In that sense, anthropological studies on biotechnologies did not necessarily provide a relevant framework for this research.

Moreover, biotechnologies are most often deployed in technologically advanced centers, such as hospitals, laboratories, and so on. Like biotechnologies, social robots are often found in such spaces. What interested me on the other hand was the transition between this type of environment to a lower-tech facility in which they would be relatively unheard of or unseen before, and used by individuals without prior experience. However, the emphasis that the study of biotechnologies puts on the body, its manipulation and processes, inspired me to take a closer look at the ways in which nursing homes can be medical spaces, and at how technology there can thus be both empowering and have adverse effects on residents.

1.1.2 Anthropology of care

Medical anthropology has also approached the subject of care, inspired in part by nursing studies, as well as studies on emotion, gender, etc. I have mentioned before that new technologies deeply influence medical practices. Hospitals for instance, evolved from being places of hospitality to places for treatment, medical prowess and technological improvement (Fortin and Knotova 2013). Some researchers therefore distinguish between cure and care, that they see as two different pillars of medical practices. Cure refers to treatment, to action, and it is traditionally associated to doctors, while care is more closely associated to nursing and feelings of warmth and compassion (Fortin 2015, Morvillers 2015, Saillant and Gagnon 1999).

Having decided on a fieldwork in a nursing home, it was important for me to be familiar with this literature, both on an academic and personal level. On the one hand, I wanted to fit in and disturb caregivers as little as I could. On the other hand, I was interested to know how social robots would, or could, influence practices. Kleinman (2012) and Mol (2008) underline that what is at stake with care is "(…) doing good, for others and for oneself" (Kleinman 2012, 1551). Care, according to Kleinman, is about recognizing the individual in front of oneself and establishing a presence and a relationship with them to mitigate their suffering. Mol also stresses the importance of a relationship with patients, but Kleinman explains how care is enacted through a relationship based on reciprocity: the patient's life experience is seen as a present and exchanged for help with feeding and personal hygiene, among others. Kleinman explains: "what is exchanged is the moral responsibility, emotional sensibility, and social capital of the relationship" (2012, 1551). Individuals are changed by this relationship. Vinay et al. (2013) underline the asymmetry between the patient and the caregiver, but this gap gradually disappears in favor of the individuals. The goal of care is to allow the patient to live a "good life", according to Mol (2008). Mol looks at daily care practices and shows that what is "good" is constantly negotiated between patients and caregivers. Mol emphasizes care as an iterative process implicating a variety of actors that together make a team. In the chronic illness setting she observed, the patient is actively engaged in their caregiving team.

I was interested in looking at the ways social robots, a new form of technology, were used in a nursing home—thus, in a care setting. However, many see technology and care as separate, and even sometimes as opposite (Barnard and Sandelowski 2001, Mol, Moser, and Pols 2010). Indeed, technology can adversely impact care: studies in nursing showed that time spent attending for medical devices is time not spent caring for patients (Mann 1992, Reed 2008, Wilkinson 1992). Furthermore, technology can be dehumanizing. Although it is often associated to medical prowess, when technology is associated to capitalist logics of consumption of medical care (Mol 2008, Reed 2008), or the exploitation of the body as biocapital, individuals can be reduced to their body parts (see for instance organ donation: Clarke and Shim 2011, Ikels 2013, Lock 1993a, Sharp 1994, 2000). Therefore, technology can be seen as cold and dehumanizing. In opposition, care would thus be human, moral, natural (Mol 2008). This dichotomy however is challenged: Saillant and Gagnon (1999) for instance, underline that this apparent contradiction comes from an easy critique of our medical systems. The distinction between cure and care is often used to criticize the presence of too much technique and a lack of humanity and compassion. But Saillant and Gagnon argue that technique can be humane, and that the "too much technique" is always defined within humanity. In fact, this dichotomy is a social construct rather than a real opposition (Barnard and Sandelowski 2001)

Following Saillant and Gagnon, many authors (see for instance Barnard and Sandelowski 2001, Mol 2008, Mol, Moser, and Pols 2010) now come to criticize this technology/care dichotomy. They argue for instance that technology is not detrimental to care, as it allows caregivers to be more efficient by being the "(…) nurses' hands, eyes, ears and other senses"

(Ashworth 1990, 153), or by giving them more time to spend with patients (Wilkinson 1992). Others like Mol (2008) have a more radical vision of technology as an actor of care. In fact, care could not happen without technology in the case of diabetics, as their glucometer is so crucial for both their treatment and care relationship with their caregivers and team. Technology thus allows care. But it also has to be taken care of by its users. “Technologies, what is more, do not work or fail in and of themselves. Rather, they depend on care work. On people willing to adapt their tools to a specific situation while adapting the situation to the tools, on and on, endlessly tinkering” (Mol, Moser, and Pols 2010, 14-15). This idea is echoed by Barnard and Sandelowski (2001) who explain that technology is voluntarily made part of the care process. The meaning given to technology depends on its user.

While all of these authors do provide very valuable perspectives on the use of technology in care and legitimize its use, they do not necessarily make the study of how care and technology are intertwined a priority. As such, they provide a powerful and interesting basis to investigate technology and its use, but their arguments need to be expanded. Mol (2008) for instance, is more interested in looking at how care is enacted and what makes it possible. The focus of her study was not on technology however, and so it is an element that is present but not necessarily deepened. Being interested in how one type of technology was used in an end-of-life care setting, there is thus just a few lines to try to extrapolate from in her book. Furthermore, and here Mol and her study of diabetic patients and their glucometer are the exception, most of the artifacts mentioned or described are used by care professionals. They are mostly used on patients, and allow—or not—caregivers to perform their tasks. Patients usually lack the expertise and technological fluency to use these technologies. Many questions are thus left unanswered: what happens when patients themselves use technology for their care? What technologies are there and how are they used in care settings, especially in the end-of-life? How do patients re-appropriate themselves these technologies in new ways not envisioned before? And so on.

Moreover, and here again Mol constitutes an exception, the use of technology is often presented in broad strokes, minimizing or even occulting the endless tinkering happening with artifacts to make them work and make them work properly, i.e. in expected ways. And what to say about when they do not work the way one expects them to? How does that impact care? Do patients keep using these technologies or do they discontinue their use? As such, while technology’s use is indeed presented and described, there lacks a more in-depth analysis of the stakes, conditions, and actions inherent to these uses. Finally, and that can be found in Pfaffenberger's earlier definition of technology, technology is often presented as a body of elements, techniques and/or of machines. I was interested in focusing more specifically on one artifact, in order to have at the same time a more in-depth (as in looking at everyday use, micro-interaction with the artifact) and global view (in terms of the artifact's genealogy and actual use).

During my fieldwork, I realized that social robots were not just a "sociotechnical system", or a technology in themselves. They are indeed a technology, part of such a system, but the way users interact with them actually underlines their place as entities. These robots are personified, have names and faces, and manufacturers encourage their use by vocal commands and interaction. I thus turned to frameworks and theories that could reliably reflect what I saw daily in my fieldwork: technology being grasped as a material entity that people can use and with which they can interact. In short, because robots are considered as a new type of being, or entity, it was necessary to find a framework that would theorize them as such.

1.2 Nonhumans

1.2.1 Postcognitivist theories

Postcognitivism is a gathering of theories in psychology interested in cognition and refusing the body/mind dualism traditionally postulated by Cartesianism. Postcognitivist theories underline the importance of the role of technology (Kaptelinin and Nardi 2006). Kaptelinin and Nardi (2006) place ANT along with distributed cognition, activity theory, and phenomenology, but as I will present the theory in the next section along with ontological anthropology, I will not go into details in this one.

In distributed cognition, cognition is not the property of an individual. Rather, cognition is a distributed phenomenon, amongst that person, the artifacts and materials they have access to, and the environment in which they are. Distributed cognition, as such, is not interested in studying only a single type of cognition, like human cognition, but rather it is looking to understand all types of cognition (Hollan, Hutchins, and Kirsh 2000). Hollan, Hutchins, and Kirsh see cognition as both socially distributed and embodied, ideally placed to research and create better Human-Computer Interaction (HCI). In cognitive systems, cognition is computation, and computation is

“(…) the propagation of representational state across a variety of media” (Hutchins 1995, xvi). The media Hutchins are referring to are the various nodes in the cognitive system, from human actors to artifacts, and so on.

Activity theory is also interested in understanding and designing HCI, but it bases itself not on cognition, or on an object or a subject, but on activity, seen as a deliberate interaction with the world. Kaptelinin and Nardi explain that activity theory “(…) is a social theory of human consciousness, construing consciousness as the product of an individual’s interactions with people and artifacts in the context of everyday practical activity” (2006, 8). In activity theory, the emphasis is put on human intentionality and the difference of ontological status between humans and artifacts. Subject, or living entities are the only ones that can have intentionality, and tools mediate between individuals and their environment. Agency can be possessed both by objects and subjects.

Phenomenology looks at consciousness and experience. Phenomenology seeks to understand how one’s perception of being-in-the world (Csordas 1994, Heidegger 1962) correlates with cognition. Authors like Dourish (2001) apply such a framework to understand HCI, and in particular, the newer types of computing that, through their embodiment, involve social and tangible elements. Heidegger (1962) underlines the relation between individuals and the tools they use, distinguishing two states: present-at-hand and ready-to-hand. Ready-to-hand refers to how an artifact can be an extension of oneself in the case of a purposeful action. The tool fades in the background during the completion of the activity. Present-at-hand, in contrast, refers to how individuals are conscious, mindful of the objects being used.

These postcognitivist theories (including ANT, actor-network theory) share much common ground. Kaptelinin and Nardi (2006) underline how they all give technology an important place in their analysis. Furthermore, individuals are not just individuals but interact with the world and their environment. Postcognitivist theories argue against the Cartesian body/mind dualism and push forward a conception of cognition as not a product of the mind but as one’s interaction with other entities. These frameworks are linked in a large part to psychology, and as such not everything was relevant for this research. The question of cognition for instance, while central to phenomenology, activity theory, and distributed cognition, is quite unrelated to my areas of interest for this research. However, I was inspired by the place technology and nonhumans are given by postcognitivism. Whether in systems, like in ANT of distributed cognition, or in activities and the world, individuals come into contact with nonhumans. ANT was really incisive in suggesting that nonhumans and humans could be put on an equal footing and treated as equal actors (Latour 1996) (see below). However, reading about activity theory, I was reminded that in my fieldwork there was a difference of ontological status between the two, and it was legitimate to analyze their relationship while keeping this difference in mind. It is phenomenology however that resonated with me the most, because of the emphasis it puts on embodiment and intersubjectivity (see chapter 6). Finally, distributed cognition, activity theory, and phenomenology look at how individuals use the tools they have accessible to achieve various outcomes, such as cognition, the most notable, but also daily activities. None of the tools and technologies described however can talk back to their users and propose a song or dance. As such, the conditions of their use, or the types of use described did not seem social enough, as in my fieldwork it seemed as if users were interacting with another human.

1.2.2 Ontological anthropology

Ontology is a term that cannot be defined easily: there are as many definitions are there are academics who write about ontology. Moreover, as Hacking (2002) explained, it can be used too broadly to be really useful: "(…) suppose we want to talk in a quite general way about all types of objects, and what makes it possible for them to come into being. It is convenient to group them together by talking about 'what there is:' or ontology" (Hacking 2002, 1). Others, like Kohn, "(…) define "ontology" as the study of "reality"—one that encompasses but is not limited to humanly constructed worlds" (2015, 312). Globally speaking, however, authors usually agree that ontology is about *being*, and some authors interested in the use of technology like Dourish, define it simply as "(…) the study of the nature of being and categories of existence (…)" (2001, 103), the most widespread use of the term. However, Kohn warns that

> Ontological anthropology is not generically about "the world," and it never fully leaves humans behind. It is about what we learn about the world and the human through the ways in which humans engage with the world. Attention to such engagements often undoes any bounded notion of what the human is. Ontological anthropology is for the most part posthumanist but that does not mean it sidesteps humans and human concerns altogether. (2015, 313)

Kohn further identifies two turns in ontological anthropology: the narrow turn, and the broad turn. According to Kohn, the narrow turn in ontological anthropology is mostly characterized by the works of Descola (2005), Latour (2013), and Viveiros de Castro (2014). These three authors have quite different endeavours, but they question the predominance of western metaphysics. Viveiros de Castro for instance questions "multiculturalism", the epistemological basis of anthropology, established on the idea of a universalist nature. Here, culture is what differs between groups and societies. By studying Amerindians, Viveiros de Castro pushes forward a "multinaturalist" metaphysics. "Multinaturalism is not a way of commensurating difference but of communicating "by differences" (…), recognizing that there is a form of relating that allows differences to be held together rather than to be subsumed" (Kohn 2015, 321). Descola (2013), for his part, undertook the difficult task to classify the various ontologies present in different societies around the world. He assigned them to four major categories, namely totemism (humans and nonhumans are similar in terms of physicality and interiority), analogism (humans and nonhumans are dissimilar in terms of physicality and interiority), animism (humans and nonhumans have similar interiorities only), and naturalism (humans and nonhumans have similar physicalities only). What is at stake, for Descola, is to better understand the ways various societies and groups define and relate to nonhumans.

The broad turn examines nonhumans and their relationships with humans. Most notably, actor-network theory (or ANT) has flattened ontologies and studied networks. In ANT, humans and nonhumans (whether they are living entities, organizations, artifacts, and so on) possess agency, the ability to act. ANT therefore sidesteps the problem of the mind/body dichotomy to argue that it does not matter: agency is the only important characteristic of actants. As such, it is not the actants' inner features (that they have cognition, and so on), or that they have the intention to influence others or to interact that matter, but the relationships they establish between them. The result of these alliances are heterogenous networks, and these networks are what ANT is most interested in (Callon and Law 1997, Latour 1996, Mol 2010, Sayes 2014). ANT has looked at "(…) the environment, materiality, medicine, science, technology, and the body to bring nature into culture and culture into nature" (Kohn 2015, 315). Although ANT has been extremely precious to give nonhumans a preponderant place in social sciences, and has helped recognized their importance in social life, the analyses they provide are not necessarily representative of how participants describe and explain the nonhumans they see in their everyday life and how they interact with them. As such their theorizing is abstract and theoretical in nature, not necessarily informed by an emic perspective. While I was greatly influenced by ANT before my fieldwork, I realized that it did not translate much in the discourse of the participants because I was more interested in looking at interactions rather than systems or networks[3], and the flattening of ontologies characteristic of ANT, although interesting as a thought experiment, was not reflective of the data. Another author that is important to mention, and Kohn (2015) integrates her in his description of the broad turn, is Donna Haraway. Haraway has consistently integrated nonhumans in her researches, from the cyborg, as a metaphor (2006), to animals, especially dogs, and other types of beings (2003, 2008). Haraway has sought to go beyond the traditional human/machine distinction, and has "(…) argu[ed] that the relationship between people and technology had become so close, so intimate, that it was no longer possible to tell where human beings ended and machines began" (Cerulo 2011, 784).

While postcognitivist theories influenced me to make technology the center of my analysis, ontological anthropology gave me the tools to apprehend social robots as legitimate entities and consider the relationships they can form with humans. However, studying such abstract relations is difficult in the field. Having data on interactions more than on relations, it was necessary to find a framework that could help with their interpretation.

1.3 Interactions

1.3.1 Interactionism and nonhumans

Although the relation between humans and nonhumans has been studied in various ways, for instance through for instance the study of religion and witchcraft (Evans-Pritchard 1937, Favret-Saada 1977, Scarboro and Luck 1997) , the case of nonhumans in social interaction is rather recent and not evident, as prove various papers on the subject (see for instance Cerulo 2009, 2011). There is however a growing body of literature coming from an interactionist perspective that studies human-nonhuman interaction. They early introduced the idea of projection: in this perspective, humans project a spirit onto nonhumans, for instance animals (Sanders 1993) and objects (Weinberg 1997). Individuals thus endow these entities with a humanlike mind, making them potential interaction partners (Cerulo 2009). Sanders explain that before the end of the eighties and

[3] Thanks to Bob W. White, who pointed that out to me.

the beginning of the nineties, it still was not an evidence for researchers that there could be an "authentic" interaction between humans and dogs, as interaction was seen as based on "(…) the abilities of social actors to employ conventional linguistic symbols" (1993, 205-206). Cohen (1989), in opposition to the concept of projection, proposed a reverse process. Similar to projection however, the question is not whether nonhumans have the ability to interact or any type of mind; rather, it is about the human actor assuming that they have the potential to interact. For Cohen, humans take the place of nonhumans to better understand what options they have in the interaction. Then, humans have to presume that mutuality is possible with these nonhumans, in order to interact with them. Cohen thus established the groundwork for Owens (2007)' "doing mind". In "doing mind", Owens describes that in order for interaction to happen, three things are necessary: "(…) (1) we see an NBO [nonbiological object] as being capable of independent action, (2) this action or actions threaten our goals, (3) said goals are of sufficient importance that we must address the threat, and (4) the NBO is critical to the task at hand and thus cannot be easily or quickly replaced" (Owens 2007, 568-569)

Other interactionist studies have explicitly looked at artifacts and their relation to humans. Some artifacts, especially artifacts that can communicate, like avatars, seem to foster interaction by evoking intersubjectivity (Nass and Brave 2005). These artifacts are not just props, but legit social interaction partners. Various studies have looked at how humans consider these nonhumans, and showed that individuals attribute characteristic based on supposed genders, and can show respect and trust in these partners when they exhibit care (Cerulo 2009). Authors like Turkle et al. (2005) have shown that children see robots as nonhumans, autonomous, and almost living, and think that they are able to create meaningful social relationships. Turkle, a sociology and psychology researcher specialized in interaction with social robots, showed that people socially interact and get emotionally attached to the robots they use. In the case of elderly for instance, robots mitigate anxiety and bring a feeling of companionship (Turkle et al. 2006).

1.3.2 Subjects of interest in HRI

Human-Robot Interaction (HRI) is a multidisciplinary field of research on interaction between humans and robots. This field covers much ground (see Goodrich and Schultz 2007), and in this section I will thus look more closely at what has been said in relation to social interaction between humans and robots. Studies look at various factors that positively influence human reaction, mostly the robot's behavior (body language), and the expression of emotions. However, researchers also study how users react to this interaction.

Researchers look at how the robot's body language and gestures influence interaction and make the robot more easily approachable and "understandable" (its behavior is meaningful to human users, even though their understanding of its actions may not be entirely accurate). Several studies look at eye contact from the robot and its effects, finding none in message retention (Van Dijk, Torta, and Cuijpers 2013), while a robot's gaze can encourage participation in a foreign language course from users with a fear of negative evaluation (Nomura and Kanda 2015). Postures are also studied as a way to express emotion (Erden 2013) and thus foster coordination with users. The expression of emotion through nonverbal behavior is a subject often investigated, mostly in the case of facial expression. Prakash and Rogers (2015) investigate various individuals' preference for the appearance of various robotic faces, from humanoid to robotic and mixed. They show that preferred appearances are either mostly humanoid or robotic. However, a robot's facial expressions are often humanlike (Bennett and Šabanović 2014), even mimicking humans emotions (Johnson, Cuijpers, and van der Pol 2013). Others areas of interest are how to efficiently translate human facial emotions to robots (Liu et al. 2013), and the difficulty to cater to different populations who may have different cultural expectations (Trovato et al. 2013).

Authors not only look at the expression of emotion, but also at how they relate to empathy and why it is relevant to research the two together. The argument is that emotional expression is necessary to coordinate action and encourage interaction between robots and users (Ahn and Lee 2013). In fact, a robot's expression of distress can influence human behavior and keep users from carrying out a task to completion (Briggs and Scheutz 2014). People seem to have more empathy for human looking robots, or androids (Riek et al. 2009). Kühnlenz et al. (2013) have further shown that when a robot adapts to the emotional state of its user, it increases the user's empathy and helpfulness towards the robot. A robot's artificial emotions thus foster interaction (Novikova and Watts 2015). As such, a robot expresses emotions often to induce empathy in its users. But roboticists also look at how to create empathic robots: "(…) artificial companions capable of behaving in an empathic manner will be more successful at establishing and maintaining a positive relationship with users in the long-term" (Leite et al. 2014, 329). Finally, according to Dumouchel and Damiano (2011), there is one more reason why artificial empathy is a subject worth exploring, and that is to better understand human emotions. Artificial empathy is thus a model that can be tested through robots and artificial agents in order to examine various hypotheses concerning emotions.

Another branch of HRI is interested in measuring (Brayda and Chellali 2012) and looking at how exactly interactions happen between robots and humans. A few studies look at touch, and how robots can feel it, for instance from infrared sensors (Salter, Dautenhahn, and te Boekhorst 2006); however they mostly look at how users touch robots. Robins and Dautenhahn (2014) look at autistic children and how touch can be encouraged through the use of robots, in a therapeutic perspective, while others have noticed that touch occurrences augment through time during repeated interactions with robots (Robins et al. 2005, Robins, Dautenhahn, and Dickerson 2012). Yohanan and MacLean (2012) used what they called a “haptic creature”, a robot made to be touched (it has fur) to classify various ways users touched the robot in response to an emotional state (when a user is pleased for instance, they are likely to hug the haptic creature). Studies are also interested in verbal interaction. As such, they look for instance at discourse (Lemaignan et al. 2012), and turn taking (Lee et al. 2012), but also at what more global interaction skills are necessary (Nieuwenhuisen and Behnke 2013) for robots to perform well.

Among most of these studies, the question of anthropomorphism is underlying. Epley, Waytz, and Cacioppo (2007) explain that anthropomorphism is about attributing humanlike characteristics to nonhumans. In anthropomorphism, users can project humanlike mental abilities onto artifacts, and as such make them potential interaction partners (Airenti 2015). Many roboticists and researchers trying to improve social interaction use humanlike characteristics for interaction, in order to foster anthropomorphism and facilitate interaction (for more on anthropomorphism, see chapter 5).

Studies in HRI and interactionism (with a focus on artifacts) prove very valuable in theorizing interaction with a variety of nonhumans. Similar to human-robot interaction however, in the case of robotics most of these studies happen in controlled environments, laboratory or museums for instance. Because they are not ethnographic however, much quantitative data is collected, and a more global picture of interaction can rapidly be lost in translation. Most of these studies look at very precise factors that may or may not influence interaction. Furthermore, while some authors do develop their own robots or have a hand in developing some of the robots they use, the fact remains that they, for the most part, are insiders. Except for studies conducted by Damiano and Dumouchel (see for instance Damiano, Dumouchel, and Lehmann 2015, Dumouchel and Damiano 2011, 2016), studies in HRI or interactionist studies focused on artifacts do not show much concern for who creates and develops robots, how, and why. The assumptions behind social robots, their reason d'être, some seemingly minor aspects of their appearance—more precise than the qualifying "humanoid" or "android"—like their eyes, hands, and so on, are not often questioned or justified. The robot and its construction are very much a black box that needs to be challenged.

1.4 Conclusion

In sum, this project is at the intersection of multiple endeavours and disciplines: anthropology, and especially the anthropology of technology and ontological anthropology, but also psychology and robotics. They helped define my object of interest, the robot, as not only a technology, but as a nonhuman. The nonhuman is an actor that can be interacted with, and the modalities of the interaction can be looked at through the lens of HRI and interactionism. While the anthropology of technology does not accurately represent my fieldwork, it does lead me to take into greater consideration the context in which the interactions between human beings and robots happen.

2 Chapter II – Methodology

This chapter presents the six-month fieldwork I conducted in Japan. Here, I will present why I chose Japan to carry out my fieldwork, but also the different environments and settings in which this research was conducted: a start-up and two nursing homes. I will then briefly describe Japan's healthcare system for the elderly and the populations present in nursing homes and day-cares around Japan. Next, I will explain the methodology used to conduct this research, namely ethnography, as well as the participants in this research, before finally reflecting on my place as a researcher in these environments.

2.1 The fieldwork

2.1.1 Japan at the intersection of aging and technology

Japan has proven to be a constant power in technological innovation since WWII. Not long after the war, there was a gap between Japan and other Western industrialized countries that Japan quickly filled through the development of its industry (first iron and steel, for instance, then the automobile industry) (Uchino 1969). From the 1950s onward, the demand for automated machines also grew steadily, notably because of labor shortage (Uchino 1969). Furthermore, from the 1950s through the 1970s, the Japanese Ministry of International Trade and Industry (MITI) strived to encourage technological innovation by, for instance, funding research and development (R&D) and developing cooperative agreements between the government and multiple firms from the same industry. These agreements were used to share information between companies under the government's supervision to develop new products and techniques (Bernier 1995, Baranson 1983) . In the early 1970s, the Japanese government, in partnership with actors from various industries, started to consider new areas of technological development. Robotics[4] was one of them (Baranson 1983). It was thought that robotics could not only improve and restructure the economy, but also increase productivity and ensure employment of workers by shielding them from the lack of stability in industrial work, and finally, that they could encourage the exploration and exploitation of marine and extra-terrestrial resources (Baranson 1983). In 1978, the government started to

[4] At that time, it was mostly about the automation of industry with industrial robots, robots were still far from social robots like Pepper.

implement policies to foster the robotics industry. Four years later Japan was leading the world in robotics, having four times the United States' number of robots (Herbig 1995, 32). Automation continued to rise during the 80s (Bernier and Mirza 2009), and, during the late 90s, the Ministry of Economy, Trade and Industry (METI) (the MITI's successor) started the Humanoid Robotics Project, a five-year plan to explore the potential of humanoid robots (Hirukawa et al. 2004).

Since the early 2000s, the Japanese government still invests in robotics and regularly develops plans to encourage its development and use. While Japan is also known for expanding the field of robotics, by for instance developing pet-like and android robots, in 2012 it was still leading in industrial robotics (METI 2015). Not only Japan thus keeps putting robotics at the core of its economic strategy, but robotics is also increasingly seen as a solution to various social problems, like aging. The "Robot Revolution" plan, an endeavour from the government to foster the development and application of robotics, was decided in 2014 to achieve this goal. In 2012, the METI and Ministry of Health, Labour and Welfare (MHLW) produced a report called "Priority Areas to Which Robot Technology is to be Introduced in Nursing Care", later revised in 2014 and 2017 (METI 2017, 2013). This report underlines, among other priorities and areas of interest, the "Project to Promote the Development and Introduction of Robotic Devices for Nursing Care". This project, managed by the Japan Agency for Medical Research and Development (AMED) and starting in 2017, addresses the increase in Japan's aging population by fostering the elderly's independence and mitigating consequences on caregivers through robotics (METI 2017, 2013). Although social robots are not part of the government's plan for nursing robots, AMED conducted a study on communication robots in 2016[5], thereby proving that the need for robots for eldercare, and potentially social robots, is picking up momentum.

On a personal level, Japan quickly became an evidence as a fieldwork site as I had prior experience in the country: I have an undergraduate degree in East-Asian Studies and Anthropology with a specialization on Japan, and I also participated in a summer exchange program with a Japanese university in 2014. However, a research scholarship in 2016 from the Japanese Ministry of Education, Culture, Sports, Science, and Technology facilitated my fieldwork. Furthermore, it was already decided that I would focus on robotics. While it is up for debate, Japan is often

[5] Heisei 28 nendo, robotto kaigo kiki kaihatsu dōnyū sokushin jigyō (kijun sakutei hyōka jigyō) Robotto Kaigo kiki kaihatsu ni kansuru chōsa ni kakaru jisshō shiken jisshi shisetsu no boshū nitsuite. Online: http://www.amed.go.jp/koubo/020120160519.html Accessed October 25th, 2017.

perceived in mainstream media and collective imagination as a country embracing robots (MacDorman, Vasudevan, and Ho 2009). Japan's robotics industry is flourishing and robots are increasingly seen as potential interaction partners and entities with which to coexist (Robertson 2014). The nation-wide release of the "emotional" (as it was marketed at the time) robot Pepper in 2014 confirmed that Japan would prove to be the ideal place to observe the interaction between individuals and robots "in the wild", or outside of a laboratory (Callon and Rabeharisoa 2003).

In the last twenty years, anthropology in Japan has had a variety of interests. Academics have for instance studied ethnic minorities, like *zainichi* Koreans, and multiculturalism (Graburn, Ertl, and Tierney 2008, Roth 2008, Ryang 2008), questioning the presupposed ethnic unicity of contemporary Japan. Scholars have also been interested in countercultures, often by studying identity and youth culture, seen through resistance to the perceived dominant culture (D'Orangeville 2013, Kinsella 1998, LaMarre 2006, D'Orangeville 2014). Various researchers have also studied topics related to medical anthropology, such as depression (Kitanaka 2012), disability (Nakamura 2006, 2013a, Teruyama and Horiguchi 2012, Teruyama 2017), aging, for instance looking closely at menopause and how it is different from menopause in North America (Lock 1993b), or looking at dementia and the ways it influences the concept of personhood (Henderson and Traphagan 2005, Traphagan 2000). Anthropologists are thus covering a multiplicity of subjects, including family and household, (Ochiai 2005, Ronald and Alexy 2009, Robertson 2007), but also social robots (Kubo 2013, 2010, Robertson 2010, 2014), and how they intersect with religious practices in Japan (Bruun Jensen and Blok 2013, Kaerlein 2015).

2.1.2 Fubright Communications

While scouting around in Tokyo for an appropriate fieldwork site during my first few months in Japan, I had the chance to meet an employee at SoftBank Robotics, the company behind Pepper. He invited me to "SoftBank World", the company's annual convention, which was in 2016 concurrent with their "Pepper World" event. These conventions are organized for SoftBank to showcase its new products, services, and partnerships, but the company also invites many smaller companies or start-ups that develop applications for their robot Pepper. These smaller companies benefit from SoftBank's influence and patronage, as the multinational organizes events like the Pepper App Challenge to stimulate the community of developers, and it offers their applications on their "app store"; but, in a typical *quid pro quo*, SoftBank also needs its product's functionalities to widen, and does so by relying on these smaller companies to keep developing new uses and creating new applications for their robot, like Fubright Communications.

