

Hospital Beds, Robot Priests and Huggables:

A (Fictional) Review of Commercially Available Care Robots

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ABSTRACT

Taking a current critique of predominant visions of care robotics about 20 years into the future, in this paper, we imagine a world in which robotic technologies have become the predominant mode of care and outline how this came to be. Based on ethnographic experience in care homes and knowledge of robotics, we have developed fictional robots for possible future care scenarios. We describe six facets of caregiving that are rarely discussed in the current discourse about robots: recovery & rehabilitation, death & palliative care, bereavement & remembrance, growth & development, transcendent experiences and intimacy & sexuality. By doing so, we pose the question if and how we could integrate them into our view on technology in care. This fictional review highlights blind spots of current endeavors and thereby this paper contributes new directions for research and design.

CCS CONCEPTS

• Human-centered computing; • Human computer interaction (HCI); • HCI design and evaluation methods;

KEYWORDS

Design Fiction, fictional papers, speculative design, critical design, care robots, elderly care, death, sexuality, old age, future technologies, scenarios, visions

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1 INTRODUCTION

Care robots have attracted a lot of interest in the HCI community and beyond as they offer the promise to overcome some of the pressures of this domain. But the tasks robots take on currently only represent a small number of tasks that arise in or could be seen as care. Within this paper we go beyond the technical functionalities of what is currently possible and imagine future tasks for robots in care. Through this speculative work we pose the question of whether we could and should extend our understanding of what care entails and how technology is situated in this area.

The study presented in this paper is a work of design fiction, up to the discussion. It is a study we have not been able to do as the robots we describe do not (yet) exist. We have turned to design fiction in the shape of a fictional research paper to illustrate shortcomings in the current discourse that surrounds robots and robotic systems employed in care. We critique that current discourses ignore tabooed topics such as sexuality, personal development and death. These might not only have a strong impact on the realities of caregivers and elderly people, but also might influence how well the technologies fit into the everyday of the people they are built for. The discourse about technology development for elderly people further often portrays ageing as a sign of loss and illness with very limited space for dreams, growth and development (see e.g. [57]). With some of the robots on this paper we ask what technology might be able to do in elderly care.

Inspired by other imaginary abstracts (e.g. [6, 42]) or even research papers [31, 32, 44], we present here a vision of a potential future of robotic systems in caregiving. Through the body of the paper we create a story world [6] in which a wider variety of robots than we currently have are coming to be. We present and analyse fictional videos of robots with a wide range of relations and functions. As a fictional result of the analysis, we have clustered the robots into six facets, representing facets of care work that are rarely considered but which are nevertheless important to care work. In the discussion we outline how these relate to current robots and what lessons can be learned from this. This paper can be used in two ways: First, it can be used as a means for the reader to question their own assumptions about care and the role technology can play in it. We hope that this paper can inspire new areas for design and the (re-)framing of studies. While the focus here is on robots, the different areas could easily be extended to other assistive technologies – future ones as well as those that already exist. Second, we

propose this paper as a ‘prop’ for discussion with others, e.g. in focus groups. We see this paper as a starting point, an invitation for others in the field to highlight further points that they would see debated in the general public and/or future research.

This work has been developed in the ReThiCare, a multi-disciplinary project on the development of robots in professional care. The facets of care presented below are inspired by extensive ethnographic work in an elderly care home. They were developed through discussions within the research team, contrasting the reality of care work in professional care institutions with what is available now and what is currently discussed in the academic literature. We have projected current developments about twenty years into the future. All robots in the videos that we cite – as indeed all videos – exist only in our imagination and now here on paper. Nevertheless, all papers we cite, such as the work by Su et al. [51] on the classification of robots exist now, as do the technologies we present as predecessors to the robots we introduce. Building on existing technologies and research, we developed this fictional review to highlight “blind spots” in the current discourse about robotics in care.