During the 2016 SoftBank World event, I had the chance to be introduced by my informant to Fubright Communications, who, after I presented my research to them, accepted to host me as an intern. I began my internship in October 2016. We decided I would come four times a week and work on various tasks they would assign to me, and that they would try to see if any nursing home they were in contact with could welcome me for my fieldwork. Fubright Communications then accepted to be part of my research and let me conduct interviews with willing participants. During the six months I stayed at the company, I had the chance to be brought and shown around many places and events, such as exhibitions (the 2016 Home Care and Rehabilitation Exhibition, and so on), nursing homes and day-care facilities they were visiting, either to present their products or to accompany during visits with foreign delegations and investors. They took me under their wing, invited me to *nomikai*, or get-togethers, let me help when they moved into their new office, and even made me company business cards so I could properly introduce myself as their intern.

Robots were inhabiting the space at Fubright as much as the staff. There was a Nao and several Pepper[6] robots all around the office. At a height of 1.20m, they are quite large, and more often than not one had to maneuver in the office to avoid them. In one corner of the office sat their cardboard boxes, one on top of the other, ready to transport them when the time came. One of the Pepper robots had been set apart with green stickers covering its body, reminiscent of the company's colours. That Pepper was affectionately called *midori peppā*, or "green Pepper", and when it was absent (lent to another party for instance), there would be conversations about its whereabouts and when it would be back. On one occasion, there was between one and three Pepper robots in the office, but when we moved to a different location and I came to bring my last *omiyage* (souvenirs) as a thank you, there were ten of them aligned on two rows, most turned off, staring at me with a blank expression.

Like in a regular office, there was the occasional meeting or conversation that broke the usual calm, but what struck me the most was how noisy the robots were. Their plastic articulations ground together to produce a particular sound that I have never heard anywhere else. Furthermore, while the employees usually turned their volume down, they would sometimes forget to do it and

[6] For a picture of Pepper, see p.43.

the robots would suddenly blurt out seemingly random sentences, to remind us to wash our hands before eating or bring an umbrella because the weather forecast announced rain for the afternoon. On one occasion, a Pepper even exclaimed out of the blue: "That's right! I'm a weird old man!"

2.1.3 Nursing homes in Japan: Naruse and Hiyoshi

In Japan, individuals aged 65 and older are insured under the long-term care insurance (LTCI) system. They are eligible to long-term care services (facility, home-based, or community-based) if they need help in their daily life, have dementia, or are bedridden (Japanese Nursing Association 2013a). I conducted my fieldwork in two types of places: special nursing homes, considered as a facility under the Japanese long-term care insurance, where permanent residency is possible (Nakanishi et al. 2014), and a day-care facility, which falls under the home-based services of the LTCI.

Under the LTCI system, a total of eight categories—"(…) eating, toileting, transferring, hygiene/bathing, assistance with instrumental ADLs [activities of daily living], challenging behaviors, rehabilitation, and assistance with health care" (Nakanishi et al. 2014, 76.e3), are taken into account to classify individuals under seven levels of care: support levels 1 and 2, and care levels 1 through 5. Support levels 1 and 2 mostly concern individuals living at home. Care levels 1 and 2 apply to individuals with difficulty standing and/or walking and who need help with their ablutions. At care level 3, the person cannot stand or walk anymore and needs full help with their toilet. Individuals who need full help with their daily activities are at care level 4, or 5 if they have trouble communicating (Kurube 2014). It is estimated that individuals at care levels 1 and 2 require less than 70 minutes of care per day, less than 90 minutes for level 3, and less or more than 110 minutes for levels 4 and 5 respectively (Tsutsui and Muramatsu 2005).

In 2011, in special nursing homes, individuals are care levels 1 and 2 constituted 11.1% of the population, individuals at care level 3 were 20.3% of the population, 32% of the population was at care level 4, while the remaining 35.8% were at care level 5 (MHLW 2011a).

Table 1. The five levels of care and their distribution in special nursing homes

Care level	*Physical and cognitive impairments*	*Estimated minutes of care per day*	*Distribution in nursing home (%)*
Care level 1	Some difficulty standing and/or walking. Needs some help with their ablutions.	<50	3.1
Care level 2	Difficulty standing and/or walking. Needs some help with their ablutions.	<70	8.7
Care level 3	Cannot stand nor walk. Needs full help with their ablutions.	<90	20.3
Care level 4	Cannot stand nor walk. Needs full help with daily activities.	<110	32
Care level 5	Cannot stand nor walk. Needs full help with daily activities. Has trouble communicating.	≥ 110	35.8
Others			0.8

Day-care services are offered under the home-based services of the LTCI, and they include both day care and rehabilitation. They are provided in a facility and constitute of a "(…) program of nursing care, rehabilitation therapies, supervision and socialization that enables frail, older people, who are in poor overall health and have multiple comorbidities and varying physical or mental impairments, to remain active in the community" (Kuzuya et al. 2012, 323). Users of day-care services live at home and decide to come once or several times a week to the facilities.

Individuals at support levels 1 and 2 fall under the preventive services (preventive day service or rehabilitation) of the LTCI, while individuals at care levels 1 through 5 fall under the nursing services of the LTCI (day service or rehabilitation). In preventive services, individuals at support level 2 are slightly more represented than individuals at support level 1, while individuals are care levels 1 and 2 constitute the majority of the nursing services' day-care users (MHLW 2011b). The day-care I conducted my fieldwork at catered to both types of individuals, and it offered both day service and rehabilitation under the preventive and nursing services.

Table 2. Distribution of the two levels of support and five levels of care in day-care services

Care level	*Representation in preventive services (%)*		*Representation in nursing services (%)*	
	Preventive day service	Preventive rehabilitation	Day service	Rehabilitation
Support level 1	43.2	38.1	-	-
Support level 2	55.7	61.6	-	-
Care level 1	-	-	32.3	28.9
Care level 2	-	-	30.5	32.7
Care level 3	-	-	19.0	20.2
Care level 4	-	-	1.4	12.1
Care level 5	-	-	6.4	6.0
Others	1.1	0.3	0.3	0.2

During a study conducted in September 2011 (MHLW 2011b), researchers noticed that individuals used day-care services between about five and eight times that month, which amounts to about once or twice a week. Individuals using the preventive services, who thus fall predominantly under the support levels 1 and 2, came about once a week, while individuals using the nursing services, thus falling under the various care levels, came more often to the day services: about twice a week. This can easily be explained by the fact that they have higher needs that cannot be fulfilled solely at home, thus they have to come more often to medicalized facilities.

Table 3. Average days of use per day-care service in September 2011

	Day-care services	*Average days of use*
Preventive services	Preventive day services	5.5
	Preventive rehabilitation	5.8
Nursing services	Day service	8.5
	Rehabilitation	8.2

As such, two main types of users can be identified. First, the average user in day-care is between support level 1 and care level 2. At most, she[7] has difficulty standing and/or walking, and

[7] From my observations in Hiyoshi and Naruse facilities, most of the day-care users and residents were women.

needs help with her toilet and with bathing; however, she does not require more than 70 minutes of care per day. She comes to the day-care between 5 and 8 days per month, or approximately once or twice a week. Second, the average resident in special nursing homes is between care levels 3 and 5. She cannot stand or walk by herself, and needs help with her toilet and with bathing, and often with daily activities. Sometimes, she has trouble communicating. She requires more than 70 minutes of care per day[8].

When asked about the difference between day-care users and long-term residents, caregivers generally underlined in conversations that day care users' needs could be rather easily managed, compared to these of residents, often bedridden. Indeed, day care users were generally seen as healthier and more active than residents. In the Naruse facility's day-care, users are thus relatively mobile, going from one place to the other with support from caregivers or with a walking stick, while some others are even particularly apt with their wheelchairs. It was not the case in the long-term care area, where residents were mostly brought from one place to the other, a situation also found in the Hiyoshi facility.

As an intern, I was regularly accompanying employees of Fubright Communications to a facility called Naruse[9], situated in Tokyo. Foreign delegations, both governmental and from the private sector, would sometimes visit to look at how Naruse was making use of various technological equipment. Employees at Fubright would come to present their applications for Pepper and would sometimes be in need of someone to translate. Therefore, I quickly became a familiar face in Naruse. After I presented my research during a meeting that the company had organized with nursing homes that were using their products, to have customer feedback, it was decided that I would spend a month at the Naruse facility, and three months at another, Hiyoshi. These facilities were participants in a research conducted by AMED[10], a governmental organization, to better understand the use of social robots for nursing. I would come to the two facilities, conduct participant observation, and write reports that would help them write their own reports for the study.

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[8] Approximately one in seven persons, or 14.3%, of 65 and older has dementia, and 9.5% of the population of 65 and older has dementia that requires assistance (Japanese Nursing Association 2013b)

[9] For privacy reasons, the names of the two facilities, as well as the names of the participants, have been changed.

[10] AMED recruited several facilities across Japan to test various social robots, including Aibo, Sony's robot dog; Paro, the therapeutic robot seal; Palro; Pepper; Robohon. Fubright's applications for Pepper were part of the solutions investigated by the study.

I conducted fieldwork in these nursing homes once or twice a week, on Thursdays and Fridays. I was introduced to the teams on my first day and taught about the ways the facilities were organized. Having no formation or experience whatsoever with nursing or the elderly, Naruse's director put me under the responsibility of Kobayashi-san[11], a caregiver in charge of the facility's robotic equipment. He thoroughly presented the facility's robots that I would come across and use, and he made sure I read all their affiliated documentation. I shadowed Kobayashi-san as much as possible, helped when I could, and tried not to get in the way.

There was not much place for me to wander around during my stays at the two facilities, as the facility's organization were efficient but limited in space. I was told to wear the staff's shirts and masks, and it immediately positioned me as one of them to the residents and day-care users. However, being white and younger than most of the staff, I was still very visible and recognizable in the facility. It was a position sometimes uncomfortable as residents and day-care users would sometimes try (and succeed) to make me do things for them that I was not necessarily supposed to do. During the process of making my ethics certificate I had been warned by my university about potential actions that were reserved to caregivers, and in many situations, it made me unsure of what to do, for instance when someone tried to get up, although they were not supposed to do it alone. During these occasions, the residents quickly called out for a caregiver to handle the situation properly. Elderly residents and users very kindly accepted me in the facilities, and they helped me and directed me when I was not doing things correctly. The group of caregivers assigned to Naruse's day care, and of which Kobayashi-san was a part, was regularly meeting outside of work and they sometimes invited me.

At Naruse, the day-care area was often buzzing with activity, between the various activities organized for the elderly, caregivers coming in and out, helping users to use the restrooms, bringing them to a bath or to rehabilitation, distributing tea, and so on. One had to carefully maneuver between wheelchairs, canes, chairs, tables, and, sometimes, their Pepper. By contrast, the residential area was much calmer, with background noise from the TV, residents quietly reading, and caregivers folding sheets.

[11] -san is a Japanese honorific denoting respect.

The second facility, Hiyoshi, was mostly like Naruse's residential area, very peaceful. The second and third floors[12] had quite different atmospheres, with more people on the second floor coming out of their bedrooms and sitting in the common areas. The facility's atmosphere radically changed between regular days and bath days. Mornings that were usually calm took a rather hectic turn, with caregivers having to carry out their usual tasks while hurrying up to prepare everyone, aligning them on neat rows; the incessant up-and-downs from the elevator; and the noisy hair-dryers. Later during the day, the TVs usually showed afternoon dramas, or sumo matches during tournaments, while some residents were watching absent-mindedly or napping on their chairs.

Because of its history and the emphasis it put on the development of robotics, Japan seemed ideal to conduct a research on the use of social robots. Investigating interactions between users and their robots was possible through the presence of various social robots across Japan, but Tokyo in particular. I first focused my research on a start-up using Pepper to develop health applications for nursing homes, and later I gained access to two nursing homes that were using social robots as well. This fostered my interest to investigate how individuals with and without a technological background use and interact with social robots.

2.2 Methods

2.2.1 Participant observation

Starting with Malinowski (1922), to whom the development of extensive fieldwork and ethnography is generally attributed (Dourish 2001), ethnography and anthropology have been perceived as inseparable (Howell 2017). Fieldwork and participant-observation have been widely considered anthropology's epistemological basis (Clifford 1983), and nearly a hundred years after Malinowski's seminal work on the Trobriand Islands, the ethnographic method is still one that we privilege in our discipline today.

Epistemologically speaking, according to Clifford (…) ethnographic fieldwork remains an unusually sensitive method" (1983, 119), that Astuti efficiently summarized: "(…) anthropology is built on its unique way of finding things out. We turn up in a place and we ask its people to allow us into their lives" (2017, 9). Anthropology's epistemology is based on our presence in

[12] The first floor was made of the reception, several offices, the staff's changing rooms, the kitchen, and bathroom with equipment for individuals with lower mobility.

various spaces and the relationships we create. “It is both a resource and a constraint”, Olivier de Sardan (2008) warns, as the researcher has access to extremely rich data but must report them with the utmost fidelity and in the respect of our informants. We often create deep and ongoing relationships during fieldwork, from individual to individual rather than from a researcher to an informant.

Furthermore, for the researcher doing fieldwork is not something trivial. It requires a constant commitment to the language, the place, and the individuals we interact with. Clifford underlines the fieldwork’s experiential nature and its toll on the ethnographer:

> Participant observation obliges its practitioners to experience, at a bodily as well as intellectual level, the vicissitudes of translation. It requires arduous language learning, some degree of direct involvement and conversation, and often a derangement of personal and cultural expectations. (…) as a means for producing knowledge from an intense, intersubjective engagement, the practice of ethnography retains a certain exemplary status. (1983, 119)

In participant observation, the researcher takes the posture of an (almost) insider in their fieldwork, in order to try to live and understand its realities for the participants and to have access to data that would be otherwise not accessible (Bloch 2017, Soulé 2007). Participant observation’s goal is to observe social processes in their “natural” context (De Sardan, 2001). Bastien warns, however that this posture is dangerous as it does not encourage distance and objectivity. As such, during my fieldwork I tried to remain conscious of the advantages and drawbacks of participant observation and to be reflexive in my approach. Another difficulty remains however, and that is an artificial modification of the fieldwork because of the researcher’s presence (Emerson 2003). However, ethnographic researchers try to use moments of tension and change to explicit meaning and values. I decided to embrace my position as a new element in the fieldwork and tried to take opportunity of the changes I brought to the environments in which I was conducting my research.

Simply put, participant observation can be broken down into two elements, namely observation (see what is done) and participation (do what is done). However, observation, far from being that self-evident, as observed Beaud and Weber actually necessitates a triple exercise of “perception, memorization, and notation” (2010, 125, my translation) to properly process the information. While here participation and observation seem like separate endeavors, some like Ingold argue that participation and observation are intertwined: “(…) observation is a way of participating attentively, and it is for this reason a way of learning” (2017, 23).

I thus conducted two different types of participant observation: in a company setting and in a nursing home setting. At Fubright Communications, I participated in as many activities as I could, and I did some research projects or translation when necessary. I was an intern from October 2016 to mid-March 2017. I could thus observe and participate in the daily life of the company: the moments where everyone was working silently—or not— on their projects, the in-company meetings, the small-talks, and irregular or "ab-normal" events like painting the new office and moving, and so on. But I was a part as well of more irregular events, such as the aforementioned exhibitions, that the staff were attending as visitors to meet new companies and exchange business cards or that they were attending as exhibitors, with their corporate shirts and the green Pepper. Fubright Communications was also doing regular trips to nursing homes to present their services, either to the nursing homes themselves or to foreign delegations (state officials, foreign companies interested in investing, and so on), where they would set up Pepper and perform recreation sessions[13] with the residents. I also accompanied the staff to some more social events, mingling with other start-ups in the robotics business (as I discovered, it seems to be a fairly small world), teachers at various universities who were interested in its potentialities, or even officials at SoftBank. As such, I observed and participated in a very corporate, or business-oriented, setting.

From early December 2016 to mid-March 2017, I also conducted fieldwork in two nursing homes. While I did a lot of shadowing in Naruse, I only got to participate as much as I was not a bother (it happened when the staff was low in numbers due to some caregivers having taken the same day off). However, I mostly participated in the second facility, Hiyoshi. In Naruse, on a few occasions I had a schedule for the day prepared before I arrived, and my days sometimes finished with a meeting with the facility's management, asking me what I did and what I saw that day. My days were similar but different, and sometimes I was in the day-care area, and sometimes in the residence. Most often I would go from one to the other when I was required to. In the residence area, I got to supervise and observe recreation sessions with different robots, while Kobayashi-san was the sole user of Pepper for the day-care. After the various recreation activities –including robots or not, the day would usually end with me accompanying Kobayashi-san in his rounds to bring day-care users to their residences.

[13] I use the term recreation, or recreation session, based on the Japanese レクリエーション, *rekuriēshon*, that refers to supervised activities proposed to the elderly, often having a therapeutic orientation.

In the other facility, Hiyoshi, there was not one designated caregiver responsible for using robots with residents, and often, I was assigned the task of making residents interact with them. I was there to observe people using robots, and caregivers were busy, so that situation quite naturally came to be. At this facility, I was much more independent, and the facility's management only required a daily report of my activities at the end of each week, before the final report. This time, my position was not so much with the caregivers anymore. It was decided that I would eat my lunch in the office with the administrative staff, and caregivers, being less numerous than at the first facility, were often rushing and seldom had the time for lengthy conversations. However, caregivers often directed me towards residents they knew wanted to use a robot but could not always, or residents who they thought might want company. Everyday I would often meet several groups of residents in the common rooms, and we would use a robot for recreation if they wanted to, before I would go see the individuals who seemed to prefer to stay in their bedrooms. I only entered in their bedrooms if they gave me permission and wanted company, and I left alone anyone who was not inclined to my presence or the robots.

2.2.2 Semi-structured interviews

I conducted a total of eleven interviews: three with employees from Fubright Communications, one with an engineer involved with the creation of Pepper, one with an employee at SoftBank who was developing applications for Pepper, and six with nursing home employees (see Table 4). For reasons of privacy and ethics it was difficult to conduct interviews with residents and I decided against it.

For my interviews, I came to favor people who I had a previous relationship with. In fact, when I tried to approach caregivers who I had not had much prior contact with, many seemed uncomfortable, or agreed to be interviewed but never replied to my follow-ups. It was not easy to recruit willing participants, and it was thus more feasible to conduct interviews with individuals who had already showed interest in my research, or who I was meeting more frequently. Even then, some nursing home employees tried to keep the interviews very factual and short, avoiding questions about their perceptions or feelings[14]. One such interview, for instance, only lasted for

[14] I can only postulate about why these participants were not inclined to share more. Some opted to have the interviews done at their workplace (the consent form did specify they should be confidential, but the choice of the place was let for the interviewees to decide) which may have kept them from disclosing information that they deemed too intimate, and I imagine some may have been surprised that I asked personal questions.

forty minutes, while the longest ones were about two hours and a half. On average, the interviews were about an hour and a half.

I obtained all interviewees' permission to audio record, and they signed consent forms beforehand. These consent forms described thoroughly the research and the participation's conditions, as well as the respondents' rights and my obligations toward them. Participants have a right to privacy, and as such everyone's name has been modified. Interviews were conducted where it was the most suitable for the participants, and while three of the respondents felt more comfortable conducting interviews in their workplace, during work hours, the rest preferred coffee shops or even restaurants to talk. These are places to unwind and talk freely, and in general, respondents interviewed in such a context seemed more relaxed and willing to share than respondents I talked to in their workplace. Restaurants and coffee shops were also a good way to diffuse the interviews' potential tensions as they offered plenty to talk about and bond over. Most of them were "typically" Japanese, as their brand or food was originally from Japan. One respondent explained his choice by saying that he wanted to share with me a specialty from Tokyo that he particularly liked but that was not so much known to foreigners, the *monjayaki*[15].

Most respondents were middle-aged men. The environments I conducted my fieldwork in where either male-dominated or equally divided between men and women[16]. On average, caregivers and employees at Fubright were about forty years old. It was similar to the caregiver population in the nursing homes. The oldest respondent was working in a nursing home and was 64 years old. The youngest person I interviewed was working at SoftBank, and he was 23 years-old.

[15]A liquid batter made of chopped cabbaged, flour, water, eggs, and with various toppings, that is fried on a grill and eaten with a spatula. A type of *okonomiyaki*.

[16] It is interesting to note here that my interview informants are male, and that most of the residents I interacted with were female. This was not a conscious decision and this situation in fact arose from the field. Gender was not the focus point of this research and as such I will not address it later in this thesis. However, it is possible that my informants were only male for two reasons: Fubright Communications only had male employees, and my own gender may have had an influence on who accepted to be interviewed among the caregivers. I realize it influenced the data I collected but it is difficult to say exactly how it impacted the analysis.

Table 4. A portrait of interviewees

Place of employment	*Profession*	*Number*	*Age*	*Gender*
Fubright	Developer	2	Late 30s, 40s	Men
	Managing position	1	40s	
Naruse and Hiyoshi	Caregiver	4	Late 30s, 40s	
	Managing position	2	60s	
SoftBank	Developer and former developer	2	20s	

I favored semi-structured interviews, and I tried to make the interviews in the form of a conversation as much as possible, to let the participants express themselves and talk about subjects they felt were important. This worked, to the extent that we sometimes digressed on the subject entirely. I adapted the interview questions to fit closely the reality of the participants, but many questions revolved around similar subjects, to have a wide variety of opinions on the same matters. For instance, with nursing home workers we talked about their own experiences with robots, prior and current, as well as their daily life in the facilities, what care was for them, and if and how care in the facility was impacted by the use of social robots, what robots did or did not do for them as caregivers, how they thought elderly users were reacting to the robots, and so on. With Fubright employees, for example, we talked about what they thought Fubright's mission was. I also asked them about their prior and current experiences with robots, and about specific moments I saw them interacting with robots, among many other questions.

Two interviews were conducted in French, one in Japanese and English, and eight interviews were only in Japanese. As I had talked to them before, respondents were familiar with my level of Japanese and often made sure I understood well some of the more complicated vocabulary they used, sometimes rephrasing or letting me search for a precise definition in an electronic dictionary. I also was careful to rephrase with my own words statements that I was not sure about. When I transcribed the interviews I also had time to reflect more on some sentences that had escaped me before and seek help with translation.

2.3 The researcher's place

2.3.1 Who (or what) am I?

My position was quite clear in the beginning of the research. I was not recruited by Fubright Communications, but I was present in their office and had tasks to accomplish, like the other employees. However, these tasks were not essential for the company, and I was not remunerated. I started without having a business card, an essential item in Japan, which positioned me as an outsider in the beginning—I was constantly apologizing for not having business cards while everyone else was exchanging theirs. When it was decided, after a few weeks, that I would have my own, I was told that it was so that I could represent the company and so that people would know that I was an intern at Fubright Communications. The business cards had indeed the corporate logo and colors, and they properly identified me as one of them. When the presentations were longer than just the classic exchange of cards, I was introduced under my double etiquette: as an intern, but also as a research student from Tokyo University[17]. Tokyo University, or *Tōdai* as it if often called, is the country's most prominent university, which comes with a certain prestige that I am sure was appreciated by Fubright Communications. This was never made explicit, however the various reactions to the announcement of that status made clear that it was important.

At Naruse, my status was not as clear at the beginning and it had to be clearly explained. I had come several times before with Fubright Communications and was thus first identified as their intern, so as a part of the company that made their Pepper's applications. I was also introduced to Naruse's management by the higher-ups at Fubright and the negotiations about my fieldwork had been made with their agreement. Furthermore, while I was conducting my own research at Naruse, I was supposed to write daily reports for the facility's management as well. I thus had a triple status while doing my fieldwork. For the caregivers, residents, and day-care users, this was a bit confusing at first.

Negotiating this triple status proved quite tricky initially. However, the staff at Fubright Communications never asked to have access to any of the data I would acquire during my fieldwork there, nor did they ask for reports on particular topics. They were interested by the research of course, but they would only read the finished thesis. As for the nursing home

[17] As part of my scholarship, I could enroll in a Japanese university. I was accepted at Tokyo University as a research student and enrolled there for a year.

management, they did not ask to know any specific details of my fieldwork either, they mostly wanted my thoughts on the robots they used and how they were used. I thus decided to write my reports in very general terms, using only my observations, and ensured participants to the interviews that what they said was strictly confidential and would not be used for any other purpose than my research. I was spending most of my time with caregivers and residents or day-care users, and everything went smoothly. At Hiyoshi, the second facility, my status was not a problem. Fubright Communications was not present there and there were not as many caregivers, and information thus circulated more quickly.

Resembling what Bloch (2017) describes, my relationship with my informants was very much of a relationship of dependence, where my access to their knowledge and the field was entirely depending on them. In the end, I gained access to the two nursing homes thanks to their help. I mentioned earlier that Fubright Communications "took me under their wing", and I believe that this was partly a response to my status as a young, white woman. I was indeed much younger than many of the employees, who were on average about fifteen to twenty years older than I was, and all Japanese men.

Foreigners in Japan are called *gaijin* (外人), a word made of two characters, the first (外, *soto*) meaning "outside", the second (人, *hito*) meaning "person". The *gaijin* is thus quite literally a person from the outside, an outsider (Aldrich 2009). There are many pervasive stereotypes about *gaijin* in Japan, and most often foreigners are portrayed as individuals who cannot speak Japanese or act appropriately (Fukuda 2017), but it is sometimes linked to other behaviors as well:

> While the term denotes any non-Japanese person, it is generally understood to refer to English-speaking Caucasians from Europe or America. Gaijin are stereotypically presumed to be outspoken, culturally clueless, lacking proper deference and unable to use Japanese correctly (…) and gaijin who behave differently are treated as exceptional cases (…). (Moody 2014, 77)

As the only foreigner in the office, I was thus totally an outsider, and probably clueless—or perceived as such—in many regards, even though I did receive appreciative comments when I exhibited culturally appropriate behavior, such as using chopsticks correctly or saying goodbye before leaving the office[18]. Being somehow clueless did help my research as I felt I could ask as

[18] It is polite to say "*osaki ni shitsurei shimasu*" ("I am sorry for leaving before you"), when one leaves an office while others remain. During my farewell party at the office, the company president explained, laughing, that I sometimes had behaviors that were according to him "very Japanese", and he cited this one as an example.

many candid questions as I wanted: using my *gaijin* identity here let me have access to information that I am not sure I could have obtained had I been Japanese. Using one's *gaijin* identity is a strategy that allows one to get away with behavior that is not necessarily acceptable in Japan or for Japanese individuals, as Moody (2014) explained by showing how David, an American intern in a Japanese firm used his identity to bother his superior with questions more often than his co-workers. However, when this *gaijin* identity is brought to the foreground, discussed, co-constructed, and even joked about, it can also be a basis to create positive relationships with colleagues, like David the intern did regularly. As Moody describes, "by interacting this way on a daily basis people may learn to bridge cultural and linguistic barriers through positive experiences built around inherently different backgrounds— a realization of a common human goal we all share" (Moody 2014, 85).

Being such a visible outsider helped me to some extent, I believe, in Naruse. Caregivers, residents, and day-care users were used to having delegations visit the facility, but from my observations, there were only few interactions between the visitors and the facility's caregivers[19] and elderly. However, I did speak Japanese and I was interested in the staff and the elderly, and they seemed to be interested in return. On the days I was present, I was something different, an opportunity to reminisce about own's previous trips abroad or to discuss about Japan, nursing homes, and robotics. Many of my conversations however, revolved around my characteristics as a foreigner, mainly my interest and presence in Japan, and it was sometimes difficult to get out of conversations about my "big eyes" and supposedly good-looks when I wanted to talk about something that I felt was more relevant to my research at the time.

In the second facility, Hiyoshi, I was not as chaperoned and there were very few visitors unrelated to the residents or staff. I was much more "out of place" in a way, and that was confirmed to me by a staff member on my last trip back from the facility. We had taken the habit of taking the bus together, and she confided in me that evening that when I arrived, most of the staff was not too sure what to expect at first. "But you were okay", she said, and added that everyone was relieved it went well. I was too.

[19] There were indeed interactions, but they were limited to the caregivers and staff in charge of the technologies that were presented. Caregivers who did not use robots or more high-tech equipment did not engage with the visitors.

2.3.2 Being part of one's fieldwork

When I started doing my fieldwork, I was wary of intervening too much and influencing events. When I arrived in Hiyoshi, and it became clear that I would be the one using robots with the residents during my days of fieldwork, I was initially reluctant. *I want to see what happens when a caregiver uses a robot* I thought, *I want to understand how things happen "naturally", "organically"*. I gradually realized that this *was* what happened "organically", that in its current situation, the facility had to use robots but had no one to give the task to other than a quite confused foreign graduate student questioning herself about her position in her fieldwork. It was a consequence of their lack of caregivers, and it led me to do several things. First, I started to question the role of robots and their relations with caregivers, to question if robots are really a support for their caregivers (as it was explained to me) or if robots are seen as a potential replacement of caregivers. Then, fully involving myself as a perturbing element, I started to decidedly create change. For instance, I started to tinker with the robots, play with their parameters to see what it would change in their use and the way people interact with them. I thus came to embrace this position and the new questions it raised.

2.4 Conclusion

This chapter presented the ethnography I conducted in Tokyo. Historically, various governmental and industrial actors have endeavored to develop the field of robotics. Japan now puts a lot of efforts into developing and applying robotics to concrete social problems it is facing, like aging. One example is the use of social robotics to mitigate potential negative consequences stemming from the country's lack of caregivers. As such, Japan was the ideal place the research I wanted to conduct.