The paper is structured as follows: We first present design fiction and its use in fictional abstracts and papers as a method, before presenting the fiction itself, which covers the introduction, background and findings section of our fictional study about 20 years in the future. Finally, in the discussion we return to the current time again and place the findings of our fictional study in relation to the current situation.

2 BACKGROUND

In this paper we present a fictional study on care robots that might be available 20 years in the future. Fictional abstracts [3, 5, 41] and even fictional research papers [20, 30] have become a method in the HCI tool box in recent years. Building on the concept of design fiction, fictional research papers describe prototypes that have not (yet) been build [44] or studies that have not been done (yet). This approach is often placed in the larger field of critical and speculative design (see e.g. [2, 17, 35]). Even though design fictions are often based in the future, they are grounded in the present and aim to make a comment about the present [21]. Our decision to write a fictional paper was two-fold: First, we drew on work by Wong et al. [58] and aimed to find a type of presentation that would be suitable to the community in which we want to elicit debate. As the critique inherent in our paper addresses the current discourse around robots rather than their technical development, we considered it useful for and applicable to the HCI audience. Second, and in combination with this, we drew on Lyckvi et al.’s [34] work with industrial partners in which the use of design fictions created a common ground as well as safe space to address critiques. We chose this format as a means to present our critique because of the ability of design fiction to build worlds [14].

The world we developed is outlined in sections 3.1 and 3.2, the introduction and background to our fictional study. By extrapolating trends and speculating, we outline how the robots came to be predominately used in care. We acknowledge changes beyond the technical development, such as climate change. These sections are

not only setting the scene, but also create a world in which the technologies we present could plausibly exist. Developing this world and populating it with robots, has forced us to present alternatives, rather than just critiquing current practices. The intention of this fiction is not to critique any robotic system in particular, but rather to address the field as a whole. With this work, we suggested a variety of paradigms of care, thereby highlighting the limited view of what care robots are currently set up to do.

With the robots presented in the review we address two shortcomings of the current discourse on technology and ageing: the lack of engagement with taboo topics and the predominant view of designers and engineers on ageing as a solely negative aspect of human life [24]. We developed this fictional paper on the understanding that technologies used on care to “some extend shape care” [39]. But, the tasks that robots are tasked with only cover a short window of human activities. Current reviews, such as Su et al. [51] show that robots in care are predominately tasked with maintenance tasks, such as running errands or are suggested as companions. While useful, these robots thereby embody certain aspects of care work. Through our ethnographic work, we extended our view of what care entails and therefore extended on the existing robots to illustrate other aspects of care work and the role technology might play here. These include sexuality and death, two aspects of life that are often tabooed, which nonetheless play a part in the life reality of both caregivers and elderly people receiving care. Another factor that shapes the development of technologies for elderly care are expectations about the activities that elderly people want, aspire to and the support they need to achieve them. This is often rather limiting (see e.g. [43]) and frames ageing as a time of loss and illness. While taking care of the body is a large part of what care work does, we pose the question here of what other aspects of care giving could be done or supported by machines. We re-conceptualize caregiving as nurturing and consider ageing as a place for growth and development. While these robots we present here are to a large extend not yet technically feasible, our critique goes beyond this and asks whether or not these six facets of care are taken into account in technology development – and whether they should be. The robots we present in the coming sections are not a wish list of technologies we are interested in, but a prop to make the underlying aspects debatable.

3 THE FICTION

3.1 Introduction

While long considered a basic human prerogative, caregiving, especially supporting elderly residents, has been taken over by automated and robotic systems (further referred to as care robots for simplification). From the humble beginnings of “Pepper” [66], “Paro” [67] & “Robear” [23], whose tasks were mainly to connect to and entertain elderly people, as well as supporting care staff with everyday activities, the tasks undertaken by robots have diversified and extended. This development has been lauded widely and the critical engagement of the early days of care robot is less prominent nowadays. As the adaptation of robots in everyday activities has mainly been successful, many of the fears of the early days have been alleviated (see e.g. [26] for a humorous take on the subject). Concerns that robots might become sentient – as predicted by many