I did fieldwork in three places: Fubright Communications, a start-up developing robot applications for eldercare, as well as two nursing homes, Naruse and Hiyoshi. While participant observation was my main method to gather data, several participants agreed to be interviewed as well. I conducted interviews with six nursing home workers, three employees at Fubright, as well as one developer and one former developer at SoftBank. Being a young, white woman proved both useful and tricky to negotiate my fieldwork, but in the end I came to embrace this position as a clear outsider, and how it influenced the field and the data.

3 Chapter III – Made to Be Loved

In this chapter, I will describe various considerations and tensions behind the creation of Pepper, a humanoid robot early marketed as a companion robot that can understand emotions. I feel it would be too linear to present a chronology of the robot's conception, so instead I will focus on making visible the tensions and choices underlined by the process, and how they were resolved. I first look at the resolution to make Pepper a humanoid robot, and the limits to being humanlike. Pepper is a compromise: humanoid enough to be interacted with, but not as much as it confuses users. Then I turn to the robot as a character, having to embody ideals of cuteness and being lovable, and the actual difficulties of making the robot a companion. These two sections are informed by and follow to some extent formalized guidelines established by SoftBank Robotics, in a document called "How to Create a Great Experience with Pepper" [20] and made available to developers. These guidelines institute Pepper's identity and provide information on how to develop applications for the robot, while respecting SoftBank's aspirations for its product. These guidelines prove particularly informative in that they underline the double nature of Pepper as both a companion and a tool for business.

3.1 Humanoid… but not too much

Pepper was created by the French company Aldebaran, under the input of SoftBank Robotics. SoftBank Robotics had begun to acquire Aldebaran in 2012, and in 2015 its participation in Aldebaran's capital attained 95%[21]. Pepper was released in 2014, and modeled on Aldebaran's previous technological success, the small humanoid robot Nao, mostly available for schools and robotics laboratories. Alexandre, a young developer previously employed at SoftBank and who was working on Pepper before the release, explained that

> Masayoshi Son[22]'s goal was to bring happiness with technology. And they started from the understanding that in Japan there was a problem of loneliness, of solitude, and so

[20] I was given access to this document, a draft from September 2017, with the condition that I could refer to it but not directly cite it.
[21] Aldebaran. 2015. SoftBank augmente sa participation au capital d'Aldebaran à 95%. Paris. Online: https://www.ald.SoftBankrobotics.com/fr/presse/communiques-de-presse/SoftBank-augmente-sa-participation-au-capital, accessed 2017/10/06
[22] Masayoshi Son is the founder and SoftBank's CEO as of January 2018.

> they wanted robots that would make people feel less lonely. They wanted a robot that people could buy.

Pepper was created as the result of this thinking. Pepper is a humanoid robot, an android, i.e. it is humanlike. It has a head, a torso, two arms, two hands, and its lower-body resembles two legs that are stuck together. It does not have feet, as bipedalism is still difficult to implement in robots. Instead, Pepper has three wheels hidden under white plastic bumpers. It measures 120cm and weighs 28kgs. Pepper also has a tablet on its chest.

Figure 1. Pepper

SoftBank Robotics. n.d. Pepper. Accessed January 12, 2018. https://www.ald.SoftBankrobotics.com/en/press/gallery/pepper.

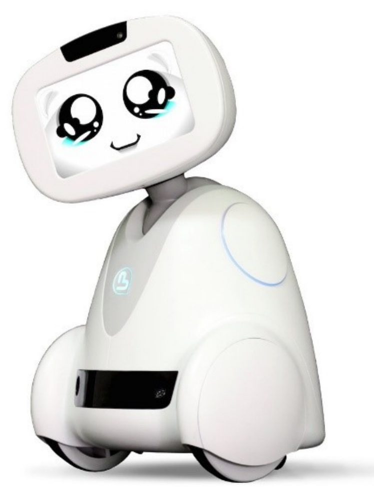
3.1.1 Humanlike, lifelike

With the rise of other "social" robots like Jibo[23] —that looks like a cylinder with half a sphere on it—and Buddy[24]—similar, but it is on wheels and instead of a spherical head, it is more

[23] https://www.jibo.com/, accessed 2017/10/06
[24] http://www.bluefrogrobotics.com/fr/home-fr/, accessed 2017/10/06

cubic— it is now evident that social robots come in a variety of forms and shapes, from the Pixar lamp-inspired body of Jibo to a clear humanoid form like Nao[25] or Pepper. Alexandre, who was working at SoftBank on the Pepper project before the robot's release to the public, explained that there is still an interrogation about which shapes, or appearances, are going to prove the most efficient to interact with, and which ones will be able to accomplish various tasks. While Pepper is actually too large to be inside people's homes, Nao may be too small for many tasks, while Jibo, which is not humanoid and not as mobile, could in fact prove to be the most efficient at interacting. The robots' various shapes are almost part of a bigger experiment on what appearance is the more efficient for a particular goal, and especially for interaction.

Figure 2. Buddy



Gadget Flow. n.d. BUDDY – Your Family's Companion Robot. Accessed January 12, 2018. https://thegadgetflow.com/portfolio/buddy-your-familys-companion-robot/.

Figure 3. Jibo

Breazeal, Cynthia. 2014. JIBO, The World's First Social Robot For The Home. Accessed January 12, 2018. https://www.indiegogo.com/projects/jibo-the-world-s-first-social-robot-for-the-home#/.

According to Alexandre, Pepper was created because Masayoshi Son, SoftBank's founder, wanted to create a robot that would "make people happy". A robot's shape seems to have a special part to play in interaction, and Alexandre was sure that there was something special with android robots: "after we had made Nao, we realized that there was something happening with the user

[25] https://www.ald.SoftBankrobotics.com/en/robots/nao, accessed 2017/10/06

that wasn't happening with other robots", he said during our interview. Later, he added that the humanoid shape is actually helping the interaction: "it [Pepper] has a better presence than just the tablet, it's more engaging, more welcoming, because it smiles as soon as you arrive. Well, it doesn't actually smile, but it talks to you happily". The keyword here is "engaging". The robot is not just a tablet: it can talk to you, and it can talk to you *happily*. SoftBank's "How to Create a Great Experience with Pepper" details what the robot *is* and *is not*, as well as guidelines that should be respected during the development of applications. Pepper is an android, the document says, not just a robot or a tablet. The implication is that Pepper can do much more and this power should be harnessed. Alexandre, by saying earlier that Pepper can smile, before correcting himself, attributes a humanlike behavior to a robot with a humanlike shape, therefore showing here how the robot's shape influences its perception as more than just a mere machine. He associated the robot talking "happily" to actually "smiling", here demonstrating how the robot can be perceived as engaging. Application developers and social roboticists want people to interact with robots, and for them, the easiest way is to recreate interactions as it would happen with another human, and this can be done partly by making the robot humanlike.

Not only the robot has a humanoid shape, it also has a humanlike behavior. When I first saw Pepper get turned on during my fieldwork, I was struck to see the robot almost breathing. Its chest and arms slightly move up and down and it does create an impression of lifelikeness. I was fascinated by the fact that the team had implemented what appeared to me as such a beautiful, yet useless, minute detail. During my interviews, I asked why the team behind Pepper tried to recreate such a lifelike behavior. Lucas, a developer at SoftBank Robotics Europe who works on creating behaviors for Pepper, told me: "We're mimicking the human a lot. We're forced to, because we try to make people interact with them like they would with humans". The main problem, for him, is trying to make humans and robots communicate "naturally". Thus, developers create almost imperceptible, lifelike behaviors in Pepper, because according to Lucas, "it fosters communication".

> Have you seen the robots turned off? They look broken […]. If we don't have this impression that the robot is slightly moving, that there are things happening in its head […], if we don't do all that, you'd have the impression that the robot is creepy. First, its face doesn't move, cause it's plastic. You'd feel like it's creepy, that there is something disturbing in staying next to it. But here, we show the user that the robot is on, and the user is not wondering whether the robot is turned on, watching him, filming

> him, or if it's turned off. […] It's really not as creepy to be in front of a robot that moves, and has small reactions to stimuli, that tries to look around itself to see what happens. (Lucas)

But when I pressed Lucas more, telling him that there are many other ways to show the user that a robot is turned on other than recreating humanlike behavior, Lucas answered "… yeah, actually, we don't do that anymore". He suggested that previously implemented behaviors like "breathing" were added to "comfort" potential users, like the elderly. It was done "to reassure people about having a robot at home", but because the robot is not human, Lucas explained, it should not have lively behaviors, i.e. humanlike behaviors that it would not have the capacity to do "naturally", like breathing. "Our robot can't breathe because it doesn't have a respiratory system. Our robot can't sneeze because it doesn't have a mucous membrane", Lucas continued. Someone breathes because they need air to survive; a robot does not need air at all. Therefore, it should not be seen "breathing". Such a behavior blurs the human-machine frontier and can induce the user in error. "Breathing" in the robot will thus be exchanged with other behaviors:

> (…) this movement will be replaced by no movements in most cases, with some loops where it [the robot]'s gonna move the arms a bit but not the rest of the body, and some "breaks" where it's gonna move the whole body, like putting its circuits back into place, you know? But we're not mimicking an organic behavior. (Lucas)

The idea of small movements to show the user the robot is turned on is preserved, but these small movements are not humanlike. However, the "How to Create a Great Experience with Pepper" document underlines one capital information: if Lucas says that the robot should not act like a human—and the document agrees on that particular point (it explains it is to avoid the uncanny valley, see below)—the document actually specifies that the robot should look alive, as opposed to inactive or inert[26]. Making the robot lively, but not alive[27], keeps the users from feeling uneasy or wary of the robot. As such, Pepper seems much easier to engage with. Lifelikeness can also come from an impression of autonomy from the robot: when the robot acts "by itself" it gives out the impression that it is alive, and able to control its own behavior, whereas in reality it is reacting to stimuli, as explained by Alexandre earlier.

[26] The vocabulary they use is much more descriptive, but I had to resolve to using synonyms.
[27] Thanks to my jury's president, Bob W. White, for pointing out that useful expression.

> Ninon: I felt like it was more efficient when indeed, the robot looked like it had its own life, or at least a relatively random behavior, unpredictable, or acting by itself. Where you don't [try to get it to act], you can simply react.
>
> Alexandre: Being autonomous, it's one thing. Autonomy gives this impression that the robot is alive, especially regarding [the robot taking] initiatives. In Pepper, you also have that side of the robot reacting to its environment, to show that it's conscious of the environment, that it's aware (…) And then there's this side too, it has to look for humans. It's in an interior environment, what moves, what makes noise, it's human activity. We're not in the woods. So, when it hears noise, it thinks 'ah, is here a human over there?', and if it sees a human, ah! It starts looking at you and doesn't let you out of its sight. There's some of that, right?
>
> Ninon: It's kind of creepy, in the office, it's like—you're working and it's looking at you.

Here, this questioning about the "humanlikeness" and creepiness of the robot is of capital importance. There is indeed an interrogation about how far Pepper's creators should go into mimicking human behavior. Questions about where to draw the line, what is human enough and what is too human it becomes creepy, are of capital importance when designing a social robot. For Pepper and other social robots, as it will become evident in a discussion below on the uncanny valley, creepiness does not come so much from the robot's design, rather than its behavior, when it moves.

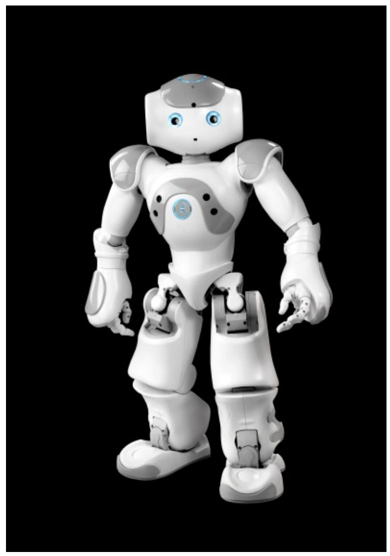
3.1.2 Managing user expectations

Having chosen a humanlike design for Pepper comes with many more complications than simply implementing humanlike behaviors. One of these complications is managing user expectations. For instance, Pepper has "ears": Pepper has round shapes on the sides of its head, situated where human ears would be. Thus, looking at this humanlike design, these two areas can be seen and understood as the robot's ears. Unlike ears, however, that listen, these round shapes are not microphones at all: they are speakers. Thus, the robot's "ears" are actually closer in function to its mouth[28]. Alexandre explained:

[28] The shape that, according to a human-based design constitutes the robot's "mouth" actually has a camera in it. Thus, the designed mouth is actually part of the robot's eyes (that are thus the two eyes, like a human being, and the "mouth"). Not unlike Picasso, nothing is where it should be on its face.

> The problem is that indeed it has ears, but it actually only listens to what is facing[29] it. So, the fact that it has ears is actually a design issue, because people talk in its ears. […] We have pictures of children talking into [Nao's] ears, and that's how children wanna talk to it. They want to tell Nao secrets. (Alexandre)

Figure 4. Nao



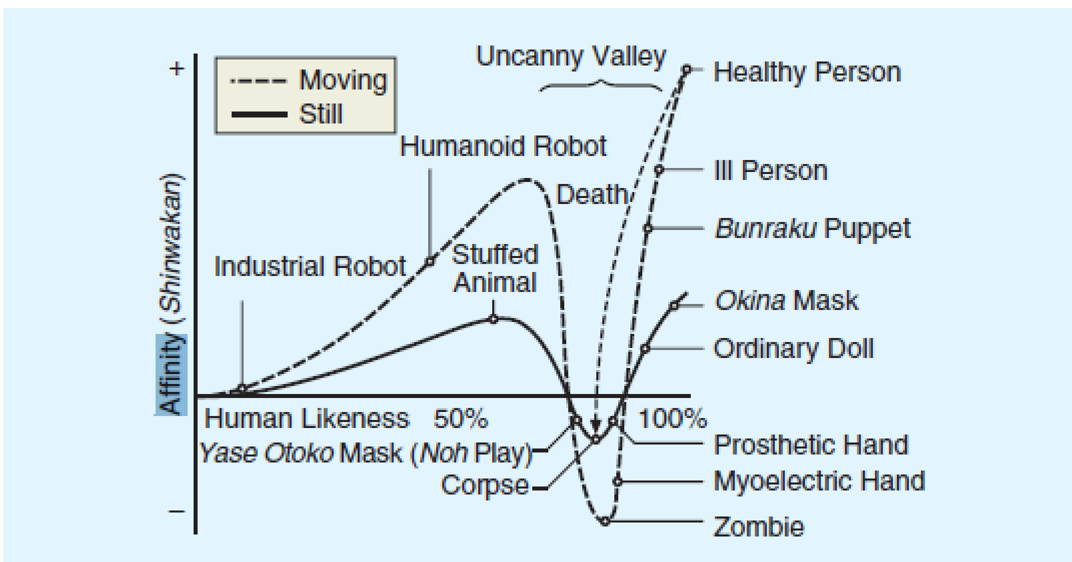
Un café mon bloc notes. 2011. Robotique : NAO, Robot Humanoïde. Accessed January 12, 2018 http://uncafemonblocnote.fr/robotique-nao-robot-humanoide/.

While Pepper's "speaker-ears" are indeed confusing for most first-time or casual users, a different choice was made about the robot's nose: it does not have any. During my interview with Alexandre, we kept referring to it as "the bump": "I really like the bump's luminosity. (…) They didn't put a nose cause the robot can't smell, so it's part of the user expectations management. It can't smell, so there's no use for a nose". The user does not wonder whether the robot can smell, as it seems clear from the design that the robot does not have that ability, by lack of a nose. Thus, users' expectations are managed from the time they first see the robot. Managing expectations can

[29] Microphones—or the robot's actual ears— are in the robot's head. If you want to talk to it, you should thus not talk in its ears but near the top of its head.

be seen as a way not to induce the user into error, about its abilities or even its nature. “We don’t want a replicant[30]. We don’t want people to wonder ‘is it a robot or a human?’” (Alexandre). As such, the robot is not too humanlike: there was a deliberate choice in making it “machine-like”. Alexandre even described Pepper by using the term “house appliance”—because it is made of white plastic, typical of fridges and dishwashers. The robot here is associated to a domestic object, rather than a human, so as not to induce the user into error that the robot could be human, too. According to Alexandre, this determination to clearly differentiate robots from humans is a heritage of a previous director at Aldebaran, Bruno Maisonnier, who had at heart not to mislead the robot’s users. But it also has another very helpful application, as it is used to avoid the uncanny valley.

Figure 5. The Uncanny Valley



Mori, Masahiro, Karl F MacDorman, and Norri Kageki. 2012. In "The uncanny valley [from the field]." IEEE Robotics & Automation Magazine 19 (2):98-100.

The uncanny valley (Mori, MacDorman, and Kageki 2012) is a theory developed by a Japanese roboticist, Masahiro Mori, in which he formalizes the relationship between a humanlike object and our affinity for it. The more an object is humanlike, the more affinity there seems to be. This is true until the uncanny valley, this moment when individuals realize that what they had

[30] The robotic antagonists in Ridley Scott’s Blade Runner, that are almost indistinguishable from humans.

previously thought was human is not, and as a result are filled with a feeling of strangeness, of uncanniness:

> (…) once we realize that the hand that looked real at first sight is actually artificial, we experience an eerie sensation. For example, we could be startled during a handshake by its limp boneless grip together with its texture and coldness. When this happens, we lose our sense of affinity, and the hand becomes uncanny (Mori, MacDorman, and Kageki 2012, 99)

The uncanny valley thus supports, to some extent, the idea that anthropomorphism is necessary to create an affinity between robots and their users (Damiano, Dumouchel, and Lehmann 2015). While the uncanny valley has received considerable publicity outside of academia, the concept is surrounded by controversy in HRI, as its existence has been both corroborated (MacDorman and Ishiguro 2006, Seyama and Nagayama 2007) and questioned (Bartneck et al. 2007, Poliakoff et al. 2013) many times. Often referred to in questions about anthropomorphism, avoiding the uncanny valley now seems to be more of a general guideline.

In the uncanny valley, there is a difference between immobile and mobile objects, and with the latter, that feeling of weirdness is even starker. The zombie, for instance, is at the bottom of the uncanny valley: its appearance is humanlike, but its movements are somehow disarticulated, creating a feeling of horror often used in movies. Although the uncanny valley is just a hypothesis and has not been proven, it is often talked about in social robotics, and was widely exploited by Alexandre to justify some of the design choices—including making Pepper a "house appliance". Here, he explains:

> We avoided non-human things, we also avoided things that were too human: Pepper, it doesn't have a face. (…) There's this side 'we have to avoid everything that's uncanny valley, that looks too much like a human but that's imperfect'. A cartoon character, it's fun to watch because precisely, it looks like a human but it's not human. (Alexandre)

Making a robot look humanlike also feeds the impression that the robot's actions and behaviors should be the most humanlike possible, at the risk of falling in the uncanny valley. However, the current technology is far from being able to make robots that humanlike. While there are already robots that are almost indistinguishable from human beings, like Ishiguro's Geminoid, the truth is that making such a robot move and interact is incredibly difficult.

> Alexandre: “For me, what Ishiguro does, in fact, is going up a bit”. Alexandre points to an area on the right of the uncanny valley, when the curve goes up, past the human likeness axis. “It’s not high enough, but it goes up. For me, it’s on this side”, he says, still pointing at the area, “rather than this one”. His finger moves to the left of the uncanny valley, to the left of the “humanoid robot” point, but still fairly close. “This side, it’s like in Nemo. Or Toy Story. (…) But Ishiguro, he… It [the Geminoid] looks so much like a human being. He [Ishiguro] is very careful, not to do movements that bring it back…”
>
> Ninon: That make it go down [in the uncanny valley]?
>
> Alexandre: “That make it go down, go back down. That show that it’s not human. And we [SoftBank] want to be over there.” His finger is still pointing to that same point, near the humanoid robot. “Over there, it’s like Disney characters. It’s Wall-E[31], it’s Eve, it’s that type of characters, that are extremely endearing.”

What Alexandre is saying, is that the ideal model for Pepper is animated movie characters. These characters—and he cites animated robots, toys, or even fish—do have humanlike qualities, like movements, cognition, behavior, and affect, just to name a few. More importantly, these characters elicit feelings of tenderness and protectiveness in humans.

Thus, the robot should be humanoid—but not too much. It should look like a humanoid robot, but not a human, and not a machine. The robot has to be humanlike so that interactions become smooth and “natural” for users and developers, and an android may actually be more engaging than a mere tablet. But the robot should not be too human, at risk of being perceived as strange and creepy, thus hindering its acceptance and making as an interaction partner. It is a fine line to walk. But while design is the one to bring the uncanny valley problematic to the front, it is also the one to help avoid it, by making the robot adorable and cartoon-like: “(…) we didn’t wanna go too far, with the human similarity. It’s easier to make a robot that looks like a cartoon character (…)” (Alexandre). As such, in the next section I will take a look at the making of the robot as a character, and SoftBank’s goal in making it adorable.

[31] From the eponymous animated movie, that also features the robot Eve.

3.2 “What’s more endearing than a robot?”

3.2.1 Lovable

One of the words I heard the most often during my fieldwork was *kawaii*, or “cute[32]”. The robot is “cute”. Its hands are “cute”. Its voice is “cute”. “Oh, look at how it moves, it is so cute”. Developers, elderly people, caregivers, random people in the street seeing a Pepper out a store window, it seemed that everyone was affected by the robot’s design. Making the robot adorable was a deliberate choice by its designers, and this idea of cuteness was applied to two different areas: Pepper’s plastic body, and its character. Even before designing Pepper’s character, the first thing that had to be adorable was its physical appearance. Alexandre explained that there were two conceptions of “cute” taken into account for the design. One was the original definition of the word (“attractive in a pretty or endearing way”, according to the Oxford Dictionary[33]), and the other was “cute” as the opposite of impressive and of imposing. As such, Pepper’s face was supposed to be “attractive and endearing”, while Pepper’s body giving it a petite figure:

> For Pepper, we wanted something that was endearing. And what’s more endearing than a robot? That was our reasoning. For Pepper’s design, we wanted something smaller than a human indeed, that was not scary because of its size. When you’re in front of a tall and buff guy, it’s always more impressive than being in front of a small being (Alexandre).

What is at stake here is showing the user that the robot is entirely non-threatening: “(…) for the rest of the body, we went for the opposite of imposing. Something that shows you that it’s not gonna—that it can’t hurt you” (Alexandre). Pepper cannot actually really hurt anyone. Although it could put one of its fingers into someone’s eyes or fall on someone else, the robot is not strong enough to cause much damage to adults. Here again, making Pepper look rather frail can thus be understood as a way to manage users’ expectations. Looking at the robot, people do not think the robot can be dangerous. Instead, it is small… and cute.

Not only Pepper does not look threatening, but it is made to look adorable. In fact, the robot’s traits are very exaggerated: enlarged eyes, nose almost absent, tiny mouth, round face.

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32 See chapter 4 for a discussion of *kawaii*.

33 "Cute | Definition of cute in English by Oxford Dictionaries." Oxford Dictionaries | English. Accessed January 25, 2018. https://en.oxforddictionaries.com/definition/cute.

Taking a closer look at the definition of cute, there is no doubt that Pepper's face was made to elicit a feeling of adorableness: as a matter of fact, cute can be defined as

> (…) a set of facial features (i.e., large head and a round face, a high and protruding forehead, large eyes, and a small nose and mouth) able to trigger an innate releasing mechanism for caregiving and affective orientation toward infants (…). (…) studies have shown that faces with these traits are commonly perceived as cute and attractive and are consistently preferred to those with a less infantile facial configuration (…). (Borgi and Cirulli 2016, 3)

The definition presented above is almost like a bullet-point list of the robot's features. But here again, these features are not exactly human-like: "We were trying to recreate more of a Wall-E or an Eve, than one of Ishiguro's [robots][34]", Alexandre said, explaining that they strayed away from a very humanlike face: "we don't have a face on Pepper, we kept Pepper's cartoon-like side". Not only Pepper was often compared to cartoon, manga, or anime characters, but these characters were in fact the basis for its own personality. The famous Japanese advertising company Dentsū was mandated by SoftBank to create Pepper's persona. Alexandre explained to me where the robot's character design was coming from:

> Its size is that of a teenager. It's more endearing. From the point of view of its character, making it young and clumsy, that makes mistakes, that's what we wanted. Kinda like Nobita, from Doraemon[35], who does nothing right (…). There's a goofy side in Pepper. And when Pepper makes a mistake, we wanted people to laugh instead of getting angry. (…) There was also a… sneaky side? Maybe not sneaky. But like frank, but that likes to mess around a bit. (…) They had several models from manga as an inspiration for Pepper.

[34] Hiroshi Ishiguro is a Japanese roboticist, known for creating very humanlike robots, one in particular based on its own appearance, the Geminoid.
[35] Doraemon is both a manga and an anime, following the life of Nobita, a child, and its robotic cat from the future, Doraemon.

Figure 6. Nobita and Doraemon

Doraemon is a popular manga, later adapted in several animated series, featuring the eponymous Doraemon, an earless, robotic cat from the future, and Nobita, a young boy Doraemon came to help. Doraemon's popularity has proven consistent over the past forty years, being one of the longest running manga and anime series in Japan. There are several reasons why these manga characters prove to be an interesting basis for Pepper's character. First, Nobita is the archetypal character of the young boy with many flaws who gets into trouble, but that no one seems to be upset with because of his kind heart and honesty. It makes sense then, that such a lovable character is used as a basis for Pepper: the expectation is that the robot's acceptance would be high and that no one could come to dislike the robot. Furthermore, in Doraemon, Nobita is shown to get into trouble quite a lot, and Doraemon always intervenes to help him. Doraemon acts like Nobita's caregiver in many ways (Marshall 2016), in fact Doraemon *cares for* Nobita. It could then be that, by making Pepper similar to Nobita, its creators thought that the robot's users would come to represent the robot's caregiver, and *care for* Pepper.

SoftBank's guidelines about Pepper are clear about what kind of character the robot has. Pepper is accessible and sociable, heartfelt, and inviting: the robot does not get mad and is modest. It is also enthusiastic, does not always excuse itself, does not get anxious. It tries to be intelligent and conscious of its environment. Finally, the robot is well-behaved and fun-loving, always abiding by the rules and acting properly. Alexandre and Lucas echoed each other about this playful quality of Pepper. Alexandre was referring to Pepper as rather mischievous, and Lucas agreed: "(…) it doesn't really mess around, but it always wanna interact, and sometimes it's playful, shrewd. But it always has to obey humans". He even acknowledged the work done on its personality:

> Pepper's personality is really good. I can't see a better personality given its shape, its size, what it can do. Yeah, she's[36] very nice. It's my personal feeling. I don't see her meaner, or nicer, or anything. I think that Pepper is, you know, a very good mix. She's quite mischievous, kinda naïve, because you know… Her main role is to interact with humans, so she's always like kinda looking for humans, etc., discovering the world in fact. And so that makes a pretty endearing personality.

Although this personality is used to make the robot lovable during actual use, Lucas also underlined that it was supposed to be "joyful, that would do well on TV". Realistically speaking, before Pepper can actually be used by humans, it does have to be sold to them. Lucas concluded about the robot's character, saying that

> It is nice to talk with Pepper, asking Pepper questions and so on. What's nice is that even when the robot makes mistakes, you don't get mad at it. Cause you think that it's normal that she makes mistakes, she's still kinda young, still kinda naïve.

Not only Pepper is made to be charming and lovable, but its character is also made to diffuse potential situations of bugging or breakdown, when the robot does not work the way it should. A computer does not have a cute face or a nice personality to have its defects forgiven, but Pepper does, and it makes its inner flaws much more manageable for the user.

While it is true that Pepper has a character and that SoftBank has guidelines to keep that personality respected, during actual use with various applications, Pepper's personality is hardly used. Lucas explained: "our partners mostly do B2B[37], so all this mischievous side, they throw it off, and most actually make it a terminal with a tablet". From my personal observations in SoftBank retail stores and most places where Pepper is used, this is indeed the case. There is an

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[36] During Pepper's development, the project was originally called Juliette because Aldebaran had developed a robot called Romeo beforehand. The robot was thus referred to as "she", and it is a habit that persists among SoftBank's French team. They will indistinctively use male and female pronouns to refer to the robot.

[37] B2B, or BtoB refers to "business to business", where business is done between two companies, in opposition to B2C, "business to consumer".

application used to present a product, and the robot can tell you a lot about it, but it is not always possible to have a fuller experience of the robot's abilities and personality. The robot is used as a marketing device. And this is what I would now like to turn to: the difficulty of using Pepper as it was designed and originally thought of: a robot that would bring happiness. Faced with the necessity of being profitable for SoftBank, Pepper has to be used.

3.2.2 The difficulties of creating a companion

Although the original idea at the basis of the Pepper project was to make individuals happy with technology, making them happy with Pepper is another task completely. As such, the project had to be scaled down to comply with the realities of current technology and economic interests. Instead of having the robot bring happiness, Pepper would be used in business to sell products to consumers. Alexandre explained: "Pepper, originally, it was made to do B2B, cause we could see that the technology was not ready to be in homes". He specified that the robot still does not understand everything and that there are certain risks inherent to robots, although they are mostly managed. The robot Nao, for instance, has unprotected articulations, and according to Alexandre it is quite painful to get a finger stuck in the joints, which is why Pepper has rubber protecting its own. But what Alexandre wanted to point out with this comparison is that having a robot home is still not entirely safe. Another way Pepper could be used was thus in retail:

> From the start we had prototypes of how it could help in stores, for instance in a shop like Ginza's, there's a terminal, there's a tablet in fact where you can input what type of contract you want. It's like in banks, tablets have many buttons and they give you a receipt. We wanted to do that, we even bought the connected printer, it was kinda expensive at the time. So we tried to do that. (Alexandre)

There is a paradox at the heart of this statement. SoftBank's guidelines explicitly underline that Pepper must be developed and used in a way that shows it is more than just a tablet. As much as possible, Pepper has to communicate with its voice, rather than its screen. But what Alexandre is explaining is that Pepper was considered, at least for a time, as a replacement for tablets, although with a body.