science fiction movies thirty (i.e. “i-Robot”) or twenty years ago (i.e. “Her”) – have been calmed. This not only happened through the predominance of robots, but also through their diversification, which led to an alternative view of them as specialist tools rather than humanoid beings. Concerns that the use of care robots might lead to dehumanised care as expressed by Sparrow [50], have also been calmed through this novel understanding. The shifts in environmental and societal factors that led to their increased use, made the argument redundant that they might lead to a decrease in jobs (see e.g. [48]). Nonetheless, not all is well. While these narratives have been proven wrong, the way robots are developed might still be biased and driven by simplified concepts of care work as observed for example by [55].

In this paper we share the results of a review of videos showing commercially made care robots. We have chosen to use all videos, including commercials because they contribute decisively to the formation of opinion in society. They also serve the function of a source of information for the general population, but in reverse they can shift or even steer the opinion in a certain direction. Using transcripts and image analysis we provide a critical reading of the tasks that current care robots are meant to undertake. We further classify these tasks into categories to explore which aspects of care they embody. We developed this work in a spirit similar to Lucy Suchman’s article on robot advertisements [52], in which she analyses implicit assumptions about social configurations that render the use of the robot Jibo. She discovered new avenues for exploration, design and development. Through our review we contribute a categorization of care robots that offers a useful vocabulary to describe care robotic systems. We further engage critically with the literature and outline directions for further research and development that will enhance future care systems.

3.2 Background

Through technological advances, life expectancies are on the rise in the last decades. As a result, in many countries in the Western world the number of elderly people over 60 has outnumbered children under 5 as predicted by the World Health Organization (WHO) [68]. Robotic systems were introduced to overcome the bottlenecks in care that developed both through overpopulation in areas of mild climate and scattered population in areas with extreme weather events as a result of climate change. In addition, they have proven useful tools in times and places in which the temperature exceeded human comfort levels for work and working conditions conflicted with workers’ rights. Elderly care does include many physically demanding tasks [45, 60], such as lifting in many instances; changing bedding, washing or helping someone onto the toilet. Through the rise in temperatures and the resulting fatigue these tasks became too straining for many human caregivers during the mid 2020’s, as most care homes were not originally built for such hot summers. Most care homes were more easily able to pool resources to acquire technologies than individuals could do in home care, which led to a wider distribution of institutional robots in care homes. The ageing-in-place discourse that had led technological development for a long time (see for example [24]) therefore was taken over by an increase in robotic systems for care homes and shared living arrangements that we focus on here. This rise in acceptance of

robots in care is most likely due to a shift in the understanding of their role not as caregivers, but as tools – may it be smart tools – in the provision of care. Early-day robots like Ryan [65] were meant to be all-rounders, combining many functions and thereby mimicking care provision by humans. In contrast, currently deployed second generation care robots are highly specialised. The initial fear that an increased use of robots would lead to a replacement of skilled workers could not be confirmed. Through their wide acceptance after initial hesitation, the cost of formal caregiving has dropped over the last decade, allowing more people to move into care homes and live their later lives in dignity and with the comfort offered by these facilities.

The literature on novel robots is relatively sparse as development has been mainly technology-driven and led by commercial suppliers who could respond to societal changes quickly. Even though robots are part of most caregiving tasks, the number of companies that specialise in the development and distribution of robotic systems for care has decreased through market forces. With the exception of small suppliers that specialise in localised solutions and several start-ups that still have to establish themselves on the market, three major players can be identified: “Morro B.AI” have a portfolio of 23 robots, some of which offer adaptations or means for customisation. Starting off with AI products that took on the role of companions, their focus shifted into embodied systems and robots, supported by the merger with MS Robotics. “Care Central” only offers two robots, but as the sole suppliers of robotics that help with recovery and rehabilitation, have reached a market share of 23 % in the last year. The third supplier, “EcoCare” recently increased their range. In contrast to Morro B.AI, they offer no customisations and more basic, but specialised products.

Considering the limited number of suppliers in the market, we set out to explore the current narratives around robots currently in use to learn whether the range is biased towards certain tasks or user groups. To learn how the current discourse around robots in care is led, we undertook a review of videos, including both commercially led and amateur videos. This covers videos in which the robots are introduced or explicitly advertised, tutorial about their use as well as a number of customers reviews. In the next section we describe how we selected the videos and what our corpus entailed.

3.3 Method

For this work we took inspiration from Su et al. [51] and undertook a review of commercial (advertising) videos presenting the robots in the public domain.

We turned to the two major platforms YouTube and NetPrime Videos and searched for the terms “care robot + elderly”, “care robot + ageing”, “robotic care + elderly”, “automated care home” and “elderly + care home automation”, “robot + residential care”, “robot + residential home” and other variations. Through this initial review we identified 71 individual videos. The first researcher reviewed these individually to identify whether they related to care robots and whether they described functioning and commercially available robots. Not all videos used were made by suppliers, some were also reviews or other types of videos uploaded by users or other amateurs. In this process, we excluded 23 videos that described care in

Table 1: An overview of the videos we reviewed, the robot they showed and the category we classified them into

V#	Robot	Category	V#	Robot	Category
V1	XSphere	Bereavement & Remembrance	V17	Soulmate I	Transcendence
V2	ConfBuddy	Growth & Development	V18	Train	Recovery & Rehabilitation
V3*	Priestbot	Transcendence	V19	Soulmate II	Transcendence
V4	Immo	Growth & Development	V20	RC10X	Recovery & Rehabilitation
V5	Perfecti	Recovery & Rehabilitation	V21	RoBed	Recovery & Rehabilitation
V6	CC2048002	Recovery & Rehabilitation	V22	GreenDeal	Transcendence
V7*	XXSilver	Intimacy & Sexuality	V23*	Huggy	Bereavement & Remembrance
V8	Nanny Cam 3000	Growth & Development	V24	TalkneF	Growth & Development
V9	Priestbot	Transcendence	V25*	ToyBot++	Intimacy & Sexuality
V10	RecBuddy	Recovery & Rehabilitation	V26	Huggy	Bereavement & Remembrance
V11	ApoFit	Recovery & Rehabilitation	V27*	Nanny Cam 3000	Growth & Development
V12	RecCo	Recovery & Rehabilitation	V28	Priestbot	Transcendence
V13*	TalkneF	Growth & Development	V29*	Soulmate II	Transcendence
V14	XSphere	Bereavement & Remembrance	V30	XXSilver	Intimacy & Sexuality
V15	ReCo, Model M	Recovery & Rehabilitation	V31*	GreenDeal	Transcendence
V16*	Immo	Growth & Development			

other contexts, i.e. care of children or people living with disabilities or chronic health conditions, regardless of age. We further excluded eight videos that described care for plants (see e.g. [56, 62], or pets [10]). While we included videos of sex robots if they mentioned a care aspect of interaction, we removed four which did not actually show robots, but rather pornographic material in which actors were dressed as robots. We further removed five videos of robots not yet commercially available. This left 31 videos for analysis.

We first transcribed the audio material of each video which formed the basis for our analysis. In addition, we took screenshots from videos if they showed the robot ‘in action’ which allowed us to contrast and compare functionalities and the way they were embodied by the robot. We coded the setting, i.e. the picture content, music, narrative and other visual elements, such as the display of users, of the videos in terms of their symbolic content to understand how the use of the robot is framed. Due to copyright restrictions we are not able to show screenshots here, but we have added descriptions of key scenes where applicable. We were further able to secure additional advertising material; such as catalogues from some of the major companies which further enriched our data.

Table 1 shows a list of all videos, the robots shown and which category we placed them into. Videos with * are not cited in the paper.