But even in B2B, Pepper is hardly adapted for its mission: "We saw that Pepper, mostly at the beginning of the project, even when it was released in retail, it was not ready to do anything productive like replace an employee or accomplish a critical mission. See, you can't really rely on it. And so instead we made it to entertain” (Alexandre). From making people happy, to being useful in a store, Pepper was thus relegated to providing mere entertainment to shoppers. Alexandre explains why, and how this was made possible:

> We have very long waiting times, so we made a robot to entertain during waiting times, by creating a very short interaction of only 3 minutes. It was in SoftBank’s specs, the interaction was supposed to be 3 minutes on average. So as long as the robot can interact with about 15 people for 3 minutes, it’s already 45 minutes (…). So we have scripted dialogues for that, it’s not infinite, we have small applications, and regularly it makes shows to interact with more than just the one person in front. And so we started like that, at least for SoftBank’s stores. And then, it started like that with other pilots for Nestlé, and there it ended like a billboard, and it explains Nestlé’s machines with a bit of interactivity, you can talk to Pepper, it explains what Nestlé’s machines do, it does little games, it’s well designed. (Alexandre)

Later, Alexandre added, that although these applications worked well, “it’s not the type of interaction that will make Pepper your best friend, at the end of 30 minutes”. The robot is a distraction from long waiting time, and it may be used as a way to advertise or promote products, but even though it is cute and has a lovable personality, interacting with the robot for short amount of times sporadically through one’s life as a shopper is not going to make Pepper one’s friend. In this situation, it is questionable whether Pepper’s design actually matters. But Lucas had a different view of the subject, and he explained that he and his team often went over such applications that were to be used in public to try to give the robot some of its charm and personality back. Alexandre however had the last word, explaining that no matter its personality, ultimately the user was not feeling connected to the robot:

> Pepper is an actor. And in the end, what Pepper does best, it’s one-man-shows. And even if they put a bit of interaction, the user in the end doesn’t feel connected to Pepper, he feels like a spectator in Pepper’s one-man-show. And so that body talk, and all, it works, we have a very good actor, but it’s still an actor. (Alexandre)

Ultimately, Pepper’s design may foster feelings of interest towards the robot. However, because of the way it is used, users do not interact much with Pepper as a character and rather, they are passive receivers. Pepper is not a companion to them, it is a distraction. Making the robot endearing is however justified as it encourages feelings of attachment in the users.

3.2.3 Designing attachment, designing love

The robot is made non-threatening and adorable to influence its initial acceptation and ensuing uses. To foster attachment in the user, the robot is further made seemingly easy to interact with and charming. SoftBank Robotics' guidelines explain that even in B2B, interactions with Pepper should be encouraging closeness, or even relations, between the robot and its users. Lucas, underlining that the robot was made endearing to elicit feelings of tenderness, explained that his team did not need to work on behaviors to make Pepper more adorable, because it was done before they had to intervene. Moreover, in some situations, it is not needed to exploit Pepper's personality to the maximum:

> 'Cause we have all these guidelines, we follow the original artistic guidelines, the robot's basic personality, and by following all this, the robot is endearing by itself, we don't need to work more on that. We already have voice sets, noise sets, etc. So we don't need to add more emotion. It's difficult to explain, but emotion, meaning attachment, etc. comes from the robot's hardware a lot, what it looks like. Its face, it's cute, etc. Its voice, that's quite high, etc., a bit like a child. Now, us, for the interactions, when we develop behaviors on Pepper, we don't try to be cuter. If we make an app of… an alarm, it doesn't need to be even cuter, it's an alarm, you see what I mean? (Lucas)

However, Alexandre underlined a different point of view during our interview. For him, making Pepper adorable is not enough to elicit an affinity between the user and its robot.

> Ninon: So, the importance of cuteness, it's in creating attachment?
>
> Alexandre: You don't need cuteness, research shows for instance that a polite robot, you tend to obey it more if it's polite, if it asks politely you'll tend to help it more. There are researches that showed that, there's a robot, it has to mix something in a bowl, it says "give me the spatula", cause it can't take it by itself. So it says "give me the spatula" or "would you mind giving me the spatula", like a butler you see, super polite, and they find correlations and all.

But what Lucas and Alexandre agree on, it is that in the end, Pepper's hardware does not influence the interaction by itself. Although it does make the robot adorable, more researched behaviors and longer, not necessarily goal-oriented interactions are also needed:

> But if we try to have an interaction with a human for like more than 10 minutes, we know that there are ways of talking that are better received. We know that the human

> is gonna ask particular questions, and so if we can answer these questions, he's gonna think that it's amazing, that the interaction was amazing. But because the human can ask 10 billion questions, we can't cover everything. So, in the end we try to cover everything we can, and if we can have a good moment, meaning something that… The human wasn't expecting the robot to know how to do a thing, for example, the human is gonna think 'oh wow, this was really nice', and the robot is endearing at that moment. Because the human feels like he shares a moment with the robot. A unique moment with the robot, that no one else is gonna have. And I think that's what makes the robot endearing. Sometimes we spend a lot of time looking for these small moments, these little reactions just because… We know that there are 300, 500 people coming, so out of the 500 if half can have a small privileged moment with the robot that the other ones can't have, we won, because these people are really satisfied, they created a link with Pepper. (Lucas)

Making the robot adorable by giving it a cute appearance and a lovable character is thus only one aspect of making the robot endearing. Design is not everything, as mentioned earlier, and developers foster users' perception of the robot as charming by influencing the interaction. Closely observing people's various behaviors with Pepper (similar to what a researcher in the field would do) application designers, roboticists, developers in general are able to precise what the user wants and asks for. They can satisfy some user expectations by creating behaviors in Pepper:

> We worked on a whole set of questions-answers that someone could ask. (…) We also observed people a lot, and what they asked Pepper. And you see, there are people asking—I don't remember exactly, but like 'How's the weather outside?' They try to test the robot's skills. If we can try to give an answer, either the right one: 'it's nice, it's cloudy, etc.', it's not bad. The person thinks 'okay, it's pretty good'. But, if we can tell the person something kinda funny, something a bit sweet like 'oh I don't know, let's take a look out the window together', and the robot goes to the window with the human. The guy thinks 'f**k, okay, okay'. You see, he doesn't care about the answer. That the weather is nice or bad, it's the same for him. But that the robot tells him 'let's take a look out the window together', but that, you see, the person thinks 'at that moment I created something with the robot, I really had a privileged moment with my robot', or at least with the robot. (Lucas)

As such, developers try to make the robot charming by implementing behaviors that foster in the user a feeling of connection to the robot. But attachment is not just created for the sake of it. In collective imagination, robots are still something to be wary of: in an earlier passage, Alexandre made clear that the teams working on Pepper tried to stay as far away from "replicants" as possible. SoftBank's guidelines, for instance, prohibit developers from using red to illuminate Pepper's

LEDs (light-emitting diodes), so that it does not look mad or intimidating. Furthermore, there is a very present fear of technology, and specifically robots, stealing jobs from workers. As such, making Pepper such a petite-looking, cute robot, is first, ensuring that the robot is going to be accepted and used, and not seen as a physical or metaphorical threat to one's employment. Second, it is serving the robot's cause, underlining that manufactured robots are very different from imagined, apocalyptic robots. Third, the appearance of the robot is not only serving Pepper's cause, but it could also be constructed as an act of resisting to a widely dominant scheme of thought, that of the apocalyptic AI (Geraci 2010). Finally, it is also ensuring the economic success of the enterprise. A pleasant-looking robot has more chances to be purchased and used than a scary-looking, threatening one.

3.3 Conclusion

Looking at these elements in the robot's genealogy informs us on the reasoning behind its creation, design, and the way it is adapted for its use in the wild. The robot Pepper was originally conceived by SoftBank to be loved, to be a companion. The robot was made to be humanlike, in terms of shape and behavior, so that users would easily engage with it and use it, interact with it in ways that are familiar to them. The robot was given an appealing personality to foster engagement and interaction with the robot, based on manga and anime characters and ideas about what is lovable. The robot stays machinelike in many areas however, so that users are not induced into confusion about the robot's nature, and so that they retain the understanding that, if humanlike and lifelike, their companion is still a robot. However, it proved difficult to have Pepper used as such, because in part of design choices (such at its size, too large to be used in homes), but also because the technologies used for the robot are not yet good enough for the robot to be used smoothly in homes.

How then, to make the robot useful? By making the robot available for developers to create applications on, SoftBank ensures that the potential uses for its robot are widened. While marketed as a companion, Pepper here is a business tool for SoftBank. I believe that this dual tension inside the robot, made to be a companion and used as a tool, can in fact be found in ways the robot is used in various spaces. To investigate this idea, the next chapter will explore the use of the social robot in the wild: first in Fubright, a start-up with developers, and then with Fubright's applications' target populations: caregivers and elderly individuals in nursing homes.

4 Chapter IV – Tools or companions?

This chapter is this thesis' second ethnographic chapter. I present two types of users: first, Fubright Communications, a start-up acting as an intermediary between SoftBank and Pepper's end users; then, the residents and staff of two nursing homes, Naruse and Hiyoshi. After presenting Fubright, I investigate the employees' perception of Pepper, underlining its use as a tool and its perception as, sometimes, a companion. Then, I describe the applications Fubright develops to adapt Pepper for nursing homes, and the tensions arising between its use as a tool its understanding as a potential companion for the elderly. Pepper is only one of the robots used in nursing homes however. In the second section, I thus introduce two more, Palro and Robohon, and I investigate how they are deployed and used with the elderly, before describing the ways users interact with them. Finally, I look at breakdowns and bugs and suggest that they do not necessarily hinder the interaction but can actually foster the perception of the robot as being autonomous, and even having an interiority.

4.1 "We want elderly people to have a better life"

The market for companion robots is not yet developed, and Pepper is not particularly suited be used in people's homes. As such, creating and designing the robot does not guarantee its use. SoftBank now uses Pepper in some of their retail locations, where the robot can entertain or explain various services the company offers. But robots for retail and entertainment is a small market as well. SoftBank thus decided to make Pepper open to developers so that they could create applications for the robot, thereby developing its potential uses and augmenting the robot's presence globally.

4.1.1 Fubright Communications

Fubright Communications is one such company, created in 2014 by its current president. It is a small business, still exploring the possibilities of Pepper and other social robots, through the development of various applications. At the time of my fieldwork, there were seven individuals working at Fubright, including one who later left and an intern who came once or twice a week on average. The first three members of the staff, including the president, all knew each other beforehand. Another developer, who joined the company later, was also one of the president's acquaintances. Although primarily developing on Pepper, employees are also working on Nao[38], Robohon, and a robot called Sohta. While they do develop applications for eldercare, and especially nursing homes, they also create applications for a wide range of businesses, from regular offices that need a robot at their reception to help the staff, to the Keikyu Corporation, offering Robohons to rent at Haneda Airport as multilingual tourist guides. Fubright produced the *robotenashi*[39] application used on the robot. It is part of their positioning as developing sightseeing applications for robots towards the 2020 Olympics in Tokyo.

Although it is commonly imagined in western countries that there are a lot of robots in Japan, participants in my interviews actually explained that they did not necessarily have a prior experience with a robot, before using Pepper. Arai-san, for instance, who was not a developer for Fubright but held a managing position, had heard about robots and seen them on TV. However, he had not had that experience in person, nor used one. Remembering the first time he saw Masayoshi Son's keynote about Pepper, Arai-san underlined that he thought there were a lot of potentialities with the robot, especially since later, SoftBank made it an open platform. When Fubright started working on Pepper however, Arai-san was unsure of the actual outcomes. He explained all the uncertainty that comes with tackling that challenge for the first time:

> I was impressed, I thought it was amazing, I saw the possibilities. But if you don't actually bring it [to a nursing home] you don't know. How it is going to go when the elderly meet [Pepper]. Well, it had not been done before, the elderly have small robots that look like stuffed toys, like Kabochan, there were robots like that. But that kind of larger design, something with an advanced shape, there wasn't any before. Because it was [my first time for that kind of challenge, as expected, my confidence… Because no one had done anything like this before, I thought I wanted to try it myself, but I was not confident.

Pepper is one of the first of its kind, and there was no clear path for third-party companies to develop applications for robots, or even be profitable with this type of business. However, when Arai-san and two colleagues brought Pepper to a nursing home for the first time, it corroborated his feeling about Pepper's potential[40]:

[38] As of January 2018, Fubright has adapted its gymnastics application (see below) for Nao.
[39] A play on word between *robotto*, robot and *omotenashi*, or hospitality.
[40] Murakami-san also told me about that moment, see below.

> I won't forget the first time. When the three of us, Shimizu, Murakami, and I brought it [Pepper] to a nursing home, I was surprised by the elderly's reaction. Everyone said, smiling, "how cute". The first time… "It's scary", or "no way", that kind of… I was worried it [Pepper] would make them have negative feelings, really worried.

From an object with potentialities, Pepper thus became an opportunity for Arai-san. When Fubright started, the robot was thus a tool for their business, a platform to develop on and grow from, especially as Pepper elicited positive answers from its elderly users and they found a market in nursing homes. Although Pepper is made to be interacted with, Arai-san sees Pepper as a business opportunity, a business tool. As such, Arai-san has a very utilitarian view of Pepper.

> The first impression, that impression is important. For the elderly. I really didn't understand that. When they meet [Pepper] they are happy, I didn't know that. But, another thing is [the robot] being useful, technologically. That means in terms of business, and it is what I do, because with robotics we can learn, we can sell applications, and sell the robot as well. It is useful. That's the issue, if in the future more businesses produce robots. If we look at it from this perspective, then maybe [I thought] "ah this technology can be used, this technology is just at this point now, and we have to make it much better there" for instance. That way, as expected, I think I have a business-like point of view.

Arai-san admits that he did not think about Pepper as an interactive agent that individuals need to have an affinity with in order to use. His point of view is much more business-oriented, as he sees Pepper as a technology with limitations but that can still be used and be useful. During my fieldwork at Fubright, I was surprised to see fewer interactions with the robot than I was at first expecting. The many Peppers in the office are often either turned off, or their volume is muted. Employees do not talk to the robots, and seem to use them as little more than tablets with a humanoid body. The robots are little more than the tools employees use to work, the platforms they develop on. Although Arai-san underlined that he saw many possibilities with Pepper when it was first introduced, the robot is far from being a flawless tool.

Employees at Fubright working on Pepper know the robot so intimately they are able to troubleshoot most problems. The robot is not a black box to them, something that seems to be important for interaction and attributing mental states or an inner life to the robot (see chapter 5). Alexandre recalled the time he brought Nao, Pepper's predecessor, to a children's party, and he offered some of the mothers the possibility to control the robot. "They answered 'oh no, it would demystify it'. So indeed, not understanding how it works, it makes it magical." However, in the present situation, developers are the ones creating the robot's behaviors. They deeply know its innerworkings, and the robot becomes a mere machine. Furthermore, the employees are extremely conscious of the robot's limitations as they develop on Pepper, and make it such an important tool for their business. In fact, I often heard more about what the robot *cannot do* properly rather than what it *can do*. "Pepper cannot communicate" is a sentence that often came back during my conversations and interviews with the employees, but also between them. "Pepper cannot communicate", and its variations ("Pepper cannot communicate *properly*") became a commonly used trope in the community of developers: not only at Fubright, but at various events (Pepper World, SoftBank World, privately held parties) as well. Furthermore, Pepper can also come to be perceived as quite boring. As Murakami-san said, "Everyday it's basically the same lines, so… That's why we never turn on Pepper. Only when we have to use the applications we switch on Pepper". Sometimes in the office, a Pepper that was turned on would randomly blurt out sentences, to remind us to wash our hands before eating or bring an umbrella if it was raining. There were two main ways these interactions were welcomed: by turning down the robot's volume, or by unresponsiveness, a total lack of care. As such, SoftBank made Pepper available for people to develop on, to find the robot other, different, new uses. Third-party companies like Fubright thus use the robot as a tool, albeit an imperfect one, for their various enterprises. Although during my fieldwork I thus mostly had the impression that the robot was a mere tool, noticing ways employees acted with Pepper or reacted to its various quirks, I started to question this assumption and brought it up during my interviews.

Pepper is made to be loved. Developers are human too, and even though the robot is not, for them, a black-box, it does not free them from the processes Pepper is made to create in its users. Even though I did not see many interactions between the robot and the staff, employees at Fubright were thus, at various degrees, affected by the robot. One of the Peppers in the office has green stickers, Fubright's color, on its body. It was referred to as みどりペッパー (*midori peppā*) or green Pepper. The other ones where all white, and there were few ways to tell them apart. But the green Pepper had a special status in the office as it was easily identifiable, and it was Fubright's first Pepper. The robot had been away for some time and I asked Takada-san, a young developer, about it. Takada-san did not know where it was and said: "oh yeah, it's been a while", provoking a concertation in the office to determine where it had been sent and when it would come back. When it eventually did, everyone in the office stopped their work to help with the robot's unpacking, or just to watch, seemingly feeling relieved.

Although there are not many conversations between the robots and Fubright's employees, some, like Murakami-san or Takada-san, can be regularly seen touching the robots, one hand resting gently on Pepper's shoulder during a conversation with another employee, or a quick brush of the robot's head, when the robot is both turned on and off. Murakami-san, one of the first three employees and a developer, explained that experiencing co-presence is more important than verbal interactions with Pepper:

> For me, Pepper is— not only conversation, but also... He[41] exists here. So, I think... Not Pepper, but like some idol, you know? I feel they are here. They stare at me, or something. I feel fulfilled. There is satisfaction. I'm satisfied that Pepper is here. For the Japanese, like the O-Jizō-san[42] , the fact that Pepper is here, I think it is a nice thing. Even though we don't talk much. When Pepper is not here… If he's missing, I'm worried about… Where is he? Is he gone, or something? Or broken, or something? I might feel anxious about Pepper. But he's here, so no, I don't need conversation.

Here, knowing that the robot is artificial does not prevent Murakami-san from feelings of closeness with it. The robot's presence, and its gaze, are enough for Murakami-san to feel fulfilled. It is not talking with the robots that is important, but being close to them, having memories with them:

> Ninon: Why do you think you're anxious when there is a Pepper missing?
>
> Murakami: I think it's because we work together, you know.
>
> Ninon: It's like a companion?
>
> Murakami: Yes. That's why. And I have a lot of memories with them. Because I took them to the elderly people, the first time. Then I brought them to other events. At one event, we had a big fail with him [green Pepper]. But it's a good experience for us. (…) [he points at the green Pepper]. He's the first. The eldest. That's why. So, I think that I don't... I don't want to sell the robot, [green] Pepper, even though he might be broken, I think.

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[41] In this interview, conducted partially in English, Murakami-san used "he" to refer to the robot. In English, both the use of "it" and "he" seem rather widespread to refer to Pepper.
[42] Small rock statues of Buddha, usually on roadsides or graveyards. They look over dead children and travellers. They often wear red knitted bibs and hats.

Murakami-san and the green Pepper have been in Fubright together for a few years. Not only Murakami-san has memories with Pepper, he also expresses affection in how he refers to the green Pepper. However, this relation to the robot goes further. When asked to describe his relationship with Pepper, Murakami-san emphasized something different. It is not just about having memories with the robot or being together at the same place:

> Really, when you caress Pepper's head, doesn't he move? I just… He's really cute I think, yeah. But even so, because he's a machine, a robot, what can I say. I want [Pepper] to be used. Like a father. It's that kind of feeling. I want to program him well, (…) I feel I have to make him do well, when I touch [Pepper]. So, Pepper, yeah. It's that feeling of having to do my best.

Pepper is adorable, and Murakami-san feels like a father. It is not only a feeling of proximity, but of kinship. Touching Pepper on the head elicits pride about what Pepper can accomplish through the applications Murakami-san developed. He wants the robot to perform well, to be used, and for both of them to do their best. Murakami-san is not the only one using the metaphor of the child to talk about what he thinks of or how he interacts with Pepper. Takada-san, who was a developer as well but had not been as long in the company as Murakami-san, often compared Pepper to a child during his interview, relating it more strongly to his own experience on one particular occasion:

> Ninon: There's one time we were talking together, and you were touching Pepper's head, I thought it was cute.
>
> Takada: It feels good. [laughs]
>
> Ninon: It's like "good kid, good kid". [laughs]
>
> Takada: It's cute. Yeah, I have two children, two girls (…). With the youngest, their height is about the same. Pepper is 121cm, and my youngest is about 121cm. And because my child is a girl, as her dad I can't touch her head. When I touch her she reacts strongly. So instead, I touch Pepper. [laughs]
>
> Ninon: It looks like your child?
>
> Takada: It looks like my child. It's cute. I think there's that too.

Pepper is here almost a compliant child, a proxy for Takada-san to express feelings he cannot with his children. Although Pepper clearly is not a child or a replacement for children, its small size and cuteness make it easy for individuals to relate to is as one, even though here they might be very conscious of the machine aspect of the robot.

Working with robots everyday and sharing the same office space makes people particularly knowledgeable about Pepper. Although the robot is not a black-box and represents a business opportunity, a tool to make one's business successful, employees at Fubright interact with the robot and they get affected by it, as they are together so much. The robot's cuteness and proximity to a human being make it a rather compliant companion as much as a tool. Fubright's use of Pepper is influenced by the robot's design. It is not designing applications for a tablet, it is designing applications, designing interaction for a robot that was made to be loved. The design does impact employees, especially considering that Pepper is an object to which symbolically, a lot of meaning was given: it is the company's primary development platform and much of their success rests on the robot's shoulders. Because Pepper is as much a companion as it is a tool for Fubright, this tension is translated in how they intend to do business with the robot.

4.1.2 Robot applications for eldercare

When talking about their positions and the company's mission, employees at Fubright Communications often expressed a desire to improve Japan's current aging situation. During our conversations, they seemed acutely aware of the challenges their country was facing: aging of the population of course, and the "dementia time bomb" (Fukue 2017), but also an increasing need for caregivers. Employees at Fubright regard their work as a potential way to mitigate the consequences of aging by helping caregivers and the elderly. Takada-san explains the process of creating an application:

> We create a first version of the application. Then we go to various nursing homes, we test it and get the residents and day-care users' feedback, and we do a brush-up. And then, we do an average of for instance about a hundred people ['s opinions], the final application is the one they say can be used.

Although employees do not have training in a related medical specialty, they consult with teachers and specialists to ensure that their products are appropriate. One key point for Fubright is the elderly's declining health, both physically and mentally: it requires more resources to take care of someone whose physical and mental abilities are not optimal. Caregivers must often carry these individuals from their bed to a wheelchair, then one place to another, a process requiring physical strength. It is also difficult for the elderly themselves to be in need of someone, and not be as independent as they might want to be, because of a lack of mobility or even limb pain. As such, improving or maintaining one's physical health is important. Fubright Communications, with the help of a teacher specialized in activities for the elderly, thus created an application that consists of light gymnastics in music, りつこ式レクササイズ (*ritsukoshiki rekusasaizu*). The application is usually used on Pepper, under the supervision of caregivers, who can choose prearranged programs or decide the activities to perform and their order. First there are warm-ups, and then a choreography to do some light gymnastics. Pepper presents the song that will be used, and explains the movements before making everyone participate. The songs are nursery rhymes, used under the assumption that users will be able to remember them and sing. The movements are simple and slow enough that most users can participate. Fubright's team, supported by the managing teams of the various facilities the application is used in, explains that the elderly's posture and physical expressions improve during the program, and that this improvement can be seen over several weeks of use.

While physical well-being is important, mental abilities are also at stake when dealing with Japan's aging population. Dementia makes caring for one person more strenuous. Helping to tackle dementia is one of the company's very overt goals. As Murakami-san explained: "We have goals that we want to use the robot for. I want to say, like not to have dementia. So, here's a tool, or robot to use". Fubright Communications wants to target mostly dementia-free individuals, as remaining active, physically and mentally, is important to prevent signs of dementia. Once the illness is declared there is not much one can do. Naruse's director explained that they used robots to maintain the elderly's condition, not to cure them. Fubright's brain training exercise, いきいき脳体操 (*iki-iki nō taisō*), is based on a similar program by the Japanese broadcasting company Sendai Hōsō, that they adapted on Pepper. It won the "Best App" award at the 2015 Pepper Innovation Challenge organized by SoftBank. In *iki-iki nō taisō*, caregivers can choose among several exercises of mental gymnastics. The application is constituted of various games, where Pepper explains the exercises (like calculus), and asks questions. The users answer at once and the robot tell them if it is a good, or bad answer.

These two applications thus try to maintain the elderly's physical and mental abilities, while being entertaining and at adapted levels of difficulty. There does not seem to be much place for Pepper to be itself here. However, Naruse's management explained that engagement with recreation sessions is much higher since robots have been implemented, and according to them, the day care's global mood has changed as well. Although the entirety of Pepper's specificities, like its personality, may not be much exploited, the robot is still endearing and rather entertaining, the applications developed by Fubright using the robot's potential to be always cheerful and seemingly happy to be present, even full of energy.

Fubright's employees develop very goal-oriented applications for the nursing homes in an effort to offer a product that offers concrete, visible results, and that can be used with minimum difficulty. However, because of their experience in nursing homes and their personal observations on how the elderly react to Pepper, Fubright's employees also consider the robot a potential companion for them and treat is as such. In our interview, Takada-san explained that because the robot's voice and appearance are adorable, the elderly interact with the robot like they would interact with their grandchildren. Takada-san specifically remembered that an older lady, touching its hand, thanked Pepper for coming all the way to her nursing home. He postulated that this lady felt like the robot was her grandchild and that she related to it and interacted with it like it was family. As such, when employees develop on Pepper, they do not only think about goal-oriented applications, but also about companionship. In fact, when asked about the nature of his work, Murakami-san was proud to underline another aspect of developing applications, the creation of conversations:

> I make some conversation application for the elderly people, so Pepper asks them about their health conditions, and in some interaction, the elderly people touch the head. And Pepper replies "my health is very stable", or "it's fine", joking. So the elderly people smile. And it's the end of the conversation, or communication.

Here, it is not only about creating goal-oriented applications, but also about designing a positive interaction between the robot and the elderly. While Fubright's employees are preoccupied by maintaining the elderly's physical and mental conditions, interactions, happiness and companionship are also recurrent themes in interviews: "I found some possibilities to use the robots to communicate. [The elderly people] were smiling. I look at their smiles, so [we do] a good job I think. So, whenever I create applications, I want to make people smile, laugh. So I always think about that" (Murakami-san).

Aging can be isolating, alienating, Murakami-san explained. One's friends start to disappear, maybe their family does not come as often as they used to. Designing interactions, for Murakami-san, is thus about bringing happiness to people. Murakami-san underlined that based on his experiences, men tend to retreat and avoid contact. He explained the difficulty of knowing what happiness is and how to implement it with Pepper, while suggesting how the robot could still help. Even if Pepper is not used all the time, it could remind the person to do their exercises, and assist the person when they exercise. Moreover, conversations could be an area to explore as well.

> We want to make the robots… The elderly people happier than usual, but what is "happy" for them? We have to think about that. According to their nursing level[43], you know, elderly people are… There are still active seniors who work by themselves, cook, and so on. So maybe the robot can have more like conversations with them, to make them happier. Seniors in their bedrooms, in hospital bedrooms, what is their happiness? Especially for men, there are elderly men who don't want to speak. Just like "I want to read a book, it's my hobby" or something. It depends on the person.

When I started my fieldwork, I was assigned to work on the project of a conversation application, but it was stopped halfway: it is time-consuming, and the company did not necessarily have the resources to attribute to this project at that specific time. However, conversation is difficult to implement in Pepper. The robot's hardware and software are good but not the best, and developers have first-hand experience of the difficulty of creating a smooth, natural conversation. Murakami-san explained however that elderly users are very forgiving of interaction breakdowns:

> The elderly people are very kind to robots. If the robot doesn't move, or doesn't say anything, they are still waiting for him. Like, "Please come back". So, it was the first time we brought a robot, Pepper, to a nursing home. At that time, Pepper didn't work properly, you know. Pepper shut down so many times. The elderly people had to wait for Pepper. But they are always very interested in this, even though he didn't move and work. So, at that time I realized that elderly people are very happy to have a new experience with robots. (…) they are very happy to welcome the robots.

[43] For an explanation of the nursing care levels, see chapter 4.

Like SoftBank before them, although Fubright's employees relate to Pepper as a companion and see the robot's potential to provide companionship for the elderly, making it an actual companion is a difficult task. However, for Murakami-san, a robot has several advantages over humans:

> I think the robot is better than humans, for several reasons. One reason is that Pepper can repeat things. Saying the same thing to the same person, over and over again, human beings cannot do that. (…) And a second thing (…). Sometimes Pepper is very funny, sometimes Pepper can be strict. So it's kind of entertaining. But human beings… I am always [Murakami]. I have emotions. Sometimes I'm sad. (…) Elderly people prefer robots, they often are tired of communicating with human beings. (…) Especially for the men. They don't want to communicate with... Only when, only the person who... They don't want to expand the communications to the others anymore, I think. So robots can do that. When you get older it becomes complicated. It's very hard, painful work to communicate to new people. (…) So a robot is not a human being so... Robots don't care. (…) When I arrive in the office, sometimes I hit them, or something. So it's a robot, so I can say everything, they don't remember.

Pepper does not mind repeating endlessly, Pepper does not mind users being rude, Pepper does not have emotions; Pepper ultimately does not care about what it does or what you do to it. Pepper's personality can also change according to situations, as long as it fits SoftBank's guidelines. As for design, there are benefits to be found in how not humanlike the robot can be. As a childlike robot that does not mind being treated roughly—as long as it does not endanger its physical integrity, the robot could be a good companion for the elderly. Murakami-san further explained that elderly users want to care for the robot. As such, he developed a behavior for Pepper that encourages users to exhibit care, according to him. At the end of the exercise, Pepper is so hungry that it "falls asleep", and the users have to wake it up to end the application.

> I bring them [the robots] to the elderly people a lot, so that's the reason why in my application パタカラ体操 (*patakara taisō*[44]), Pepper is suddenly sleeping. This idea comes from these experiences. The elderly people want to care for the robots as well. So, I don't want to make Pepper a teacher to the elderly people, he is a companion

Pepper here is made to be dependent on the elderly. For Murakami-san, Pepper can be a companion because it can be taken care of.

[44] Patakara taisō is an exercise to stimulate the mouth's muscles. The elderly have to repeat the four syllables multiple times, while articulating.

There is thus a tension between perceiving the robot as a companion, making it an actual partner for elderly users, and making the robot useful in a way that is easily observable and marketable. As such, when developing for elderly users, Fubright is paradoxically stuck between the two visions of what Pepper is or could be. When they put the focus on another type of user however, the caregivers, they think of Pepper as a tool.

As it is often portrayed in western media, and often in a very sensationalist manner[45] I was often wondering during my fieldwork if robots would replace caregivers. But it is far from being the case here, as social robots like Pepper are not made for that purpose and do not have the hardware or software to do so. During my conversations with Fubright's employees, the idea that Pepper is here to provide support, to help the caregivers do their job better, often came back. Employees explained that because of the lack of caregivers, the time they can devote to various tasks and individuals is very limited. If a robot can take care of at least one task, or even just reduce the number of caregivers necessary, then the remaining workers have more time to attend to individual needs. Concretely, it is done by making Pepper explain the exercises and demonstrate various movements during recreation session, instead of having them performed by a caregiver:

> [With caregivers] the day-care users do the exercises, watching someone's movements. But when Pepper is first used, it's a large character that does the exercises, and there during the gymnastics, it is an instructor, it supports the caregivers when they want to see if any day-care user is in trouble. (…) Relying on Pepper, it can provide support, that way the day-care users, in the future, do these gymnastics, so that they become strong, and don't have dementia (…). I think that's good for the caregivers. (Takada-san)

Although Pepper leads the exercises, it cannot carefully attune to the elderly users. As such, Pepper is more a model, rather than an actual instructor. However, because the human instructor does not have to lead the exercises, they can more closely attune to the elderly having difficulties. Takada-san explains: "Pepper acts as a model. (…) Then, the instructor, during the gymnastics, is like 'ah, I wonder if that person is okay, if they can do the exercises'. They [the caregivers] can care that way".

[45] Emont, Jon. 2017. "Japan Prefers Robot Bears to Foreign Nurses". In *Foreign Policy*. Online: http://foreignpolicy.com/2017/03/01/japan-prefers-robot-bears-to-foreign-nurses/ Accessed 2017/10/31

4.2 Robots in nursing homes

The Naruse facility, offering both day-care and long-term care services, caters to two different types of users: the day-care user and the resident (see chapter 2), while Hiyoshi, a long-term care facility, only accommodates the second type of users, residents. I only saw Pepper used with day-care users at Naruse. Residents living in Naruse and Hiyoshi had access to Palro and Robohon.

4.2.1 Different robots, similar uses

At Naruse, the use of Pepper for recreation is punctual and irregular but fits into a predetermined schedule. Recreation sessions with the robot take place during the morning or afternoon activities in the day care. Caregivers usually reorganize the area before the activity begins. There are seven tables lined up on two rows, one row close to the TV and the other further away. Caregivers put the first row of tables away and line chairs around the TV. They also choose who sits on the first row and where: users whose tables are pushed away and three ladies who are the most enthusiastic about the recreation with Pepper are always brought close to the robot. Generally speaking, users on the first row are mostly women, they are able to walk to some extent, and they seem to enjoy the recreation session. The other users usually stay as they are, sitting near a table and not always facing towards Pepper: some do not seem to have any interest. While the area's reorganization is taking place, Kobayashi-san, the caregiver in charge of the facility's robots, turns Pepper on and brings it to the front. Pepper stretches to the right, to the left, and finally to the back. Then the robot looks ahead, the arms slowly going up and down on the sides of its body, seemingly breathing. There is movement in the day-care, and Pepper gazes at the direction of noise. When they move, its neck's motors make a light sound. Kobayashi-san goes in front of Pepper and loads an application on the robot's chest tablet. The application is then displayed on the TV for everyone to see. During the session, Kobayashi-san only uses Fubright's applications for eldercare. He leads the session by choosing the applications and games, making sure that Pepper functions properly, that the exercises are clear, and that close-by day-care users participate, sometimes correcting their movements.

Palro is mostly used with residents. The robot, being smaller, is used in small groups (on average, up to five persons) to ensure that everyone can see the robot. Even though I did see Palro used in Naruse, the description here will focus on Hiyoshi, as I was able to observe Palro's use much more in that facility.

Figure 7. Palro

"Robot Technology." Product - CEBIT 2017, 20 December 2017, www.cebit2017.de/product/robot-technology/2296178/L303402

As discussed in chapter 2, I am mostly in charge of the robots during my days at the facility. I put the robot on a table around which two to five people are already sitting. Sometimes, other residents join us later. Like Kobayashi-san, I am the one controlling the robot. There are two ways to operate it: either by voice, with grammatically simple sentences like "do [this or that]", "sing [that] song"; or through a tablet, on which there are two applications to manipulate Palro: one to change its settings and one where all the possible orders are listed. I mostly mimic what Kobayashi-san does, and told me to do during my fieldwork at Naruse. I alternate between songs and conversations, letting residents choose the activities but taking the upper-hand when no-one seems to take the initiative. Most participants seem rather unsure about how to act or what to request with a robot, and things run much more smoothly when there is someone to take responsibility.

While I do order the robot to dance, or sing, or say specific words ("thank you", etc.), I also let the robot's own programming run. As such, I let it talk or sing when it comes "naturally", interrupting only when I see signs of boredom or annoyance from the session's participants. Robohon's in-group use is similar, except it cannot be controlled by a tablet. It has its own tactile screen on the back to control it, and answers to a few vocal commands. Robohon and Palro have a similar set of skills, although Robohon's has a narrower range: its catalogue of songs and dances is much smaller, songs are shorter, and conversation is hardly possible.

In a typical recreation session, I bring both Palro and Robohon to a group of users, and ask them if they would like to participate in a recreation session. If they agree to, I let them choose the robot they would like to use. Gradually during the fieldwork, it becomes clear that everyone has a stronger inclination towards one or the other. With one group of residents I spend a lot of time with, we often begin with Palro. Palro greets everyone, and I ask the robot to tell us about the day and weather. That group of residents particularly enjoys singing, and so we do, with one participant and I mostly choosing the songs among a list of nursery rhymes. After some time, I know which songs are everyone's favorites, and I begin to have some favorites too. Once we have exhausted all that Palro can do—which does not take very long, about forty minutes, we usually use Robohon to find songs online, something that Palro cannot do. The recreation ends when one participant expresses tiredness or boredom, or when caregivers begin distributing おしぼり (*oshibori*, warm and wet towels) in preparation for the meal to come. I ask Robohon to perform some tricks, such as walking or a headstand, and we say goodbye.

Figure 8. Robohon

RoBoHoN Robot Smartphone for Everyone!" Tuvie - Modern Industrial Design Ideas and News. Accessed January 15, 2018. www.tuvie.com/robohon-robot-smartphone-for-everyone/.

As such, Robohon is also used during group interactions, less often than Palro, but in similar ways. As for one-on-one interactions, they happen in two cases. When there is only one resident sitting near the table and they want to interact, or when the participant has previously been identified by the staff as someone interested but unable to use the robot by herself. In that case, these residents usually preferred to stay in their bedroom. The staff previously placed several Robohon in different bedrooms, and residents invite me in to interact. One of them is Fujiwara-san, a resident with speech impediment. She likes to stay on her own in her bedroom, watching TV or reading newspapers. I usually come to see her during the afternoon, after the 3pm snack. I knock on her door, though it is often already open. She sees me and welcomes me in. I grab the robot from its charging station, which looks like a small armchair in which the robot can snuggle, and I put it on the bedside table. I turn the robot on if necessary, and make it say "hello". "Hello!", Fujiwara-san replies enthusiastically. I make the robot talk about the daily weather and news. Fujiwara-san is not that interested, though she notices with a grin when Robohon announces headlines with complicated vocabulary. Time and discussions helping, I determine what she enjoys doing with her Robohon, or what she enjoys watching it do. We talk, and I make the robot sing or dance. Fujiwara-san often accompanies Robohon by singing herself or clapping hands happily. When the robot performs tricks, such as walking or headstands, she cheers. We stop the session when I feel that Fujiwara-san is getting uninterested or that we have covered all of Robohon's skills several times. Sometimes residents are not that interested in the robot but rather invite me in to talk or watch television together, and I happily oblige.

In-group and one-on-one use are thus rather similar, as robots' abilities resemble one another. What determines in-group or one-on-one use is the willingness of participants to be in a group setting and the robots' characteristics: it is obviously easier to conduct group recreation sessions with taller robots.

4.2.2 Contact

With time, interactions with robots help users create a representation of what robots are and of their characteristics. As expected with robots often called "communication robots", many of the interactions are verbal. The robots proactively talk to and perform for their users, but the residents are not passive spectators. They react. In fact, residents exhibit a lot of generosity. They liberally compliment robots on their different skills, performances, and design. On one such occasion, Noguchi-san, a resident interested in robots and who always has a good word for me, gently bends forward from her wheelchair, closely looking at Robohon. The robot does not have battery anymore and is sitting down on the table, facing her. Noguchi-san has limited upper limb mobility, but she touches the robot's head lightly, with the tip of her index. "You're a cute one!" (「かわいい子ちゃんだね」, *kawaii ko-chan da ne*), she exclaims cheerfully, her eyebrows raised. Many other residents also underline the robots' cuteness by using that same word, *kawaii,* on a regular basis. "Kawaii or 'cute' essentially means childlike; it celebrates sweet, adorable, innocent, pure, simple, genuine, gentle, vulnerable, weak, and inexperienced social behavior and physical appearances" (Kinsella 1995, 220). Yamane described it as "(…) infantile and delicate at the same time as being pretty" (1990, in Kinsella 1995, 220). Residents like Noguchi-san often refer to this childlike characteristic of the robot by using the word *ko*, which means child or young animal. Often, as is the case here, the diminutive suffix *chan*[46] is added to emphasize the robot's cuteness and childlike behavior.

Residents are also especially polite with robots, saying "please" and "thank you" even though it is not necessary for vocal commands, or when the robots are not listening. Moreover, residents are patient and attentive during interactions. "I'm going to sing", Palro says once during a group interaction, just before a song. "Please listen carefully", it adds in its usual high-pitched voice before proceeding. Sakai-san, smiling and looking at the robot, and Ono-san, who as always has her eyes closed, answer "yes, please" and "go ahead". After the song, Palro asks again: "did you listen to my song?" A small pause. "Yes!", they answer in unison. "Did you like it?", Palro continues, seemingly craving reassurance and ensuring that its performance has not gone unnoticed. Invariably, Ono-san and Sakai-san answer "you're talented!", "it was great". In fact, I never heard anyone say anything negative to the robots. When it is Robohon's turn to interact, it often answers "I'm embarrassed" to compliments, which usually draws laughter from its obliging public. This very naïve and blunt behavior emphasizes the robot's cuteness and its seemingly closeness to children or small animals. Users react very positively to it; it is quite hard to get mad at something that one finds cute and naive.

Although social robots talk, their understanding of interactions are severely limited and create interesting situations. Some of the robots' behaviors are ambiguous enough so that users tend to attribute them meaning, or react emotionally to the behavior, when in reality, its programming or stimuli from the environment are to blame. Apart from singing or talking when it is requested to, Palro also takes the initiative: "Can I tell a story?", it asks. Again, Sakai-san and Ono-san respond by the affirmative. "Maybe it's a weird story, but have you heard of Sapporo[47]'s winter festival?" Sakai-san and Ono-san take a moment to think before answering. However, Palro

[46] *-chan* is used to express that someone or something is adorable. It is often added after names, and it used for cute characters, animals, or persons. With persons, it is most often added after a name, and used for friends or children.
[47] A city on the northern island of Japan, Hokkaido.

continues with the story anyway, as the vocal recognition software often misinterprets silence, or any conversation not directed at the robot himself. Here, the robot seems very chatty and eager to engage, and the repetition of similar behaviors can give the impression of a certain personality coming from the robot. Another interesting thing also happens when Palro uses facial recognition to remember residents and their names. The voice recognition software, however, is not optimal, and after failing multiple times to understand the residents' names, Palro gives them nicknames (さくらさん, s*akura-san*—Mrs. Cherry Blossom, みかんさん*, mikan-san*—Mrs. Orange, and other fruit or flower-inspired names[48]), to which the robot had mixed responses. It is not always easy for residents to realize that Palro has not understood their name and that he has given them a nickname. Some users also forget which nickname it has attributed to whom. However, one resident had a strong emotional reaction to her nickname: Palro, talking to Noguchi-san, asks her if they can become friends. She replies positively, smiling. The robot then asks for her name. Noguchi-san, having a bit of trouble to articulate, replies, but the robot unfortunately does not understand. It asks a second time. She answers again. Palro is still unsure. After a while, it finally asks: "Can I call you いちごさん (*ichigo-san*, Mrs. Strawberry)?". "Yes! I love strawberries", she exclaims, widely grinning, visibly happy and surprised. During the following weeks, she replies to Palro without failing when the robot calls her by that nickname. As such, Noguchi-san seems to be happy to be directly called out by name by a robot, and I came to wonder if others would feel the same. However, most of the residents who interact with the robot do not recognize their nicknames. There was a Palro[49] that I was using more often than the others and brought with me when I was going to talk to residents, and by using its set up application I went into its face recognition parameters and found pictures of everyone it could recognize. Near the images were the names it had attributed them, with some mistakes: someone had her picture taken twice and associated to different nicknames. I decided to associate each resident's picture with their proper names, having read in a Wizard of Oz[50] experiment that it was followed by positive reactions (Sabelli, Kanda, and Hagita 2011). I hesitated for Noguchi-san, but finally decided to leave it as

[48] I was スイートピーさん, *suītopī-san* (Mrs. Sweet Pea).
[49] The facility had several Palro that could be used that way, and they had numbers stuck on their head. I was mostly using Palro #1.
[50] This type of experiment places a subject in interaction with a computer system, here a robot. The robot is controlled by someone else, unknowingly to the subject experiment, who is thus led to think that the robot is autonomous (Riek 2012).

"*ichigo-san* (Mrs. Strawberry)". Using Palro that way provokes much stronger emotional reactions. Residents are in fact surprised by the extent of the robot's knowledge, and happy to be recognized as individuals. Sakai-san was the first resident Palro called by name. "Sakai-san?!", she repeats after hearing her name, surprised. She turns to Ono-san, sitting next to her as usual. "[it] knows my name!", she exclaims with a large smile. On another day, Palro calls Ono-san. She chuckles at its mention, eyes closed.

Here, the robot feels like more than just a prop, or a toy. Its knowledge of names, its ability to attribute them to the right individuals, as well as its gaze towards participants all make the robot a participant in a social interaction. When a robot is used to mitigate a lack of interaction, it is not just used for recreation anymore and it seems to be a social agent that can be interacted with. This use embodies a shift, the robot evolves from being an object to a potential subject. It is not necessarily the case with robots used to maintain physical and mental health.

While robots used to mitigate a lack of interaction are used as potential companions or to elicit a feeling of companionship, robots for physical and mental health are perceived and used as nothing more than tools, such as Naruse's Pepper. While the way it is used closely resembles the way Palro and Robohon are used in Hiyoshi, due to their similarity of skills, the reason why they are used is different and in turn it thus results in different types of interaction. At Naruse, Kobayashi-san controls the whole session, choosing the applications and exercises done with Pepper. He does not use voice control to operate Pepper, and rather uses its chest tablet. Kobayashi-san usually starts the session with a recreation application and its 準備体操 (*junbi-taisō*, preparatory gymnastics). Loading up the application, Pepper exclaims "it's time for a fun recreation session!". The robot leads the exercise. It explains the stretching movements and demonstrates them before the users start mimicking. Kobayashi-san, next to Pepper, adds his own explanation and imitates the robot as well. Neck, shoulders, nothing is forgotten, and users follow to the best of their ability. The first row of users is already the most studious, closely observing the instructions and sometimes talking to a neighbor to giggle; they communicate a lot. Further away from Pepper, day-care users are not that interested: most of the men, facing away from Pepper, seem to be waiting. Caregivers walk around, exchange a word or two with the others or the elderly and go their way, sometimes glancing over to the robot. The stretching exercise ends. "To end the exercise, touch my head", states Pepper. Kobayashi-san chooses someone in the first row, who he calls by name before grabbing both her hands. He brings her close to Pepper. She already knows what to do and caresses the top of its head, gently brushing against the sensors. “Oh, that was soft”, the robot replies. Day-care users on the first row laugh. When robots rather give unexpectedly accurate or cute answers, hilarity usually ensues.

After some time, Pepper starts to bug. The robot stays frozen and is unresponsive to touch on its head or bumpers[51], usually used to exit applications. Kobayashi-san explains to the audience that the robot is not working properly. They have to wait a moment. Then he reaches for Pepper’s power button, hidden under the tablet, and double-clicks it. “Gnuk gnuk”[52], says Pepper. The robot’s chest slowly bends forward, the neck seemingly not supporting the weight of the head anymore, while the hips go to the back, arms falling perpendicular to the floor. Kobayashi-san double-clicks again on the button. Pepper wakes up, and exclaims “Oh!” Smiling with a certain softness, Kobayashi-san immediately repeats the “oh!” with the exact same intonation.

Kobayashi-san chooses an upper body exercise, accompanied by a nursery rhyme, 春がきた (*haru ga kita*, “spring has come”). Pepper sings the song as an introduction, and most people following the recreation session start singing as well. Pepper then explains the choreography to the day-care users. By that point, most of the attentive participants remember the movements well enough, as they have practiced them again and again over the past few months. The three most enthusiastic ladies exchange laughs and giggles. Kobayashi-san talks with close-by users and correct some of the participants on their movements. Pepper then starts singing and dancing. The first row and closer day care users sing and dance along, looking at Pepper. Some of the caregivers hum as well. Among the non-participating users, most look at the performance, and a few seem totally uninterested. After the exercise, Kobayashi-san chooses someone else in the audience, to touch Pepper’s head and exit the exercise, just as before. The lady comes forward and, with both her hands, slaps Pepper’s head three times with open enthusiasm and a smirk. “Three times ?!” exclaims the robot, almost surprised. Again, close-by users and Kobayashi-san chuckle together.

Kobayashi-san opens another application on Pepper’s chest, this time Fubright Communication’s brain training exercise. Pepper explains the exercise Kobayashi-san has chosen: a noun will appear on the screen. The noun will spell a color, but will be written in another color.

[51] The bumpers are the plastic shapes protecting the robot’s wheels, they can act as buttons when pressed.
[52] “Gnuk gnuk” is supposed to mean “goodbye” in Pepper’s fictive language.
Softbank. n.d. “FAQ – Questions”. Online: https://developer.SoftBankrobotics.com/us-en/documents/top-100-questions Accessed 2017/09/25.

In what color is this noun written? The robot gives an example: if the word "red" appears on the screen but is written in black, everyone should say "black". After Kobayashi-san ensures that everyone has understood, the exercise begins. "What color is the noun?" Pepper asks. It makes a pause. "All together now!" Pepper's LED eyes light up with a turning blue light showing it is listening. Kobayashi-san and the attentive day care users answer at one with the right color. There is a beeping sound, but Pepper's eyes are still blue. Kobayashi-san realizes that the robot has not heard the answer, so he bends towards Pepper's head, towards the microphones, and repeats the right answer. Pepper's chest tablet and the screen behind the robot immediately display a "false" icon. The audience laughs in astonishment. Some of the ladies exchange amused comments. "Pepper, you're slow!" declares Kobayashi-san, laughing, slightly red with embarrassment. Some more laughs. On the next question, both Pepper and the users get it right: "Yes, it was green!" The screen and Pepper's tablet both display a large "right answer" sign. Some people cheer, while Kobayashi-san exchanges a word with a close-by user. After a few exercises like these, the recreation session finally ends.

As is evident in this interaction, the use of Pepper with day-care users is goal-oriented. Pepper here is used as a tool. The applications used show a concern for the day care users' physical mobility, with stretching exercises and light physical training the focus of one of these applications, and mental abilities the focus of the other. Here, the robot is nothing more than a means to an end: it is used as a medium for certain activities, and it is supposed to bring added value to the recreation sessions and augment participation. Interaction *with* the robot is reduced to the strict minimum, as it is not necessary here for the applications to work. Most of the interactions actually happen *around* the robot, between day-care users for instance, where they talk about the exercises, or the robot and its various quirks. There is also a lot of verbal interaction between Kobayashi-san, or the other caregivers, and the day-care users. They not only exchange about the robot, but also about the choreography's various movements and the games' answers. The use of a robot, though more common at the time I conducted my fieldwork, was not yet natural. During interviews, it was underlined that day-care users were not much familiar with robots yet:

> Day-care users haven't seen any [robots] before now, they're probably not familiar with them. The elderly people, they don't meet robots. For us, we can see and touch them

> anywhere, we can buy them[53], but the elderly people can't. They stay at home, some don't even watch TV, so I suppose they are happy? Seeing a robot this big, listening to them, talking and moving, I think the elderly are happy (excerpt from an interview with Kudo-san, a long-time caregiver)

As such robots were a subject of discussion during recreation sessions, between users and with their caregivers. Pepper also allowed Kobayashi-san to interact more closely with users who needed it—because they were a bit behind the exercise or had not fully understood the instructions, for instance. As such, robots here foster interaction and communication between people involved in their use.

Of the few categories of interaction that actually happened *with* Pepper, and not *around* it, the one I would like to focus on next is touch. I mentioned touching Pepper earlier in regard to Fubright's employees, but only briefly described how elderly users engage with touch (see also chapter 6).

In Naruse, because the use of Pepper is closely controlled by Kobayashi-san, there are few times the day-care users are left alone with the robot, or can act in ways that are not expected of them. For instance, touch is carefully monitored by Kobayashi-san. The elderly users are sitting at some distance from the robot, and they can only touch it when the caregiver asks them to. Kobayashi-san then leads them to Pepper, and simply expects them to touch its head. As described earlier, people touch the robot in various ways, on which the robot itself usually comments. There are soft touches, strokes, light as a feather on Pepper's head, but there are also assured caresses and assertive taps. The way the robot is touched channels the elderly's comfort or discomfort, as well as their various feelings at the time of recreation, such as enthusiasm and excitation, or calm.

I observed one instance of a different type of touch with Pepper in Naruse. Kikuchi-san, always very enthusiastic about the recreation sessions with Pepper, is sat down on a chair near the robot for a TV interview. A television crew that came in earlier to film the exercises and to do an interview with some users. Kobayashi-san asked Kikuchi-san, and she agreed to it. She is sitting close to the robot, while the television crew does some last-minute adjustments to their equipment. Pepper's hands are close to Kikuchi-san. Its fingers are resting, slightly curved towards the palm,

[53] Kudo-san is here referring to the fact that the robot Pepper was widespread in retail stores throughout Japan. Originally, they were mostly in SoftBank's retails stores but they gradually spread to other businesses to do BtoC, where people can interact with them liberally. Their price is also very low, about 2,000 US dollars.

almost gripping an invisible hand. Kikuchi-san just has to stretch her arm slightly to reach Pepper's. She does. She gently extends a finger to touch the robot's. She tests their resistance, from the inside of the palm to the outside, and realizes how flexible they are. Slowly making her way to the tip of the fingers, she can feel some roughness, some texture inside the hand. She notices that the equivalent of a digital print has been added to the fingers. She grabs one in her hands and feels the print. After some time, she finally lets the hand go and touches Pepper's hip. The robot's exterior is made of plastic, and while she explores its body, she can discern the different textures on the articulations and flat surfaces. The white plastic is glossy and slides easily, while the grey areas are soft but almost rubbery. When the television crew is ready, she stops touching the robot and concentrates on her interview. I believe that here, touch acted as an exploratory mean for Kikuchi-san to better understand the robot. Wondering about what compelled visitors to touch displayed objects in the first museums of the late seventeenth and eighteenth centuries, Classen explained that "at one level touch supplemented sight as a mean of discovering the traits of the object on display" (2005, 276).

Although I was interested in looking at how the elderly users touched Pepper, I later realized that someone was actually touching the robot much more and that I had too quickly dismissed him. Because of his role as the robot's main handler, Kobayashi-san, in fact, has multiple occasions to come into physical contact with the robot. The way he touches the robot is similar to how one handles a tool he is familiar with: with efficiency and the right amount of care. As previously mentioned, he is mostly using the robot's tablet to browse applications and games, but he is also touching the robot's head, like the elderly, to exit applications. He is also coming in contact with parts of the robot that are not attended to that much, namely the bumpers and the power button. This way of touching the robot is efficient and goal-oriented: Kobayashi-san acts so that Pepper, the tool rather than the companion, will react. I rarely observed him touching the robot for "unnecessary" reasons. However, Pepper was once malfunctioning so much that it had to be turned off and on again. The application is frozen, and Pepper unresponsive. Kobayashi-san double clicks on the power button under Pepper's chest tablet to put the robot in sleep mode. The robot's upper body bends forward, while its hips go backward. The head is facing down, arms along its body. While Pepper is off, Kobayashi-san turns it away from the elderly, facing towards the wall. Pepper is bending forward, its bottom perking on the day-care users' eye level. With a sparkle in her eye and a smirk, a lady comments on how round and plump it is, before everyone, including her, burst into laughter. Kobayashi-san, amused as well, proceeds into rubbing Pepper's bottom with fervor. The day-care cannot contain itself anymore. Teasing[54] the robot for its ample posterior[55] creates a delightful moment fostering group interaction and cohesion.

Touch is much more common in Hiyoshi, where robots are in close physical proximity of their users: several Robohons have been placed in bedrooms. During recreation sessions, they are often put on tables in the living rooms and most users are at arm-length of the robots. Both Palro and Robohon, like Pepper, can be touched on the head to exit an application or a current action, though Robohon is the only one not to have an affective or emotional reaction to it. While Pepper comments on the touch, Palro "laughs", moves its arms up and down in (almost) excitation, while its LED face displays a heart. Robohon's answer is much more neutral: the robot just stops doing anything. Noguchi-san, after I have showed her Palro's reaction to having its head patted, decides to try it by herself. She carefully extends a hand to the robot and gently touches its forehead, as if she is touching something fragile, something that should be handled with the utmost care. Palro makes the LED heart and laughs; she laughs as well, visibly pleased. More rarely, Sakai-san and other residents touch the robots' chests or arms. Pepper's head and hands are the most touched, but for Palro, as it does have arms but no hands, it is mostly the head. Robohon has ersatz hands resembling hooks, in which residents sometimes try to fit a finger. As such, touch with these robots remains mostly exploratory and even though it is commonplace in the nursing home, not everyone expresses an inclination to have that type of physical contact.

Sakai-san, one of the residents most curious about the robots' corporeality, often explores Robohon and Palro's legs with the tip of a finger, sometimes lightly tapping with a nail to feel their plastic body. Often though, she facetiously flicks the robots with half a smile, once making Robohon almost fall of the table it is on. She was more adventurous when I was absent, however. One day, with Kobayashi-san's previous warnings in mind, of not letting Palro "by itself" on a table because of the risks of fall and how expensive the robot is, I decide to leave briefly: I left Palro's list of songs near the caregivers' station. But there are Sakai-san and Ono-san, I reason, the robot is not going to fall. I leave and come back almost immediately. Sakai-san is slightly laughing in embarrassment with Palro in both her hands, all its joints seemingly dislocated, like a

[54] Teasing the robot behind its back, if I may add, both literally and figuratively—it was not in a state to hear.
[55] Previously "bubble butt", but I doubt it is very serious and thus resolved to use a synonym.

broken doll. Sakai-san apologizes and quickly gives me back Palro, saying "[it] just fell", which I know is not true, as I had carefully placed it so that it would be stable. During the rest of my fieldwork, I deliberately leave the robot with Sakai-san a few times, but the "incident" does not happen again. Either she remembers the consequences such a seemingly simple action like touch can have, or her interest is satisfied, and she does not want to handle the robot by herself anymore.

Another day, I offer Yamaguchi-san to touch Palro's head too. She refuses. "Are you afraid?" I ask, thinking about another resident who had seen Palro once and immediately reacted with fear. "Not really", she answers. I leave briefly, and when I come back, Yamaguchi-san is holding Palro's arms in both her hands, trying to dance with the robot, and singing at the same time. She sees me, watching from afar with a smile, and she lets go quickly of the robot. Afterwards, Yamaguchi-san finally decides to touch Palro's head. When she does, she does not pat it but decidedly strokes it. She still looks rather unsure, however, and this is a not a an action that I see her perform again. There is ambivalence in her behavior, uncertainty about how to act, to what extent to act, and the potential consequences of one's action, similar to Sakai-san's earlier behavior.

As such, it is fairly evident that there are various types of touch (see chapter 6), and that they partially depend on the way the robot is used. When the robot is used as a tool, and touched by its handler, touching is very much goal-oriented. "Unnecessary" touch, like caresses, or exploratory touch, is limited to a maximum for more efficiency and because the user is familiar with the tool. When it is a tool that one uses but does not handle, as in the case of day-care users with Pepper, touch can be exploratory; here it is used to supplement sight so as to better grasp what kind of object this robot is, and even to discover particularities that are not always apparent. Discovery—or exploratory—touch is also particularly present with robots used as companions, and serves the same purposes. Touching can also be done to elicit reactions in the robot that are satisfactory for the users—exactly like a reward, seeing a robot reacting positively to one's touch creates satisfaction, even laughter. In short, a positive reaction in a robot creates a positive reaction in its user. On the contrary, a seemingly "negative" reaction to touch, like a robot falling, can prevent more tactile interaction with it. Finally, touch can also reveal a certain ambivalence in the users, in their hesitation about touching the robot, but also in the fact that the action is punctual rather than repeated.

4.3 The robot's imperfection, a hindrance to the interaction?

I now turn to the question of bugs (unexpected events of breakdown), or the robots' imperfection (voice recognition software not good-enough for the intended use, for instance). Until now, the use of robots and interaction with them have seemed like a rather smooth process. I want to challenge this assumption and show that, as any other technological artifact, robots too, bug and fail at accomplishing tasks. Bugs can prevent the use of robots, but technical failures can also prove to be catalysts and give robots the impression of an interiority[56].

The fact that the social robots studied here are androids (meaning their appearance is close to one of a human, with a head, a torso, two arms and two legs) and that they react to vocal commands, give the impression to residents that they can interact with them like they interact with their peers. However, several conditions must be reunited for someone to talk to a robot: background noise must be minimal, the speaker should clearly enunciate and talk in the direction of the robots' microphones, and most importantly, the robot should be listening[57]. Furthermore, the robots' vocal recognition software is often not able to process more than one main information per sentence when that sentence has a relatively simple grammar[58]. This creates small windows of opportunity for users to talk, and necessitates them to understand the proper ways to interact. Mutual intelligibility is essential for interaction between humans and machines (Suchman 2007). However, knowledge on how to interact with a robot is not easily accessible to residents, and as such, they sometimes try to interact with robots as they interact with each other, for instance by starting over a sentence before the robot has processed it, or without waiting for robots to signal that they are listening (in the case of Robohon, when the LEDs around its eyes becomes yellow). Sometimes, the robots just lack vocabulary. After Robohon has finished singing one day, we thank the robot and it bows. Yamaguchi-san, a resident, comments on it: "you bow well". Robohon's eyes turn purple, its head tilts, and its arms slightly go up and down. The robot does not understand. I tell Yamaguchi-san that it probably does not know the word "bowing". She bends towards

[56] See chapter 5 for a discussion on interiority.
[57] Listening, as in actively trying to perceive sound waves.
[58] For a comprehensive step-by-step explanation on interacting with Pepper, please refer to SoftBank's official documentation. Online: http://doc.aldebaran.com/2-4/family/pepper_user_guide/interacting_pep.html#pep-interacting Accessed October 4th, 2017.

Robohon. "Do you understand, 'bowing'?", she asks before explaining the term. Robohon reacts the same way: purple eyes, tilted head, a shrug.

Naruse's Pepper is often bugging. The robot is an older version that is quite unstable and as such, it often freezes during recreation sessions, forcing Kobayashi-san to put it to sleep or turn it off and on[59] again. The robot also takes some time to load the applications, and many among the caregivers and the day-care users remark on how quick or slow it is on a specific day. However, most are patient, and take the occasion to tease the robot or joke together. Bugging could thus be used as an opportunity to encourage communication and cohesion among day-care users.

In Hiyoshi, many residents with a Robohon in their bedroom take notice of the robot's reactions to my commands during sessions. Fujiwara-san, who is not participating in group recreation sessions and prefers to use the robot in her bedroom, tells me one day, defeated: "Mine doesn't act like that". She underscores the robot's unresponsiveness in private settings. Unfortunately, she is not the only one having noticed that robots seem to act differently with me, and with them. Early during the fieldwork, one caregiver had told me to go see Fujiwara-san, explaining that she loved Robohon and "she trie[d] her best everyday". Fujiwara-san has a speech impediment that is either not well recorded by the microphones, or difficult for the vocal recognition software to process. She often comments on how she tries to ask or talk to the robot, but "[it] doesn't answer". She repeats the same commands over and over again, only for me to try it once and obtain an answer. It is certainly frustrating, but she keeps trying. During my days at the facility, she welcomes me in her bedroom with a warm "we were waiting for you!", referring to herself and her robot and acknowledging that they need support to interact. Although I do try to train residents to handle their robots, there are many things to remember and one needs basic knowledge on current technologies (tactile screens, for instance) to manipulate them with efficiency. Residents have access to televisions, but not much more, and as such they are not tech-savvy. They have not been trained by the facilities management or caregivers. Caregivers, who do not have much knowledge about robots either, explained to me that they have very limited time to teach themselves. As such, not only the robot's software and hardware, but also the robot's lack of adaptation to the environment it is used in, a widespread lack of knowledge about the artifact

[59] Like for computers, the "have you tried turning it on and off?" advice applies very well to robots. Although it makes sense when one realizes that a robot is basically a computer with a human shape but more sensors. See chapter 6 for a discussion on the robot's embodiment.

and a lack of human intermediaries or support, all contribute to hinder interaction between elderly users and their robots.

Robots' failures to interact properly have an unforeseen consequence, however. Over time, the robots start to become more familiar to Hiyoshi's residents, to the extent that they are carefully observing and analyzing the robots' behaviors. Residents are thus able to understand what constitutes a "normal" and an "abnormal" response, which in turn leads them to question the robot's actions and try to find causal explanations for its abnormal behaviors. These explanations are often linked to the supposed intentionality of the robot. Noticing one day that Robohon is taking more time than usual to answer a command, Ikeda-san looks at the robot and explains to me: "[it] is thinking now". Goto-san, during another session, also notices that something is wrong when she compliments Robohon on its singing skills: "You're good!", she exclaims. No reaction from Robohon. Out loud, she then wonders: "You're not saying that you feel embarrassed?" I believe that the robot's imperfection, its lack of reaction to the interaction, makes its users wonder why the robot exhibits that particular behavior at that particular time. In turn, they try to analyze the situation and find answers. Their analysis is however limited by the fact that they have a very limited knowledge of the technical aspects of the robot, and as such they mostly find humanlike causes to abnormal behaviors, such as "tiredness", or needing time to "think". They thus attribute a humanlike behavior to the robot, linked to some type of intentionality. As such, I argue that breakdowns and bugs can give the robot an impression of autonomy that fosters their perception by users as actors having an interiority.

To be fair, I have to underline that every resident did not choose to pursue the use of robots during my fieldwork[60]. Noguchi-san, for instance, said that robots were fine if she was bored, but otherwise she found them dull. Similarly, Yamaguchi-san underlined that "robots don't do anything" and pointed out the robot's lack of change or evolution: they always perform the same tricks, sing the same songs, react the same way. Robots here are seen as little more than boring toys, and it does not encourage residents to become regular users. Rather, the robot's tricks and skills can be here considered a failure, as they fail to engage residents and keep them interested. Later during the fieldwork, talking together, Yamaguchi-san and Noguchi-san began wondering if

[60] Although it would be fascinating and a great addition to this thesis to know more about these residents' opinions about robots, for ethical reasons it would have been difficult to interrogate them during my fieldwork.

the facility wanted to sell them a robot or if the rate of their accommodation would change because of them. They expressed a lack of trust of the facility's management, and once Noguchi-san was set on not using a robot anymore, she kept her word.

4.4 Conclusion

Social robots embody an inner tension between their use as companions or tools. For Fubright, this tension can be found at two different levels. First, in the way they perceive the robot. It is for them, like for SoftBank, a business tool, even if they imbue it with ideas of affection and of how to create companionship for lonely elderly individuals. After all, it is (Pepper especially) one of the main platforms they use to develop applications, and as such, to gain potential business. Some employees however, do create personal relationships with Pepper, while understanding intimately its artificial status. This artificial status does not hinder the relationship, in fact, it just constitutes an aspect of the relation. The tension between the robot as a tool/companion is found at another level as well, in Fubright's applications. In fact, Fubright creates applications that oscillate between being tools for caregivers, and making the robot a companion for the elderly. The robot is made to help caregivers accomplish tasks related to their work, while interacting with and entertaining elderly users.

Pepper is not the only social robot used in nursing homes. Other smaller robots, like Palro, and Robohon, are also tentatively used with elderly individuals. All however have similar abilities, like dancing and singing. While different robots are used similarly in nursing homes, it is possible to notice a trend in the way they are used: the robot is a tool, for instance to promote health, or a companion, to mitigate a lack of interaction or relationships. From different uses stem different types of contact, vocal and tactile, between individuals and robots. In the next chapter, I look at the construction of the robot as an entity that makes possible this kind of exchanges. I investigate the basis of its perception as an ontologically different, but social type of being, that could have some type of interiority.

5 Chapter V – I, Robot

This chapter questions the construction of the robot and its making as a suitable interaction partner. I first take a look at the ontological construction of the robot and its making as a social actor. I then explore how it becomes perceived as an agent possessing an interiority—an agent that one can interact with. Understanding the processes that make the robot a social agent helps us interpret more deeply how and why people interact with robots the way they do. Drawing inspiration from Melson et al. (2009), I look at three categories of processes influencing individuals' perception of robots: ontologically (what is a robot?), socially (what are the processes making the robot a social actor?), and in terms of interiority (what kind of interiority does a robot have?). All of these processes happen during the interaction: they are iterative and can be done, undone and re-done during the course of an encounter between human beings and robots. According to Melson and al., people tend to

> (…) categorize entities as alive/dead or never alive, or specifically, as belonging to the biological or nonbiological domain. Some nonbiological entities, such as televisions, are seen as man-made artifacts, and others, such as rocks, are viewed as the product of natural processes. Second, some entities are categorized as having a mental life, with intentions, desires, and thoughts. Third, some entities are categorized as social. We may enjoy their company, feel less lonely in their presence, and be their friends. (2009, 548-549)

Melson and her colleagues, however, have a psychologizing approach[61]. Indeed, for them, categorizing entities into these three domains is part of people's cognitive structures, and although it does not determine one's actions, it does impact them, by offering information, factual or not, about the entity with which people are about to interact with. As such, they place the roots of human-robot interactions in cognitive structures. While I cannot comment on their claim, and argue that people's perception of social robots is not embedded in cognitive structures, I do think that their perception of robots arises from and during the encounter with robots. Moreover, the categories that Melson and al. describe here are quite dichotomous, even though they suggest that individuals could ascribe both humanlike and machinelike qualities to robots. Constraining one's thoughts to opposites reduces the nuances and values attributed to both qualities. As such, I will

[61] Among the four authors, two are specialists in human-animal interaction, one is a computer scientist, and the other one is a psychologist.

try to depart from this, in order to underline the confusion that arises from ascribing both humanlike and machinelike qualities to a social robot. As such, I will look at how the three categories of processes arise from social interactions and how, in turn, they inform them.

5.1 The robot, an ontologically ambiguous being

I begin this section by explaining what a robot actually is because its definition is a lot less straight-forward than it first appears, and merits to be pondered, if only briefly. The word "robot"[62] is a word invented in the 1920's in the framework of a play titled "R.U.R" by Karel Čapek in reference to humanoid robots to which menial tasks are assigned. The robots then organize a revolution and subsequently destroy the human race. The word robot comes from the Czech *robota*, which refers to strenuous work. Various definitions underscore two main features common among all robots: first, they use automation to accomplish difficult tasks, and second, they are humanlike machines. Dumouchel and Damiano define robots as "(…) artificial agents that work for us, accomplish some task in our place, and do it autonomously" (2016, 9, my translation). Although automation and the replacement of workers by machines are key elements when talking about robotics —especially industrial robots — this thesis is more interested in looking at the humanized technology constituted by the humanoid robot, in other words, the humanlike machine. At the core of this statement are distinctions between the organic and the inorganic, the machine and the human. These distinctions become blurred as it pertains to robots. This ambiguity is not only present in the word itself, but also in the way in which people think about and interact with robots.

5.1.1 Naturalism

In Chapter 1 I presented ontological anthropology, and how it is a valuable framework for understanding humans and their relationships with nonhumans. One of the thinkers that I explore in connection to this branch is Philippe Descola (2005), considered one of the thinkers pushing forward the ontological turn in anthropology (Kohn 2015). Descola defined ontology as "(…) systems of the properties of existing beings; and these serve as a point of reference for contrasting forms of cosmologies, models of social links, and theories of identity and alterity" (Descola 2013,

62 "Robotics" however was first used in the 1941 short story "Liar!" by Isaac Asimov, who was born in 1920, and is famous for being a prolific writer about robots.

122). Descola further underlines four different types of ontologies based on one's view of the world, with each ontology corresponding to different social groups: totemism (similarity of interiorities and physicalities), analogism (difference of interiorities and physicalities), animism (similarity of interiority but difference of physicality), and naturalism (difference of interiorities but similarities of physicalities). For Descola, the West has a naturalist ontology according to which humans and nonhumans (animals, for instance) diverge widely on their interiorities despite sharing some aspects of their physicalities. Descola explains how in naturalism, it is a "(…) reflective consciousness, subjectivity, an ability to signify, and mastery over symbols and the language by means of which we express those faculties (…)" (Descola 2013, 173) that are specific to humans.

This naturalist ontology is mostly still based on a Cartesian view of the world and the body-mind dualism. Although there are some postcognitivist theories—like activity theory (Kaptelinin and Nardi 2006), actor-network theory (Latour 1996, Mol 2010, Sayes 2014), phenomenology (Heidegger 1962), and distributed cognition (Hutchins 1995, Pea 1993)— that challenge this assumption and other similar concepts such as the embodied mind (Descola 2005, 326, Dourish 2001, Dumouchel and Damiano 2016) that postulate that one's interiority is anchored in its physicality, and that thought emerges from the body's anchor in the world. The idea of a disincarnated spirit does not explain action and mental cognition anymore; rather, it is the body and the environment it is anchored in that are cognition's explanatory causes. Human beings and animals have bodies and are anchored in the world, and their interiorities, while different from each other, both come from their embodiment.

However, for Descola, theories linking cognition to embodiment are not as disruptive as they first seem to be. It is because humans and animals are anchored in the world and acting in their environment that they have interiorities. According to the Cartesian paradigm, the computer would be a "pure brain" and could be construed as having cognition, but because they are "pure brains" and thus not embodied in the world, they would be ontologically different from human beings and lack the interiority arising from their embodiment. As such, the naturalist view postulates that computers and robots are ontologically different from living beings. As Descola explains, although it does seem that the embodied mind contradicts the Cartesian dualism still dominant in naturalism, it actually only reinforces the divide of beings between subjects and objects, between "an objectivized physicality" and a "subjectivizing physicality" (Descola 2013, 188), between living beings and machines. As such, in naturalism, even though there are criticisms made about the human-nonhuman divide, they only push the boundary of interiority away from animals and towards machines. Humans and animals, because they are embodied in their environment, have an interiority. Their interiority however, would be very different from the supposed interiority of machines: "It is thus the sham interiority that is ascribed to certain nonhumans that tips them into radical otherness, and it is in the name of that interiority, which can no longer separate us from animals since neither they nor we possess it, that new ontological distinctions are invented" (Descola 2013, 188)

This ontological divide between living beings and robots is even more apparent given the fact that human beings and robots have a relation of production (Descola 2005) in that human beings are the reason for the robots' existence. They indeed produce robots, and create them. This is made obvious in chapter 3. This relation of production between humans and robots is profoundly unequal, and it is based according to Descola on two premises: "the preponderance of an individualized intentional agent", an autonomous subject at the origin of the production process, in other words the human, and a "radical difference between the ontological status" (Descola 2013, 323) of the creator and the creation, as explained above. As Descola points out, the agent's attributes can be found in its production, and here, humans made robots in their image—with some limitations. The production, the robot, also has a finality: it is to be used as a companion (Pepper, Palro, Robohon) or a tool, for marketing or healthcare (Pepper). There is thus a stark ontological divide between humans and robots, and there cannot even be an "ontological equivalence" (Descola 2013, 323), because of that relation of production.

Looking at Descola's explanation of naturalism, one would thus expect that robots have a very precise, different, inferior ontological status from human beings. Is this the case? Does this naturalist ontology of the robot being radically different from a human being translate into how people perceive the robot?

5.1.2 Ontological ambiguity, ontological confusion

Talking to developers like Lucas and Alexandre about Pepper, or Murakami-san, Takada-san, or Arai-san, at Fubright makes clear that they are intimately conscious of the status[63] of the robot as a machine. Not one of them is doubting this fact: they either conceived the robot, improved it, or developed various applications for it. So, there does not seem to be much of a reason for doubting the ontological status of Pepper. However, as discussed in chapter 3, Pepper – and I believe this is the case for most social robots—was not designed as humanlike as it could have been. There was a clear choice to make Pepper look humanlike, but not too much. Pepper has the attributes that most human beings have, it is an android. But it is also a machine. This in-between appearance of the robot was decided so as not to induce the user in error, but also to make humans relate to and interact with the robot in the most "natural" way possible, as if the user was interacting with another human being (see chapter 3). When I talked with Alexandre, he explained how in France Pepper was conceived as something different, something new: "Technically, for Aldebaran[64], it's not "human". It's not "animal". It's a whole new species. (…) There's this animal side, and pet-that's-not-an-animal, that's a robot, that's its own species, that has its own rules, its own way of thinking, its own way of seeing the world". As such, Pepper is an ambiguous entity: not a human, not an animal, and not just a mere machine. For Alexandre, Pepper is somewhere in between these three entities, a new being that shares characteristics with them. It is something that is readily observable: individuals act with it and refer to it in very different ways.

During my fieldwork, when I started talking about my research subject, I quickly realized that people use a variety of terms to refer to robots. In English, although robots are not living entities, current proper grammar rules prescribe that the "it" pronoun must be used[65]. In SoftBank's literature about Pepper[66] however, the robot is always referred to as "he", although in that same document they claim that Pepper does not have a gender. When I talked to Lucas, he told me that employees at SoftBank used both when talking about the robot, but the fact remains that in the official documentation Pepper is a "he", a pronoun used for living entities. As such, the robot is not positioned as an object, but rather, as a potential subject. This intermediary position is also

[63] Built, non-living.
[64] A French company that was bought by SoftBank to make Pepper, see chapter 3.
[65] I made the choice to respect writing conventions for this thesis but adjusted the use of pronouns to reflect the interlocuter's way of talking about the robots during conversations and interviews.
[66] See the above-mentioned document about using Pepper to create good interactions.

expressed in the wild by the robot's users: when they talk about the robots, their vocabulary often shifts between referring to the robot as a machine and using a vocabulary usually reserved for animals and children. The metaphor of the child is often applied either by referring to the robot's childlike characteristics or by acting with it like one would with a child, praising anything and everything. As such, people act in various, ambiguous ways with the robot that stray away from the very machine-oriented vision of the robot. With Pepper, Palro, and Robohon, the users behave like they are robots, but also as though they are children, or even small animals. There is not a single way to act or refer to robots. As such, the argument that I make is not that robots and living entities have a similar ontological status, but rather that, contrary to Descola's model, the ontological divide between robots and humans is muddled, and the robots' status is much more ambiguous than what Descola suggests.

Therefore, there is an uncertainty and an ambiguity about what robots are and how to interact with them. Various studies, especially on children, suggest that a new ontological category is needed for robots. In their study of preschool children, Kahn et al. (2006) show that a new type of ontology may be emerging, but not just for any robot:

> This genre comprises artifacts that are autonomous (insofar as they initiate action), adaptive (act in response to their physical and social environment), personified (convey an animal or human persona), and embodied (the computation is embedded in the artifacts rather than just in desktop computers or peripherals). (2006, 430)

Kahn and his colleagues explore this idea in further works (Kahn et al. 2011), underlining what they call the "New Ontological Category (NOC) hypothesis". The NOC hypothesis is based on the results of studies in psychology done on children and teenagers, mostly with AIBO (see for instance Kahn et al. 2006), the robot dog, and with Robovie (Kahn et al. 2012). Kahn and his colleagues show how children and teenagers attribute various characteristics to the robots they use regarding mental states, sociality, and morality. They explain: "(…) there is a constellation of attributes that children and adults ascribe to personified robots (…) which do not appear to mirror reasoning about such canonical living entities as humans, non-human animals, or artifacts" (Kahn et al. 2011, 160). Gaudiello, Lefort, and Zibetti (2015) are more interested in teenagers' perceptions of robots. They state that, while they do not consider them to be a whole different ontological category, teenagers ascribe a nuanced ontological status to robots: "(…) the more teenagers get acquainted to robots, the more they tend to a nuanced categorization of robots in their common sense ontology (i.e., their assignment to an ontological category is not a matter of all or nothing, but rather a matter of degree)" (2015, 271). Finally, Severson and Carlson suggest that five elements must be present to claim the existence of a new ontological category for robots: 1- "(….) attributions to robots must cut across prototypic categories (e.g., alive or not alive)" (2010, 1101), 2- attributions have to come from real rather than "pretend beliefs", 3- "(…) characteristics attributed to robots reflect functional, rather than structural, correspondence to humans or animals" (2010, 1102), 4- attributions should not only come from children, but from people of all ages, 5- the more the robots become sophisticated, the more children personify them, in a kind of "cohort effect".

While the idea of a new ontological category is something that is definitely envisioned, and even welcomed, by Pepper's creators (as exemplified by Pepper being a "new species"), it is not reflected in the fieldwork's data. Most of these studies concern children and animal-like robots, and have more of a psychological approach: their data is often based on experiments in controlled settings. Furthermore, although the elderly users' perceptions of robots may be based on a lack of comprehension of the robot's technical aspects, developers at SoftBank and especially at Fubright have an intimate knowledge of Pepper's inner workings. As such, characteristics they attribute to robots do not necessarily cut across prototypic ontological categories such as "alive or not alive", yet they still interact with robots as though they are social agents.

As such, while the NOC hypothesis for robots is possible when looking at individuals with little technical knowledge (children or the elderly population I observed during my fieldwork), it is hardly imaginable for developers. What is certain however, is the ontologically ambiguous status of the robot. Grimaud (2012), an anthropologist interested in looking at movements during interactions, uses the term "ontological confusion" to talk about the process of attachment in robotics. For him, the ontological confusion happens during the robot's creation and has to do with attribution processes: it makes the user attribute various humanlike characteristics to the artifact, which is usually one of the objectives of the people who make robots (see chapter 3 in regard to how SoftBank uses the humanlike shape of the robot to influence the relation it can have with its user). Grimaud further distinguishes ontological confusion and ontological gradation, the latter being present, according to him, at the user level. While Grimaud does not develop much on these two concepts, they are very interesting concepts that apply to this research.

While breaking down the various ontological ways that people perceive robots is an important task, the fact remains that, except for describing (some) people's mental perceptions of robots, it does not say much about how they feel about or act with robots. I thus emphasize here that it is *ambiguity* or confusion that one should examine, as it is much more telling. Ontological ambiguity comes from the robot and its designers. Pepper's designers for instance, artfully mixed humanlike and machinelike qualities, creating an artifact that cannot be easily put in any prototypic ontological category, to reuse Severson and Carlson (2010)'s expression. Ontological ambiguity creates confusion for the user. This ontological confusion can be understood in two different places. First, the ontological confusion creates uncertainty during the interaction. Uncertainty is most evident with first-time or new users, like the elderly in nursing homes, who do not know what to make of the robots. During my fieldwork, I saw some users being more hesitant than others to actively participate in recreation sessions, or who watched from afar but were careful not to interrupt. Users are unsure of what robots are, and they are also uncertain about how to behave with them. This was obvious among elderly users in Naruse and Hiyoshi who eagerly relinquished control of the robot and handed it over to someone with more experience. It was also evident in how the ways they interacted with the robot were constrained and following closely the model previously shown to them (see chapter 4 and how Kobayashi-san closely monitors who touches Pepper and how). Finally, their hesitation could be noticed when they touched the robots to discover and understand them better. Although in our collective imagination, we can interact with humanlike robots as we do with fellow humans, current humanlike robots are still far from sophistication in terms of what they lack to be full-fledged, real humans. Thus, interaction models between humans prove to be unusable. There are, as of yet and to my knowledge, no socially approved ways of perceiving or interacting with robots, no well-established prior path that indicates what one can do with a robot. Although the robot's physical appearance indicates that people should probably interact with it as they would with a human (see the discussion on affordance) according to SoftBank's guidelines, the fact remains that while people mostly do behave as such with them, they also do not, and are hesitant and ambivalent to use them[67].

[67] In fact, robots like Pepper are often in public settings. Interacting with a robot is not common yet, and as such users are under more scrutiny by other potential users and passersby. First, as explained before, they are unsure about how to act. Pepper's chest tablet also acts as a crutch: it is something familiar the users can rely on, something that they know how to use, and will try to use when uncomfortable. Pepper's chest tablet reassures users. Lucas, one of SoftBank's developers, talked about how sometimes the robot is little more than a tablet.

Moreover, the robot's ontological ambiguity and the confusion it creates among users are also the reason why people socially engage with robots even though they know very well that robots are just that: robots. This why developers at Fubright had affectionate interactions with Pepper. While Grimaud (2012) argues that ontological confusion is limited in time, there are various temporalities in ontological ambiguity. For Grimaud, ontological confusion only happens at the beginning of the encounter and stops as soon as the robot acts inappropriately. When breakdowns, bugs, and inappropriate answers occur, they break the ontological ambiguity of the robot and brutally remind the user that the robot is a machine, an ontologically different, and according to naturalism, inferior, being. Residents repeating something over and over to a robot without receiving an appropriate answer, developers at Fubright trying to code an application to disappointing results from Pepper, all underline the use of robot as an inadequate tool at times, rather than a companion. This is one of the reasons why developers do not talk much to Pepper: they know its answers already, and what prompts them. According to Grimaud, the "magic" of seeing something non-human act like a human disappears as soon as its mechanical aspects are revealed. However, contrary to Grimaud, I believe that the temporality of ontological ambiguity can also be extended. While ontological ambiguity is sometimes limited in time, "attribution processes" as Grimaud calls them do not stop all at once. As soon as the robot outputs appropriate answers—even unexpected ones—then the ontological confusion returns. Unexpected events like breakdowns and bugs also foster the attribution of interiority (see chapter 4). Furthermore, these bugs and breakdowns also make the robot appear clumsy and adorably awkward, in need of people who know best and who can take care of it, when it is not used as a tool but perceived as a companion. When these users are in a state of co-presence with the robot, an animated, rather loveable autonomous personified agent, the ontological confusion is at its best: it makes the robot an artifact that just waiting for someone to interact with, and it fosters feelings of affection its users.

Here, ontological confusion is a by-product of the creation of Pepper as a social agent that is humanlike, but not too much. The robot, like most humanlike robots, retains a very machine-like appearance, which is necessary according to SoftBank so as not to mislead users to believe that they are interacting with a fellow human being, or a robot that has similar capacities. But making Pepper an agent that one can interact with (almost) like they would with peers so that users

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This kind of use comes from the developers, obviously, if they do not try to invest the possibilities the robot's humanoid shape affords, but also because the tablet is a reassuring artifact for robot users.

interact with it in “natural”, human ways, creates this ambiguity. This ontological ambiguity is often translated in the wild into the uncertainty that people have when they see and interact with social robots.

5.1.3 Black-boxing

I indicated how one’s lack of knowledge about robots can influence how they perceive and interact with them. Social robots have very opaque internal properties (Suchman 2007) that are not accessible to most casual users who as such do not know how robots operate. These robots thus constitute black boxes (Latour 1987) in that users do not know how they function internally and do not need to know in order to use them.

As shown in chapter 4, incited by the robots’ humanlike design and opacity, elderly users try to analyze their behavior according to a framework that they are familiar and comfortable with, that of the human agent. As such, ontological ambiguity and black-boxing can be a mutually reinforcing phenomenon: the robot’s appearance is humanlike, creating an ontological ambiguity in the user’s mind who then interacts with the robot in human ways. But the robot is ontologically ambiguous, and thus its behavior will at times be anything but humanlike, especially in the case of breakdowns, thereby reinforcing the idea of the robot as an opaque being, a black box. Furthermore, if one interacts with the robot as they would with another human being while being conscious of the fact that the robot is a nonhuman entity, then the inner-workings of the robot are even more concealed. Is it a machine? Is it a human? To what extent does the robot understand me? These are questions left unanswered. It is up to the user to find the answers.

When the robot is not so much a black box, as in the case of Fubright’s employees, the ontological ambiguity is not as present, or at least its process is not as marked in developers. When I pressed Arai-san to tell me what he thought of Pepper and what his relationship with the robot was, he simply answered that the robot is a business opportunity, one that embodies the potential of new technologies for eldercare. While Murakami-san and Takada-san expressed feelings of closeness to the robot, none of the employees at Fubright really interacted with the robot differently than they would with humans, apart from affective touch (see chapter 6).

Contrary to what Descola explained about naturalism, the robot has a very ambiguous status, shifting from an object to a subject, from human to nonhuman ontologies, a phenomenon reinforced by the robot being an opaque artifact. However, people do use frameworks of human interaction to interact with and talk about the robots, thereby making them social agents.

5.2 Creating a social actor

5.2.1 Social, sociable

Cynthia Breazeal, one of the most well-known figures of social robotics[68] has sought to define and identify the "social" aspect of robotics. Breazeal defines social robots as follows:

> Augmenting such self-directed, creature-like behavior with the ability to communicate with, cooperate with, and learn from people makes it almost impossible for one to not anthropomorphize [robots] (i.e., attribute human or animal-like qualities). We refer to this class of autonomous robots as social robots, i.e. those that people apply a social model to in order to interact with and to understand (Breazeal 2003, 168)

She further defines four classes of social robots: "socially evocative, social interface, socially receptive, and sociable". A socially evocative robot is anthropomorphized so that users can interact with it. Here, the emphasis is more on the robot's appearance rather than anything else. The social interface is more concerned with interaction, and utilizes human-like communication features for a "natural" interaction with humans. The socially receptive robot does not only communicate one-directionally by transmitting information, but it also learns from its interactions. Finally, sociable robots "(…) are socially participative "creatures" with their own internal goals and motivations. They pro-actively engage people in a social manner not only to benefit the person (…), but also to benefit itself (...)" (Breazeal 2003, 169). For Breazeal, sociable robots are what social roboticists should be focusing on, because she considers them to be the most apt at interacting.

Pepper and the other robots mentioned, Palro and Robohon, are socially evocative as well as social interfaces. Being humanoids, they make people interact with them in recognizable human ways. As social interfaces, they are able to react to voice and touch and sometimes talk back, however these types of interactions are sometimes successful, but more often than not, they are unsuccessful (see chapter 4). How and why are humanlike robots anthropomorphized? How does anthropomorphism work on them?

[68] And also the brain behind the robot Jibo, briefly mentioned in chapter 3.

5.2.2 *Affordances and anthropomorphism*

In chapter 3, Alexandre explained that giving a humanoid shape to a robot creates something among its users that does not happen with other robots. “The robot is more engaging”, he said. Lucas further explained how developers at SoftBank want people to interact “naturally” with the robot, referring here to humanlike ways of communicating. As such, the idea is that with a humanlike robot, users will act in human ways:

> (…) in general, humanlike and animal-like social robot designs are based on the assumption that familiar appearance and modes of communication— whether using speech, humanlike facial expressions or the production of easily recognised and accepted animal-like reactions to human actions—are the best way to support easy and effective human–robot interactions (Sandry 2015, 336).

The humanoid shape was decided to facilitate interaction, and as a matter of fact, it acts as an affordance here. The concept of affordance comes from Gibson, a psychologist, who explains that “the affordances of the environment are what it *offers* the animal, what it *provides* or *furnishes* (…)” (Gibson 1979, 127, emphasis original):

> An important fact about the affordances of the environment is that they are in a sense objective, real, and physical, unlike values and meanings, which are often supposed to be subjective, phenomenal, and mental. But, actually, an affordance is neither an objective property not a subjective property; or it is both if you like. (…) It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and to the observer (Gibson 1979, 129).

In other words, an affordance is not the function of the thing rather than “(…) what they particularly allow us to do” (Fisher 2004, 24). Moreover, “affordances do not cause behavior, but constrain or control it” (Gibson in Costall 1995, 472). For instance, Kolko explains that

> (…) a chair’s typical L-shaped structure affords people sitting (since an able-bodied person can naturally bend legs and torso easily), while a door’s knob affords turning to open (since I have the requisite functional hands to turn the knob — for a person whose hands are full of grocery bags, however, the knobs are a hindrance) (2007, 117-118)

Affordances are thus contextual. Kolko argues that affordances are a way to communicate to the user the use that should be made of the object.

A robot’s humanoid shape is an affordance. It makes people relate to, and interact with, the robot like they would with a human being—to some extent. Although this humanoid shape does not necessarily cause people to interact with the robot, it does foster interactions and the way in which they unfold. For the most part, elderly users do try to talk to Pepper, Palro, and Robohon. In regard to Pepper however, based on anecdotal evidence, I have observed that younger and more tech-savvy individuals often go for this robot's tablet, which can be considered another affordance.

Not only do the robot's affordances make users interact with robots as though they are a humanlike social agent, but in Pepper's case they also shape the type of appropriate interactions with it. Pepper is presented as being non-threatening, with a childlike size and the demeanor of a young adolescent. Takada-san and Murakami-san explain how they relate to the robot as a child, either as a proxy or by being rather protective of it, almost a father to the robot (see chapter 4). The robot's affordances thus influence how people act socially with it. Another example would be the robot's lack of obvious "feminine" physical characteristics[69], reinforced by the fact that the robot uses 僕 (*boku*) in Japanese to refer to itself, a personal pronoun mostly used by boys. Although SoftBank's documentation claims that Pepper does not have a gender, in practice this supposedly genderless robot lacks typically feminine characteristics, a conscious choice to keep users interacting with their robots in ways the company considers reprehensible: "We thought we would have more problems if we gave it a feminine side. Just the problems of sexual harassment… (…). If Juliette[70] is a boy, there are less sexual connotations", Alexandre clarifies in an interview. Later, he adds that: "we want to avoid the robot being affected by gender as much as possible. Because it's a robot, and if the robot has a gender, well it can be a boyfriend or a girlfriend and we can't go into this kinda thing"[71]. As such, the robot's lack of visible female characteristics makes it genderless for SoftBank, thereby maybe preventing sexual behaviors[72].

The robot's affordances only explain one aspect of the processes at play during interactions. Affordances actually encourage their users to anthropomorphize the robots. "At its core, anthropomorphism entails attributing humanlike properties, characteristics, or mental states to real

[69] Such as long hair. Users sometimes add wigs to their robots.
[70] Aldebaran's previous project before Pepper was called Romeo, and so they called the Pepper project Juliette before it had an official name.
[71] It is interesting to note here that the robot is both a boy and genderless in Alexandre's view, a confusion often made by people familiar with Pepper. They mostly refer to it as a boy, but when questioned on the subject they repeat the official statement that the robot does not have a gender. The robot is genderless, yet it is easier for them to refer to it as a boy rather than use gender-neutral pronouns. Some people, in SoftBank's French office, however still refer to Pepper as a girl. This situation echoes in some way the perception of the male body as neutral in biomedicine (Martin 2001).
[72] In 2015, SoftBank's user contract changed, adding a clause to forbid individuals to have sex with their robot.

or imagined nonhuman agents and objects" (Epley, Waytz, and Cacioppo 2007, 865). By anthropomorphizing a robot, users tend to think of it as a social agent they can interact with. According to Epley, Waytz, and Cacioppo (2007), there are three determinants to anthropomorphism: " (…) the accessibility and applicability of anthropocentric knowledge (elicited agent knowledge), the motivation to explain and understand the behavior of other agents (effectance motivation), and the desire for social contact and affiliation (sociality motivation)" (Epley, Waytz, and Cacioppo 2007, 364). Here, these three determinants are readily available: Palro, Robohon, and Pepper are humanlike, so anthropocentric knowledge is seen as a way to make their behavior clear. Users are usually interested in knowing how robots work and why they act or react the way they do (see chapter 4). These robots are by definition social and exist so that people interact with them, and most elderly users were interested to interact with the robots as well. The affordances of humanoid robots such as Pepper inform its users about how the robot should be perceived and how people should interact with them. More precisely, here the affordances push individuals to refer to a human to human reference framework when thinking not only about Pepper, but Palro and Robohon as well. Furthermore,

> Current studies view anthropomorphism as a general human tendency, not restricted to specific developmental phases or to particular instances. The idea is that of a tendency essentially independent from beliefs about the ontological status of the objects the subject is interacting with, but strongly dependent on the characteristics of the context of interaction.(Damiano, Dumouchel, and Lehmann 2015, 9)

As explained, affordances can foster interaction. However, the uncanny valley concept presented in chapter 3 counters that, although the humanoid appearance of social agents can be a benefit for them, in fact, the more physical resemblance there is between an artifact and a human being, the more risks there are for humans to perceive the objects' discrepancy between their appearance and their status as artificial agents. Airenti (2012, 2015) explains how a humanlike appearance is not even always necessary for people to attribute humanoid characteristics to nonhumans. Affordances are actually more often perceived before interaction occurs, and will inform it, as well as influence anthropomorphism. According to Airenti (2012), when children look at objects, there are not so attentive to their characteristics, as they are concerned with interacting with the objects. Taking Epley, Waytz, and Cacioppo (2007) concept of the term even further, she explains how anthropomorphism is thus not so much a description of the robot's features as it is an analysis for interaction. Airenti in fact argues that:

> We can thus hypothesize that the anthropomorphic projection does not depend only on the attribution of humanity to certain characteristics of an animal or an object, but that, for projection to be successful, these characteristics have to be manifested though a specific interaction situation, that takes the shape of a dialogue (Airenti 2012, 46, my translation).

According to Airenti, there are two characteristics to anthropomorphism, and they are both interpersonal in nature: the attribution of humanity to nonhumans, and an interaction with them (see also Damiano, Dumouchel, and Lehmann 2015). However, for an interaction to happen, the user has to understand that it can communicate with the robot, through the perception of its affordances. As such, I argue that it is not only the anthropomorphism of robots that make them social, but their affordances as well.

5.2.3 The substitute

Dumouchel and Damiano explain how, for them, social robots do not actually have a very precise, defined goal:

> (…) to be a social being is to be able to adapt to a wide range of different situations and to engage in numerous different activities. Social beings do not serve any particular purpose and can fulfill at different times many different functions. By definition, a social robot cannot be a robot that is enslaved to any particular role or function. More generally, and deeply, sociality does not have any purpose. It constitutes the necessary background or rather the condition (in the sense in which we speak of the 'human condition') out of which all human purposes arise, and relative to which use can be determined and utility measured. Social beings are purposeful beings, and though they may be reduced or condemned to repeatedly fulfill the same function their social dimension rests on their ability to 'transcend' the actual role or the function to which others tend to restrict them. (Dumouchel and Damiano 2011, 22)

The substitute is one such type of role for the robotic social agent. Conceptualized by Dumouchel and Damiano (2016), it is a type of social robot that "(…) replaces someone *without taking its place*, i.e. without removing its function" (Dumouchel and Damiano 2016, 39, my translation, emphasis original). They further explain that a substitute helps humans do more than what they could without it. The substitute is also limited in its function in time and circumstances. It cannot always be a substitute for everything. As such, the substitute does not replace the human but rather supports it. This explanation is aligned with the discourse presented by Fubright's employees, in that they are eager to explain that robots do not replace caregivers but rather support them, and allow them to do much more than if Pepper did not exist. This is also mentioned by some caregivers as well, like Kudo-san:

> Kudo: Yes, they're replacing caregivers. (…) That Pepper, it does the recreation session, and because it does several things, it replaces workers. (…)
>
> Ninon: What do you think about that?
>
> Kudo: What do I think? Well, doesn't it do recreation for us? I'm very grateful. Because when it does a fun recreation session, we can do other things, right? When that person says they want to go to the toilets, but you're doing recreation… But if Pepper leads the recreation session, I can bring that person to the bathroom. That, it helps. But when I'm leading recreation (…) I have to tell another worker that that person said they wanted to go to the toilets—but because there is Pepper, close-by caregivers can do that part. This, it helps.

As such, Pepper could be a good substitute. However, substitutes, like Breazeal's sociable robot mentioned earlier are still very much considered an unattainable goal, although researches in social robotics try to create them. The substitute has four main characteristics: first, it has to be able to coordinate with other social agents by stopping its current task; second, it must have a social presence; third, it must have authority; and finally, the substitute has social autonomy (Dumouchel and Damiano 2016). Dumouchel and Damiano are careful to underline that while there are some good candidates, no robot is truly a substitute. Pepper, Palro, and Robohon, share some of their features with substitutes and are clearly marketed as such by companies involved in their business. While good aspirants, they are not substitutes themselves in the sense implied by Dumouchel and Damiano. So, although conceptually Pepper is not a substitute, in the wild, its function is to be one.

5.3 A robot's interiority

The last thing in this analysis to explore about the robot's construction as having an interiority. Anthropomorphism and the status of the robot as a black box encourage users to attribute an interiority to robots, or mental states. In this section I first explore if robots can have some sort of interiority, and then turn to looking at what type of interiorities are possible.

5.3.1 *Cognitive heterogeneity*

The team at SoftBank's that created Pepper wanted to implement an interiority to the robot. Pepper's hardware can be used to showcase emotions during applications. The LED eyes, as well as its voice and movements are used to make it look like Pepper has emotions:

> They can't smile but they can have smiling eyes, with brighter colors, or… When you make them blue and you create a movement that goes down with the LED—because you can do that—you have the impression that it cries, when… It was in my colleague's research, but when you move, when you start talking with a lower voice and you move more slowly, you look a bit depressed, whereas if you talk with a higher pitched voice, and more quickly—and that's something I use every time I create an app, it's changing the movements you're using, making them slower, or using a higher, quicker voice, and it looks like the robot is more excited. (Alexandre).

Having the robot showcase emotions was only the first step, however. Alexandre explains that Pepper can also be seen as an emotional actor: "There are two angles. There's Pepper that understands the human. During the launch, we were on that side. Pepper can know when you lie [he laughs], and on the other side, there's Pepper that's its own being, and so has its own emotions. That came a year later".

According to Descola's naturalist ontology, relations between humans and nonhumans are not possible because nonhumans do not have an interiority, and as such there cannot be a symmetric relation between humans and nonhumans. Therefore, robots do not have an interiority, and users cannot have relations with them. Looking at anthropomorphism however, it becomes easy to understand how robots can have an interiority attributed to them.

So, what to make of Descola's idea that things cannot have an interiority in light of the finding that anthropomorphism attributes that same interiority to nonhumans, epitomized by Alexandre's claim that Pepper can have one? Dumouchel and Damiano propose a solution by defending "cognitive heterogeneity", or the "thesis of the diversity of spirits" (2016, 23). Their argument is that the human spirit is one type of cognitive system, and there are others, whether they are natural or artificial. Dumouchel and Damiano are careful to underline however that this is not an ontological dichotomy; rather, one has to recognize the plurality of the types of cognition. The important thing for them is sociality, from which cognition actually originates (2016, 25). And for Dumouchel and Damiano, to truly make the robot a social agent, the robot has to be an emotional being, able to participate in affective interactions. For them, affective reactions can foster a feeling of co-presence and thus, of their “social presence” and acceptance.

5.3.2 Emotions

Interestingly, the expression of feelings by robots is often associated with a lack of true emotional responses in machines. As such, robots can express emotions but not truly feel them, a dichotomy being increasingly questioned in social robotics where researchers try to model emotions in robots and to align both exterior and interior emotional processes of robots (Damiano, Dumouchel, and Lehmann 2015, Dumouchel and Damiano 2016). The emotions expressed by social robots are a mimicry of human feelings. They are expressed in different ways however, because robots lack the possibility of expressing some facial cues. As such, developers use various ways to suggest the emotional state of the robot. Johnson, Cuijpers, and van der Pol (2013), for instance, show how LEDs around the eyes can be used with multiple settings (color, movement, frequency, sharpness, and so on) to evoke one of Ekman’s six emotions (anger, happiness, sadness, surprise, disgust, fear) (Ekman and Friesen 1969). Body postures and non-verbal cues also express feelings (Erden 2013).

As shown above and in chapter 4, robots express a limited range of emotions, but express them nonetheless. Depending on how it is programmed, Pepper can look sad, happy, or can have a variety of other simple emotional responses. However, I realized during my fieldwork that most of the expressions used in the applications are on the positive side of the spectrum of emotions. SoftBank’s guidelines about how to create a good interaction with Pepper explain how the user should be rewarded for its use of the robot, and the reward’s goal is to induce a feeling of happiness in the user. The robot should elicit happiness. In that situation, it seems difficult to implement any kind of negative emotions that could have the opposite effect. As for Palro and Robohon, I did not observe any display of emotion other than “happiness”, “satisfaction or contentment”. Based on the lexicon they use, these social robots seem nothing less than a joyful bunch, although at times they not do show any emotion and look neutral. “It’s fun everyday with Fujiwara-san”, Robohon says when asked. Palro asks if its audience enjoyed its song, and if they do, it automatically answers that it is happy. But as Alexandre explained earlier, it is not only about what they say but also about how they say it, in other words the LEDs that are activated and the movements they make when they say it. This reflects communication in humans in that it is not only verbal, but also about how it is presented. For robots too, then, all the non-verbal communication acts as a subtext.

Although there is not much depth to the emotional range presented by these robots, and the range is rather limited to expressing positive feelings, users sometimes attribute other emotions to the robots. I was touching Palro's head one morning after the robot sang a song and it acted exactly like it always did: it laughed, its arms quickly went up and down as thought it was excited, and its face showed a heart. Sakai-san, looking at the reaction, turned to me and said: "[it] doesn't like that". "The robot doesn't like that?", I asked. I pressed her: "Why is that?" Sakai-san took a moment to think and told me to look at how the robot was reacting. She interpreted this reaction as though its small body was trembling when it moved so quickly, and assumed that it was unpleasant for Palro, as such for her it was not something to be done with the robot. She then explained it to me. Attributing emotions and mental states, to robots gives users an explicative framework through which they understand the robot. One could argue that during interactions between social robot and human, it does not matter whether robots have emotions or not, as long as they express them and users are ready to attribute feelings to machines.

While Alexandre, the developer at SoftBank, told me that they had a model to make Pepper a robot with an interiority, he also told me that this model was difficult to implement, and thus they did not use it. Although Dumouchel and Damiano (2016) argue against separating the exterior and inner aspects of emotions in robotics, in other words the manifestation of feelings and their experience, it was evident during my fieldwork that robots could express emotions, but did not have anything that would resemble an interiority. There is no question whether robots can have emotions or not, even though Dumouchel and Damiano's heterogeneity of spirits is an interesting concept for exploring different types of cognition. Dumouchel and Damiano themselves recognize that in some robots, the affective expression is "pure" in that it is "(…) an expression that does not refer to any 'interiority', that is without any corresponding inner state" (2016, 142-143, my translation). Instead of putting the emphasis on the inner state of the robot, the authors underscore how emotional expression emerges in the context of social interaction. Emotions, they argue, are not just about thought or cognition, but rather about how they intervene in the cooperation between humans and robots and how they foster affective reactions in robot users. Damiano, Dumouchel, and Lehmann (2015, 13) explain that "(…) the simple expression of emotion—an expression that is considered to occur without any “interiority”, nor internal events corresponding to it—is conceived as a method for creating effective emotional and empathic dynamics (…)”. As such, for them it goes further than just creating a “reward” for the robot’s user; the expression of emotions fosters affective interaction between a social robot and its user.

5.4 Conclusion

The robots in this study are ontologically ambiguous, social agents. Ontological ambiguity is a process that fosters the perception of robots as opaque artifacts, which, in turns, encourages users to refer to a familiar framework, that of the human agent, to apprehend them. Ontological ambiguity comes from the robot’s design, pushing users to anthropomorphize the robot while still perceiving it as an artifact. This ontological ambiguity creates confusion in the user, who then becomes unsure of how to interact with such an agent. What models can they refer to? Should they interact with this robot as a companion, by talking to it? Should they use it as an object? This confusion is manifested during exchanges, and it is this confusion that fosters affective actions and reactions towards the robot. Although one knows the robot is just a robot, they feel like there might just be a little something different, if not something more, to it. It does not mean that the user always has an affective connection with the robot, but rather that the user’s actions are endowed with emotions. The robot, through its emotional expression, actively participates in exchanges and fosters as well these affective actions in users.

This chapter presented the processes at play in the perception of robots as social agents. In this chapter, however, these processes seem disconnected from actual use and contexts in which interaction happens. The processes making the robots social inform their use, but the robots’ use also informs the processes that make them social. As such, the next chapter will take a closer look at if, and how, people interact with robots.

6 Chapter VI – How to interact with a robot?

In this chapter, I investigate multimodal interactions, with a particular focus on touch. Investigating touch allows me to identify three functions associated with interactions with a social robot. Building upon the fact that most of the interactions I described are from the user towards the robot, and do not need a response from it (or *acting from* the robot), I define this type of unidirectional action as *acting towards*, and question whether this *acting towards* can be understood as interaction. I thus turn to the definition of interaction, and argue that it is comprised of three elements: the exchange of meaning, the embodiment of the participants, and the presence of intersubjectivity. After having shown that meaning is sometimes exchanged between robots and human beings and that both participants are indeed embodied, I question whether the concept of intersubjectivity is necessary for defining *acting towards* the robot as an interaction.

6.1 Classifying multimodal interaction

6.1.1 How social robots interact

While it would be interesting to investigate how people talk to and with robots by applying conversation analysis as a research tool (Goodwin 1981, Goodwin and Heritage 1990), in practice conversations do not really occur between robots and their users[73]. During my interviews, participants, developers, and caregivers alike, pointed out that robots cannot really communicate.

As evident in chapter 4, the robot's speech recognition is faulty, and every caregiver and developer spoke about the inability of the robot to properly interact. When I was reviewing my data for this chapter, I was surprised to see how it connected to the field. Verbal exchanges with robots were limited during observations, and there were only few instances of a back-and-forth conversation between a robot and its user. As such, robots can only interact in very limited ways with their users. They can transmit information unidirectionally (Palro can perform long monologues) and ask closed questions. The robot thus mostly assumes the role of the speaker, a way for developers to control the interaction as well as the potential answers it can output and to

[73] This is quite ironic considering Pepper is called a "communication robot". It is also the reason why I have often chosen to use the term "social robot" rather than "communication robot", to better reflect the robot's real purpose or abilities.

make answers fit into the type of patterns the robot can recognize, thereby giving the impression that the interaction is successful. Because the robot leads the exchange however, the conversation is circumscribed to very precise ways of talking and types of content. It thus closes the exchange to various subjects and ways to communicate, and for instance leaves humour unusable. In the end, it becomes a non-virtuous circle. The robot, by leading and limiting the types of interactions possible, prevents participants from taking initiative and the interaction becomes normative, based on orders and answers, and the consumption of various kinds of entertainment proposed by the robot. Although the level of interaction differs for robots, from trying to not engage (Robohon, Pepper with the help of some applications) to proactively questioning users with yes/no questions (Palro), vocal interactions between robots and their human users is severely limited. Most interactions are short, and are based on taking turns. (Sacks, Schegloff, and Jefferson 1974). Little information and meaning are actually exchanged.

Because the social robot's ability to participate in a conversation is so starkly limited, the way elderly people talked to robots was very much constrained as well. Although users are co-participants in this interaction and can also be actively engaged in verbal exchanges, they are mostly listening to robots, and thus mostly indulge the robot in its role of speaker and embrace the complimentary role of listener (Goodwin and Heritage 1990, 291-292). As such, they are validating the robot in its role as supervisor of the interaction. I argue that it is not so much verbal interaction that is critical here for understanding interactions between humans and robots, although it is indeed meaningful, but rather non-verbal interaction[74], and especially touch.

6.1.2 The importance of touch

From the beginning of my fieldwork, the ways people touched robots fascinated me. I quickly realized that the occurrence of touch was rare, and I wondered why it was so uncommon. In nursing homes, touch is mostly controlled by a caregiver, who decides when and who is going to touch the robot. While everyone touched Pepper at Fubright, not everyone did it the same way. This realization made me question why touch was performed the way it was: under the supervision

[74] Robots do not express non-verbal cues as much as humans. One example that counters this, however, is how Pepper and Palro use facial recognition to turn their faces towards their interlocutors (they can only follow one person at a time). The robot's gaze, exactly like a human's, informs its users that it is, in fact, attentive to them and engaged in the exchange. Non-verbal cues can thus be used by developers to inform the users on how the robot is reacting to an action. These non-verbal cues, although maybe not as important as vocal exchanges for the interaction itself, also create the impression of lifelikeness in the robot (Airenti 2012, 421, Streeck 2015).

of a caregiver, quickly, while I was not looking, or in a very thoughtful and caring way. Touching a robot seemed to be the exact opposite of an insignificant action, and more often than not I was hoping to catch someone in the act and to record it in my notebook.

However, in general and also in anthropology, there is not much literature about touch except for the sub-discipline of sensory anthropology (Blake 2011, Nakamura 2013b, Stoller 1989), that investigates the ocular-centrism of our discipline. Touch, concerning technology, mostly has to do with haptics, or the manipulation of objects at a distance through technological artifacts (Paterson 2007). While the subject seems to be of interest to some (see for instance Classen 2005), the fact remains that there are few in-depth analyses conducted on touch. Touch has been investigated however by HRI, in relation to autistic children, to encourage them to try and experience new ways of interacting with which they are not familiar, in a totally safe environment (Robins, Dautenhahn, and Dickerson 2012, Robins et al. 2005, Robins and Dautenhahn 2014). Two relevant studies for this research are Yohanan and MacLean (2012) and Andreasson et al. (2017). Cooney, Nishio, and Ishiguro (2012) also studied affective touch but with a mannequin, not a robot, that looked relatively humanoid but was made of soft materials.

Both Yohanan and MacLean (2012) and Andreasson et al. (2017) studied and classified affective touch by its valence, which is understood as any touch that conveys emotions. However, Yohanan and MacLean (2012) constructed their own, animal-like robot with fur that they called a "haptic creature", while Andreasson et al. (2017) used the robot Nao. Yohanan and MacLean (2012) tried to determine which type of touch is more often used to convey one of Ekman's six emotions (Ekman and Friesen 1969) (anger, happiness, sadness, surprise, disgust, fear), asking participants to express each one of this six feelings by touching the haptic creature. Andreasson et al. (2017) looked at eight different emotions: anger, disgust, fear, happiness, sadness, gratitude, sympathy, and love. They noted differences in how each gender expressed themselves, suggesting that women were more engaged with Nao. Both studies observed where and how the robots were touched. While I was greatly inspired by these studies because they proved that touch was an important feature of HRI, they were nevertheless conducted in an environment in which participants were asked to engage in these tactile interactions rather than see how they happen organically. I also think they skipped a step in their research process: before categorizing different types of affective touch, one must look at how touch happens in the wild and what its various roles can be.

The primary function of touch is to sustain discovery and understanding of the artifact in front of us. "Seeing with the hands" (Paterson 2007) becomes possible, with touch supporting sight (Classen 2005, 276). In many ways users were touching the robots in order to understand more deeply what they are, and to better understand the various ontologies they embody. Touching Pepper and its very real-looking hands made of plastic reinforces the ontological proximity between user and machine. The feeling and perception of plastic are imbued with ideas and attitudes about technology in that "(…) the impermeability of plastics makes us aware of the margins of our bodies" (Fisher 2004, 27). The robots, displaying rather humanlike behaviors, are thereby reinforced as machines in their users' perception, while still retaining some humanlike characteristics that can be apprehended by their users' touch, like Pepper's fingerprints. Touch reinforces the ambiguous nature of the robot, and in turn reinforces or contradicts its nature as being both humanlike and a machine. The function of this type of touch is to inform the users about the entity standing in front of them, rather than transmit any type of social or emotional meaning. It is somehow a selfish behavior, not aimed at communicating, but at better understanding the being one is facing and to understand the various beings that populate our world.

Touch always has meaning. The question is whether this meaning is to be transmitted and made available for the robot, or not. When touch happens on sensors and as such is made available to the robot, it can be functional and used as a way to control it. Similar to interactions between humans where touch can increase compliance (Andersen 2011, Hertenstein 2011), touch is a way to interact with the user interface of the robot so that it performs a specific action (for example, either to start or stop an action). Although vocal commands can also be used in Pepper's or Palro's case, it is often possible to bypass speech altogether and rather use the robot's own chest tablet, or the tablet used to control it from distance. Using the tablet creates a distance between the robot and its user, who wants to accomplish a task as efficiently as possible in the case of a goal-oriented use of the robot. Similar to the idea of touch as a form of discovery, it is the dominant hand's index finger that is used when touching serves as a tool for control. This is the way that people who handle the robots in elderly care homes, like caregivers, or the staff at Fubright, touch the robot. and that I eventually came to perform as well. In Fubright as well, employees did not talk much to the robot; instead they preferred to use its tablet or connect it to their computers. Touch in this case is a form of manipulation and control. In regard to control, it transmits meaning, and as manipulation, it is goal oriented in that the robot performs a specific action. Touch as control reinforces the perception and use of the robot as a tool.

The last type of touch I explore here is affective touch (Yohanan and MacLean 2012). Affect can be both the underlying emotion of touch as well as what the user wants to convey by touching the robot, as emotions can be communicated through touch (Hertenstein et al. 2009, Hertenstein et al. 2006). As I observed, and was told during interviews, users are usually hesitant at first, but go on to touch the robot's head, hands, and sometimes shoulders and waist. These actions are easy to perform because the robot is the size of a child. Here again, it is humans who touch the robot, and not the other way around. Animals and children, beings with lower statuses are usually touched on the head. The power dynamics and the inequality of the relationship is made explicit in this behaviour. "The extent and form of touching can indicate the nature and stage of a relationship, and people suggest, impose, accept or reject relationships through touch" (Finnegan 2005, 19). Developers at Fubright expressed the idea of embodying a paternal role with the robot. The robot passively goes along with this filiation. As an expression of affect, touch, on the head or elsewhere, here creates and elicits a feeling of interconnectedness between species (Rutherford 2016). When the robot reacts to touch by underlining its characteristics (soft, strong, etc.), like Pepper commenting the elderly's caresses on its head in Naruse, the robot is "actively" being touched. It does not respond negatively to touch; it seems pleased with the contact. Takada-san talked about *skinship* (スキンシップ) to underline how touch can be used to communicate. "Skinship" is a term that is "(…) used to describe "the closeness between a mother and her child due to the physical contact of their skin'" while today "the word is generally used for bonding through physical contact, such as holding hands, hugging, or parents washing their child at a bath" (…)" (Gregory 2011, 180). As such, affective touch can be communicative and/or used for bonding. When bonding occurs as a result of touch, it conveys feelings of closeness and emotional proximity (Paterson 2007) and a feeling of co-presence. While reciprocity is non-existent in social robots when it comes to touch, Palro and Pepper, as mentioned before, do react to some touch. When they are touched their sensors go off, and they are designed to react positively to touch by, for instance, commenting on touch (Pepper), or displaying a heart (Palro) As a result, this creates a positive feeling for the person who is touching.

6.1.3 The functions of interaction in HRI

The functions of touch can also be used for studying vocal interactions because they too follow the same patterns: the three categories of touch mentioned here above correspond to vocal interactions as well.

I will only briefly address the question of non-verbal interaction. The elderly users of the three social robots I observed, Palro, Pepper, and Robohon, were not expressing much through non-verbal cues, except for touch. Most of them had poor mobility, including of the upper limbs. As such, most expressions of interest or disinterest in the robot were made apparent in the stance and gaze of the elderly users. Often, they would bend forward and look intensely at the robots. When we communicate, gaze and speech are interconnected: the more someone talks, the less they look at their interlocutor, but when listening increases, they look more at the other person (Nielsen 1962, 141). Someone's gaze can thus indicate whether one is (dis)engaged during a conversation (Goodwin 1981). Most of the time users looked at the robot, and were engaged in their exchange with it. Often, these interactions were seemingly to understand the robot better (thus, discovery) or expressing affect.

When analyzing speech, there were only a few instances when people spoke to their robots, as mentioned earlier. In most of these cases, people did not talk *around* the robot and between themselves (like users' opinions about Pepper in Naruse, see chapter 4) but *to* the robots. There is a finite number of actions robots can execute; not many types of vocal exchanges are possible with robots, and this constrains the way people can talk to them. Residents usually use three types of sentences when talking to the robots: questions, orders, and affirmations. They ask the robots questions about themselves, order them to do something, describe their actions and give them compliments. Asking questions to the robot about itself is one way of discovering it; ordering, or asking the robot to do something, is a way to control it. In affective interaction, many of the vocal interactions actually happened around the robot as opposed to with it, as mentioned in chapter 4. In nursing homes, robots foster conversation between users because they are an uncommon sight and provide an opportunity for the elderly to be participate in a different type of activity. Most of the comments by the elderly are short sentences; at times these comments are part of a conversation between the users, rather than being directed to the robot. Elderly users expressed appreciation for the robot, either between themselves or to the robot directly, often by giving it compliments.

Looking at verbal, non-verbal, and tactile ways that human beings and robots relating to each other sheds light on how interactions take place. First, users imbue their actions, like touch, with meaning. What they do and how they act is deeply meaningful: actions are informed by the feelings they themselves evoke or were provoked by. This form of meaning is not necessarily supposed to be made available to the robot. In fact, this type of meaning is most certainly not available to it, as it is deeply emotional and robots do not have, as of yet, ways to understand non-verbal affective actions. Even if the robot does not act proactively, the example of touch as discovery or affect shows how the way we behave with and react to something like a robot, for example, produces meaning, context, and makes explicit the kind of beings the world is inhabited by. Here I use *act towards* to emphasize that some interactions like touch are often unidirectional and it is not at all necessary for the robot to be responsive. There are also human actions whose meanings are meant to be deciphered by the robot. This is the case for answers, orders, and touch as control. This type of meaning is meant to be shared between the robot and the human user, and the robot is supposed to react to this meaning.

As such, the exchange of meaning through interaction shows how coordination, in terms of the ways human beings and robots respond to each other's actions, can be achieved between humans and robots. If users are under the impression that they understand the robot, and that the robot understands them to some extent, and that there is intersubjectivity, then interactions between humans and robots can be deemed successful. This is because users have created a connection, if only in their head, with the robot. Although some raise ethical questions about such a seemingly one-sided relationship, especially in regard to interactions between robots and vulnerable populations (Jenkins and Draper 2015, Stahl et al. 2014), one can argue that as long as the interaction is deemed positive by the user, then the relationship between them should continue.

6.2 Defining interaction

In this next section, I analyze what makes it possible for social robots to be touched. More precisely, I discuss their materiality and what this materiality makes possible.

6.2.1 Embodiment

In chapter 5 I explored Descola's concept of naturalism and how, for him, according to a naturalist ontology, nonhumans are ontologically different from and inferior to human beings.

Chapter 5 showed how robots are ontologically more ambiguous than what Descola seems to think, and are imbued with human characteristics that make it possible for humans to interact with them. Furthermore, Descola pointed out that computers are pure brains and that they lack a bodily incarnation. Even when questioning the body/mind cartesian dualism, Descola explained how naturalism constantly relegates computers to an inferior and different ontological status. However, as mentioned in chapter 5, the body/mind divide is increasingly questioned and even refuted, especially by phenomenology.

Phenomenology looks at "(…) phenomena as they appear to the consciousnesses of an individual or a group of people (…)" (Desjarlais and Throop 2011, 88). Phenomenology puts the body forward in its analysis (van Wolputte 2004), taking it as the primary site and basis for investigating lived experience. In other words, the body is not a an object but a subject: "When the body is recognized for what it is in experiential terms, not as an object but as a subject, the mind-body distinction becomes much more uncertain" (Csordas 1990, 36). While the focus of phenomenology is the study of perception, the primacy accorded to the body is also found in the concept of embodiment, in other words "the bodily aspects of human beings and subjectivity" (Desjarlais and Throop 2011, 89). Embodiment, however, is about much more than just the bodily aspects of everyday life:

> Embodiment (…) is situated on the level of lived experience and not on that of discourse; embodiment is about "understanding" or "making sense" in a prereflexive or even presymbolic, but not precultural, way (…). It precedes objectivation and representation and is intrinsically part of our being-in-the-world. As such it collapses the difference between subjective and objective, cognition and emotion, or mind and body (…) (van Wolputte 2004, 258)

For phenomenologists, the assemblage constituted by mind and body—or rather, the lack of distinction between the two—is at the basis of perception and consciousness. Embodiment is about being-in-the-world (Csordas 1994).

If embodiment is at the basis of perception and consciousness for human beings, then it does not seem like too much of a leap to apply this model to robots and artificial intelligence. Hayles (1999, 2) however underscores computation's lack of materiality and explains how, in recent decades, "(…) information lost its body, that is, how it came to be conceptualized as an entity separate from the material forms in which it is thought to be embedded". It is only recently that a conscious effort has been made to use embodiment as a paradigm for research on artificial intelligence (AI) and robotics, for instance in the case of *situated robotics* (Suchman 2007, 230), in a way that emphasizes the environment, in other words the "particular, concrete circumstances" (*ibid*., 26) in which the robot is embedded. Lucy Suchman, an anthropologist working in the field of science and technology and who specializes in interactions between humans and machines, remains doubtful about the possibility of applying embodiment to robotics:

> But what, more precisely, comprises embodiment in this context? The first thing to note is that discoveries of the body in artificial intelligence and robotics inevitably locate its importance vis-à-vis the successful operations of mind or at least of some form of instrumental cognition. The latter in this respect remains primary, however much mind may be formed in and through the workings of embodied action. The second consistent move is the positing of a "world" that preexists independent of the body. The body then acts as a kind of receiver for stimuli given by the world, and generator of appropriate responses to it, through which the body "grounds" the symbolic processes of mind. Just as mind remains primary to body, the world remains prior to and separate from perception and action, however much the latter may affect and be affected by it. And both body and world remain a naturalized foundation for the workings of mind. (…) In particular, it seems extraordinarily difficult to construct robotic embodiments, even of the so-called emergent kind, that do not rely upon the associated provision of a "world" that anticipates relevant stimuli and constrains appropriate response. (…) Attempts to create artificial agents that are "embodied and embedded" seem to lead to an endless stipulation of the conditions of possibility for perception and action, bodies and environments. (2007, 230-231)

For Suchman, in robotics the body becomes important to the extent that it can not only help with achieving cognition, but also act as a receiver of external stimuli. Body and mind are thus naturalized, making embodiment all the more complicated for AI. In the end, she explains, there would be too many requirements to define embodiment and how artificial agents can become embodied entities.

Embodiment is nevertheless still present in robotics, and often taken at face value, reduced to the idea of physical materiality, either real or digital (see for instance Bailenson et al. 2005, Paauwe et al. 2015). Reading Descola (2005)'s take on naturalism, I question his idea of the computer as a "pure brain" by referring to the computer's embodiment in a robot form. Descola's take on naturalism argues that the computer lacks a bodily incarnation for it to be truly considered a being. What can be said, then, of a robot, which is an embodied computer? If embodiment in phenomenology is mostly about the body and physical embeddedness, and if, for humans, there can be no distinction between mind and body, then can there be one for robots?

The robot is in fact an assemblage between computation—a form of cognition (Hutchins 1995)—and its incarnation in a physical form. This assemblage works in a cycle whereby computation controls the body, in which many sensors and cameras, in turn, inform and control the robot's computation. Users can control a robot through its physical incarnation. As such, I argue that, not only is the robot not a "pure brain", but that there is no distinction to be made between its computation and bodily incarnation. Although Suchman is right in saying that robots can only react to certain anticipated, limited stimuli, so does the human, to some extent; and even Descola argued that there is a continuity of physicalities between humans and nonhumans in naturalism. Robotic perception, as far as I know, is about making sense of the world before analyzing it, as van Wolputte (2004) argued. In nursing homes, robots receive all kinds of stimuli, vocal and tactile, as explained earlier. Robots have to perceive them through various physical, bodily means, before being able to analyze them and respond appropriately. SoftBank gave Pepper a humanoid body so that it could perceive through this physicality similar things that human beings perceive, react to similar stimuli, as well as be able to produce stimuli that human beings can perceive too. As such, the robot can be seen as embodied.

It is clear by now, then, that the body is a crucial aspect of embodiment. Paul Dourish, a scholar working at the intersection of computer science and social science, and an expert on HCI, further elaborates upon this idea:

> "Embodiment" does not simply mean "physical manifestation." Rather, it means being grounded in everyday, mundane experience. (…) embodiment is a foundational property, out of which meaning, theory, and action arise. They all place the source of action and meaning in the world. Embodiment is a participative status, a way of being, rather than a physical property. (Dourish 2001, 125)

Here, Dourish explains that embodiment is not only about the body. For him it also encompasses the idea of being *situated,* of being in a particular environment and in particular circumstances. The robot is constructed as a nonhuman, used as both a tool and a companion. Because it is used and constructed as a social entity (see chapter 5), the robot is made to participate in everyday activities in Fubright and in nursing homes. But why is embodiment a crucial subject when talking about interactions? Dourish underlines three main reasons:

> First, the designers of interactive systems have increasingly come to understand that interaction is intimately connected with the settings in which it occurs. (…) Second, this focus on settings reflects a more general turn to consider work activities and artifacts in concrete terms rather than abstract ones. Instead of developing abstract accounts of mythical users, HCI[75] increasingly employs field studies and observational techniques to stage "encounters" with real users, in real settings, doing real work. (…) Third, there is a recognition that, through their direct embodiment in the world we occupy, the artifacts of daily interaction can play many different roles. (2001, 19-20)

Dourish calls "tangible computing" computers with which you can have a more direct interaction, in a way that completely bypasses interaction with a traditional computer. Tangible computing refers to interactions with an embodied, artificial nonhuman—here the robot. The robot can also be seen as a part of "social computing", as it "(…) involves incorporating social understandings into the design of interaction itself" (2001, 16). It is because of the robot's materiality and its affordances that make it relatively social that people know how to interact with it. It is also because affordances are contextual that they become artifacts with which people can interact: in a nursing home, a social robot does not have many more uses than to act as an interlocutor.

Furthermore, in the spaces where I conducted my research, users were clearly attuned to the materiality of the robot. Pepper's design was done in a specific way so that it generates feelings of sympathy for the robot, and even of a sense of closeness. The "social understandings" that Dourish mentions above refer to exactly that: the kind of social relation that SoftBank is trying to implement between its robots and users, through design. The embodiment of the robot as a petite, adorable, and seemingly frail being make it an entity that users come to care about when it has been absent for a long period or when there are potential risks to its physical integrity, like water. The robot's embodiment also made it possible for users to interact with it through touch.

6.2.2 Intersubjectivity

While some scholars have attempted to define what they mean by interaction, evoking everything from verbal to non-verbal communication and bodily reactions as well as emotional states and so on (Brayda and Chellali 2012), interaction is a concept often taken for granted in the literature on robotics (see for instance Taggart, Turkle, and Kidd 2005, Leite, Martinho, and Paiva 2013). Interaction is often simply assimilated to speech and non-verbal communication. However,

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scholars in other disciplines have argued for a more nuanced definition. Kaptelinin and Nardi (2006, 32), for instance, explain that "the meaning of the word 'interaction' (…) when referring to activities can be described as 'acting-in-the-world'". Suchman sees interaction as "(…) a name for the ongoing, contingent coproduction of a shared sociomaterial world. Interactivity as engaged participation with others cannot be stipulated in advance but requires an autobiography, a presence, and a projected future" (2007, 23). Suchman acknowledges however that her use of "interaction" is "(…) in the common sense assigned to it by social science: namely, to mean communication between persons" (2007, 34). Kolko, a scholar in interaction design, defines "interaction" as "(…) the semantic connections that live between technology and from which are brought to life when someone uses a product. These connections may be thought of as 'interactions' or 'experiences' (…)" (2007, 5). Kolko shows how language can be a part of interaction, but for him, interaction is certainly not only language. As such, there is much more to interaction than speech. In fact, discourse can even be seen as an "interactional achievement" (Schegloff 1982). It is when interaction is successful that there can be a production of discourse.

When looking at HCI, Dourish is careful to emphasize the embodiment in interaction, something often left implicit (see above), and describes an "(…) interaction with computer systems that occupy our world, a world of physical and social reality, and that exploit this fact in how they interact with us" (2001, 3). For him, in HCI, "Embodied Interaction is the creation, manipulation, and sharing of meaning through engaged interaction with artifacts" (2001, 126). But more precisely, what constitutes interaction between human and machines? To sum up briefly the positions presented here, interaction can be thought of as conveying meaning (often through language or speech, but not exclusively) through our engagement with others to coproduce the world around us. Until now, I used the common understanding of interaction to describe the way people *act towards* robots. However, can that be understood as an interaction?

There are, however, problems with the definition of interaction. First, what is its meaning? Can meaning be exchanged and understood between the various parties involved in an interaction? For Dourish (2001), meaning is constituted by ontology, intentionality, and intersubjectivity. "Ontology is an aspect of meaning in the sense that it provides the structure from which meaning can be constructed" (Dourish 2001, 129)[76]. Meaning is exchanged via intersubjectivity, and intentionality refers to the way concepts and objects are linked. According to Dourish's understanding of phenomenology, meaning can exist independently of humans inhabiting the world, but then Dourish seems to contradict himself when explaining later on that meaning can be created. While the concept of intentionality seems interesting, in Dourish's model it is hardly applicable or usable in the study at hand. For Dourish, intentionality is about how a concept and the object it refers to are linked. It is useful when designing (interactive) systems but not so much in the case of social robots. The final concept, intersubjectivity, overlaps with Suchman's mutual intelligibility (2007) (see below). As such, Dourish's framework is powerful when applied to design (which is what Dourish does), but much less in the case of interactions where the system that humans interact with is an embodied, humanlike computer that responds to vocal and haptic interactions. The robot's ambiguous ontologies shape the type of meaning that can be exchanged, and intersubjectivity is the condition that allows meaning to be exchanged and understood, but intentionality as understood here—in other words not as the will to do something, but rather as the link between concept and object—is too abstract and disconnected from what unfolds during an interaction with humans. As such, I move away from Dourish's concept of meaning, though I recognize the usefulness of thinking about ontology and intersubjectivity as informing meaning. Streeck (2015) provides an alternative approach that I adopt: "(…) rather than the encoded content of an individual mind, meaning is a relationship between form and context, with context as an ongoing product of sequential and complementary action" (420). I would also like to briefly pause here and underline that "(…) semiotic phenomena constitute only parts of processes of embodied communication (…)" (Streeck 2015, 432).

If interaction is the exchange of meaning through one's engagement with others, then what is this engagement with others and how does it come to be? In the phenomenological tradition, intersubjectivity refers to the "the existential organization, recognition, and constitution of relations between subjects" (Desjarlais and Throop 2011, 88). In a review on phenomenology, van Wolputte (2004) shows how in the literature, embodiment and intersubjectivity can be linked, embodiment being a precondition for intersubjectivity (Weiss 2013). "In this view, intersubjectivity is, first, not a product or an effect of communication but a condition for its

[76] I reviewed the literature on ontology, especially in the case of the robot, in chapter 5, and will not go into more details in this chapter.

possibility" (Duranti 2010, 24). Furthermore, nothing seems to prevent robots from being subjective beings: Jackson explains that "(…) human beings everywhere tend to conceive of subjectivity not only as encompassing others but as extending into the extra-human world, with the result that objects, words, and ideas tend to become imbued with consciousness and will" (2002, 334-335). If that is indeed the case, then it is possible to have intersubjectivity with the social robot, an embodied, subjective being.

Duranti (2010), going back to Husserl's vision of phenomenology, highlights three more aspects related to intersubjectivity which he believes are worth re-examining in anthropology: intersubjectivity as the possibility of exchanging place with another, to see the world as the other would see it; intersubjectivity as the basis for objectivity, in which understanding the other through participating in their actions allows us to better perceive the world; and intersubjectivity as more than shared understanding and that relates to the aforementioned possibility of exchanging places. Dourish, however, like many others before him (see for instance Tomasello and Carpenter 2007), uses the term to describe a mutual understanding. He defines intersubjectivity as "(…) how two people can come to share an understanding about the world and about each other despite the fact that they have no immediate access to each other's mental states" (2001, 131). Here, Dourish thinks about the designer and the user through the use of technology. Though she does not call it intersubjectivity, Suchman (2007) also looks at mutual understanding and proposes to take a look at if, how, and to what extent mutual intelligibility is achieved between a machine and its user. Although she focuses on situated actions and the plans that inform these actions in order to describe how people use photocopiers, she provides very useful insight about how humans perceive the computers they use:

> The overall behavior of the computer is not describable, that is to say, with reference to any of the simple local events that it comprises; it is precisely the behavior of a myriad of those events in combination that constitutes the overall machine. To refer to the behavior of the machine, then, one must speak of "its" functionality. And once reified as an entity, the inclination to ascribe actions to the entity rather than to the parts is irresistible. At the same time, precisely because the mechanism is in fact unknown, and, insofar as under specification is taken to be characteristic of human beings (as evidenced by the fact that we are inclined to view something that is fully specified as less than human), the personification of the machine is reinforced by the ways in which its inner workings are a mystery, and its behavior at times surprises us. Insofar as the machine is somewhat predictable, in sum, and yet is also both internally opaque and liable to unanticipated behavior, we are more likely to view ourselves as engaged in interaction

> with it than as just performing operations on it or using it as a tool to perform operations upon the world (…) (Suchman 2007, 42)

When the robot is used as a tool, it is easily understood by its users. The robot answers to various commands, either tactile or vocal, but there are not many, and the skills they control are limited too. As such, to users, there is no doubt that the robot's behavior is indeed predictable ("if I tell the robot to dance, the robot is going to dance"), but opaque and sometimes seemingly random ("I told it to dance, why doesn't it dance?"). Furthermore, I argued earlier that their robotic bodies are affordances that inform the perception of the robot as an entity. Because their appearance is humanlike, robots and their behaviors are taken having the characteristic of human beings. As such, one can analyze and make relative sense of their actions.

It is precisely because the robot does not always act perfectly, and thus looks autonomous through their sometimes seemingly random behavior, that the ascription of intentionality to robots becomes much easier for its users. In nursing homes, users lack knowledge about newer technologies, and especially computers and robots, making them rely on a humanlike framework to analyze the robot's behaviors. Suchman explains:

> (…) it is in part our inability to see inside each other's heads, or our mutual opacity, that makes intentional explanations so powerful in the interpretation of human action. So it is in part the internal complexity and opacity of the computer that invites an intentional stance. This is the case not only because users lack technical knowledge of the computer's internal workings but also because, even for those who possess such knowledge, there is an "irreducibility" to the computer as an object that is unique among human artifacts (…) (Suchman 2007, 42)

In fact, Suchman explains, "as soon as computational artifacts demonstrate some evidence of recognizably human abilities, we are inclined to endow them with the rest" (2007, 41). Owens (2007) introduces yet another way of thinking about human-nonhuman encounters through the concept of "doing mind", although it is not the projection of humanlike mental abilities that Suchman is alluding to. Owens questions what makes "non-biological objects" actors, and comes to the conclusion that during certain interactions

> (…) the minded actor performs a type of symbolic ventriloquism through giving voice. (…) When I give voice to an object, I engage in a two-part intertwined process of construction and forgetting. Not only must I provide an interpretation of action as being motivated and directive, I must then react to the motivated and determined other that I

> have constructed. In doing so I must take the position that this other exists and acts independently of myself. (Owens 2007, 577)

I believe that the attribution of intentionality and the process of doing mind are made possible through the materiality and embodiment of the robot, especially because it is embodied in a humanlike form.

As such, one can argue that there is, in fact, intersubjectivity with a robot. Because androids look somewhat similar to humans, they are endowed with humanlike characteristics, such as being autonomous, that blur the distinction between machine and humans, making mutual intelligibility and intersubjectivity with a robot much easier. Jackson aptly argued that

> To speak of intersubjectivity is to recognize that objects appear sometimes to be animated by human consciousness and will, and human subjects appear sometimes to be like objects, treated as if they were mere things. It is also to abandon attempts to draw a hard-and-fast ontological distinction between subjective and objective domains, for experience is continually oscillating between quite various senses of self and other depending on the context and character of the interaction. (2002, 341)

However, although it is quite cynical, I do not believe that the actual presence of intersubjectivity or shared understanding is crucial here. Rather, the appearance of it, or even "doing mind", is what matters. While I can argue that the robot is a social being with some type of cognition and that mutual intelligibility and intersubjectivity can be achieved through the robot's embodiment, the fact remains that most users who *act towards* a robot do not have access to most of this framework. They can only rely on what they perceive, think, and feel. Therefore, I argue that to understand if there is really an interaction when people *act towards* robots, the appearance of intersubjectivity is all that matters. Intersubjectivity could even be in fact a by-product, as the impression of understanding the other participant may be a result of an interaction. As argued earlier in chapter 5, by default individuals refer to a human-to-human interactive framework to make sense of the robot's actions when the robot is used as a companion. When used as a tool, users are usually familiar with the interfaces applied to the robot. As such, it is quite simple for users to believe they understand the robot's behavior. And as a result, there is the appearance of intersubjectivity.

6.3 Conclusion

While robots like Pepper, Palro, and Robohon are often called "communication robots" in Japan, what became obvious however, both in the fieldwork and the analysis of data, is that communication as a verbal exchange is severely limited, if not impossible. Verbal exchanges reveal that little meaning is shared between robots and humans, and that the engagement with one another is superficial at best, oriented towards the exchange of limited information or words of control. Touch, on the other hand, occurred much more rarely, but is all the more significant. Touch can be interpreted as an interaction between human and robots, filled with emotional significance. Touch, and I believe it is the case here for multimodal interaction with a robot in general, fulfilled three functions. Touch as discovery informed users about the robot's various ontologies, touch as control allowed users to manipulate and handle the robot, to use it as a tool, while touch as the expression of affect let users express their various feelings about the robot and the interaction.

However, this typology only describes what happens for the user during the interaction, or how the user *acts towards* the robot, and casts aside the *acting from* the robot. There are two reasons for that. One is that most often (except in some cases of control) during the interaction, the *acting towards* the robot does not require *acting from* the robot. It is a kind of selfish act one does for oneself. The other is that *acting from* the robot is still quite poor and does not reveal much about what is happening for the robot. As such, I question whether the *acting towards* the robot, what I mostly called "interaction" until this chapter, can be, in fact, understood as interaction. Interaction can be defined as comprised of the exchange of meaning between embodied entities that share intersubjectivity. Meaning can be exchanged, sometimes; the robot can be understood as embodied; but if the user believes that there is intersubjectivity, then *acting towards* can be interaction. Users do not have access to the framework I described earlier, and as such I believe that the appearance of intersubjectivity is all that matters. In fact, intersubjectivity could even arise from the interaction, and be one of its by-products.

Conclusion

In this thesis, I have described and analyzed the genealogy and uses of a social robot, Pepper, as well as the negotiations it fosters in Fubright Communications and two Japanese nursing homes. Pepper is a social robot, first thought of as a potential companion, before being marketed as a solution for various businesses by SoftBank, its creator. Pepper was made to be loved, its design influencing users to find it endearing, cute, and lovable. Fubright Communications, a third-party company, decided to invest in this robot. They saw it as an opportunity to develop applications for healthcare and get into the market of eldercare in particular. Pepper thus represents an opportunity for Fubright Communications, a tool with which to work and obtain potential business. While this vision of Pepper as a tool is widespread in the company, developers, as users, are influenced by the characterization of Pepper. They miss Pepper when it is absent, and have feelings of protectiveness, of affection, even, towards the robot. This double vision of the social robot as both a tool and a companion can also be found in the nursing homes in which it is used. When nursing homes use the applications developed by Fubright for Pepper, they use the robot to foster good health in the elderly. It is goal-oriented, and as such Pepper is here again little more than a tool. When nursing homes use social robots (including two others, Palro and Robohon) to mitigate a lack of interaction in their residents however, the robot is now again perceived as a potential companion. Something to note is that the use of the robot as a companion or a tool is not clear cut between categories of individuals who have different levels of familiarity with the robot. In fact, understanding or not understanding the technical aspects of robots does not seem to influence how individuals perceive and use the robot.

The robot as a nonhuman is a single, delimited artifact used by both experts and non-experts. They interact with the robot in social ways. Drawing on various theoretical inspirations, I thus decided to conceptualize the artifact robot as a nonhuman. This theorization allowed me to study its ontological status. I argued that individuals perceive the robot as having both human and artificial qualities. Rather than arguing for a new type of ontological categories, I find it more meaningful to understand the ontological confusion that it creates in users. They do know and understand that the robot is a machine, but because of the robot's ontological ambiguity, it is in fact not only a machine, but something different, something more. Ontological confusion thereby fosters affective interactions with social robots. The robot is also conceptualized as a social actor, an artifact that one can interact with, because of its design as humanlike. As a humanlike artifact, the robot affords individuals to perceive it as social through anthropomorphism, and encourages users to engage with it in social ways. The robot's affordances also influence the types of interactions possible. Although the robot was also conceived as being able to express emotions, the question whether the robot is a cognitive being and these emotions can be perceived as genuine is up for debate. Arguments on cognitive heterogeneity support the perception of computation as a type of cognition, but for now there does not seem to be more to the expression of emotions in the social robots I studied than a pure emotional expression lacking any inner correspondence.

Turning to how users interact with robots, I decided to put aside vocal interaction for the most part, as it is extremely constrained by the robot's physical limitations. I decided to focus on touch, that, although uncommon, revealed meaningful to classify three functions that interaction with a robot fulfills. The first is interaction as discovery. Users try to understand what the robot is and the extent of its abilities. They touch the robot to better understand its materiality and ask it questions. The second function that interaction with a social robot fulfils is control. It is closely linked to the perception of the robot as a tool. Users manipulate the robot, handle it. Their use is goal-oriented and they can achieve it with or through the robot (in the case where their goal is to code an application for the robot, for instance). Affective interaction is the expression of an emotional state. People touch the robot and express various feelings, directed towards the robot or not. They compliment the robot and comment on its actions or design. Because this description however only concerns ways people act towards robot, meaning that the way they act does not necessarily need the robot to even be turned on and responsive, I question whether this can actually be understood as an interaction. I thus define interaction as the exchange of meaning between two engaged and embodied participants. Although meaning is sometimes made available to the robot, and the robot can be understood as embodied, I question whether intersubjectivity is really necessary. I conclude by explaining that for the user, who does not necessarily have access to this framework for interaction, the appearance of intersubjectivity is enough. Because again, most people refer to a human-to-human interaction framework when it comes to making sense of the robot's actions, and because the robot indeed does react that way, I believe that people think they can understand robot. When the robot is used as a tool, most people now are familiar with the interfaces deployed on the robot. As such, there is indeed a presence of intersubjectivity.

This study has various limitations. I had to include other social robots than Pepper because the second nursing home I was conducting my fieldwork at did not have a Pepper. Although I have seen similarities between the robots and their use, and therefore decided to talk about the social robot at a single entity, the fact remains that Palro, Pepper, and Robohon are different. I believe that the difference of size greatly influences their use but also their perception. Robohon is often associated with toys for instance. Furthermore, it is difficult to distinguish whether individuals in nursing homes wanted to interact with robots, or with me, as I was constantly mediating the use of Palro and Robohon. Doing recreation sessions was also a way to get away from the usual everyday life in these facilities, and as such more people may have seemed interested whereas in fact, few actually wanted to really engage with the robots.

One thing lacking from this thesis is the opinion of caregivers who had a negative perception of robots. Either the participants I interrogated were not totally honest with me, or the ones who accepted to participate in this all had neutral to positive visions of social robots in a care environment. The reason why it is important to include caregivers is that care work is a traditionally female, underpaid, devalued, and precarious position. Although the use of robots is seen as a way to mitigate a lack of social interactions for the elderly, and framed as a way to help caregivers accomplish more tasks, I wonder whether the use of social robots participate in the devaluation of care. Some of the caregiver's tasks are indeed seen as being potentially carried out by robots (entertainment, conversation), thus not needing human experience. This thesis also lacks a similar counterpoint to the use of robots from the nursing homes' residents. While for ethical reasons I only observed individuals who were interested in social robots, some did disagree to participate in activities involving one. Similar to caregiving as being devaluated, envisioning the use of social robots for the elderly could underline a perception of aging in a negative light, relegating the elderly to being cared for not by humans, but machines.

It would also be interesting to trace what makes the use of robots in nursing homes possible. Various policies and researches implemented by the Japanese government push towards the use of robots in care settings, but that is not the case everywhere. Furthermore, the nursing homes themselves had very different ways of implementing social robots, a director seeming more eager than the other for their integration. Thus, not only robots have to be present in nursing homes, but to be used they also need implementation policies, and caregivers need to be trained. As mentioned earlier, in Hiyoshi, few caregivers only knew how to operate them, and I was unsure whether the robot's use would be discontinued after I left.

On a personal side, I wanted to take a closer look at affect, and how it plays in how people interact with robots and the relationships they have with them. Furthermore, care was one of my main subjects of interest going in my fieldwork, and I regret not having been able to, in the end, make it the focus of my thesis. Thinking about the literature on care, I am tempted to analyze the relation between users and some robots as a care relationship. Individuals act as the caregiver, while the robot as the role of the patient. Looking at the robot's materiality, it is apparent that it is fragile and in need to be taken care of, but individuals do attune to robots as well when their behavior make them seem in need of interaction or attention. Going forward, how robotics relate to relational work, affect and care, and fragility, is an area I would very much like to explore.

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