3.4 Six Facets of Care Embodied by Care Robots

Through the review process and the analytical work, we identified six facets of care that are embodied by the robots which are currently deployed. Within this section we describe each point in depth and illustrate it through examples from the videos. We first present facets that deal with the negative aspects of caregiving, such as illness and death, before presenting those that frame later life as an opportunity for growth, development and a rich life. Compared to the robots for care contexts, that were discussed in the 2020s, a shift can be seen from anthropomorphic robots to machines that are integrated into the environment, greatly extending the range of

what robots can do. While the focus of what is possible – ethically as well as technically – has shifted, we still observe some common themes in the way ageing is addressed through technology, e.g. the medicalisation of activities.

3.4.1 Recovery & Rehabilitation. A range of robots are situated at the intersection between health and care: recovery and rehabilitation. The results build on technical advances of the early 2000s, such as bandages for rehabilitation [1] or chronic wounds [38]. But while initially developed to support caregivers in the physically demanding tasks, the combination into whole robotic systems brought with them additional functions as we outline below. These led to a wide acceptance of these systems. Robots developed for this field focus mainly on regaining physical abilities and improving overall health, i.e. monitoring the state of health and guiding various measures to support recovery. A special focus is on the question of how the body can be placed to avoid strain on affected areas. For example, the advertisement of the “Rec Buddy” [V10] describes a variety of use cases: “*From surgical trauma to decubitus, Rec Buddy avoids pressure on the affected area and monitors the state of the tissue to alert caregivers to any signs of infections early. Reminders for the application of ointments and changes of bandages can be set individually per patient.*” Some of these devices also offer individual tools that support the patient in rehabilitation exercises, on the first hand through physically supporting the activity, e.g. via braces that support leg or arm movement in a prescribed manner [V18], through instruction of individual physiotherapeutic exercises. Others on the other hand offer mental support, for instance, through inspirational music [V15] or guided meditation [V5, V20], though these are normally less detailed than those that cater for spiritual experiences alone.

Care Central stands out with its guideline “*Fit and healthy in old age*” (taken from the company brochure). They want to make mobilization training in old age easier for elderly people in particular, no matter whether at home or in a special institution (special group functions are in the foreground here). The “ApoFit” product

was specifically designed for stroke patients to provide follow-up support for patients who have already undergone rehabilitation. According to the manufacturer, ApoFit offers "*regular speech and writing training*" as well as a gait trainer and various training sets to sharpen fine and gross motor skills "*so that they can once again participate in life with confidence*" [V11]. The user can choose between various classical therapy concepts used in the rehabilitation of stroke patients, such as Proprioceptive Neuromuscular Facilitation (PNF) or cognitive-therapeutic exercises according to Perfetti.

All of these systems have a similar appearance that is highly functional and far removed from the humanoid companion robots that were successful in the early stages of care robotics. Many of these resemble objects of furniture or are even integrated into beds, such as the Cover Unit "RoBed" by Morro B.AI [V21]. They differ in the level of effort that has gone into masking the underlying mechanical structure of the device. Care Central market their device as the "*future of rehabilitation*" [V6] and highlight the gleaming chrome features from foot pedals to the mounts for attaching the device to the wall. In [V12], the makers emphasise the individuality of the system that can be "*seamlessly integrated*" with the environment. Their catalogue lists a total of 84 material and colour variations with which the robotic unit can be designed to fit into the existing environment and thereby to disguise its technical nature. Many of these are designed to be soft and warm, both in colour and material through the use of textiles and wooden applications.

3.4.2 Death & Palliative Care. Some of the artefacts in this category overlap with those mentioned in the last section as they cater for the physical comfort of those who are at the end of life. An important function of palliative robots is the organization and monitoring of release and administration of painkillers. Due to their objective but individualized diagnosis of medical needs and their availability on demand, the robots are able to give the patient the correct and appropriate amount of painkillers at any moment. Painlessness and comfort are important aspects of palliative care as expressed by Ferguson [19], but this goes beyond physical needs. Following the pioneer of the field, Cicely Saunders, palliative care should not only be understood as the absence of pain or comfort but even more so as a holistic and spiritual perspective on the personal well-being of the person taken care of. Robots in this field therefore also provide support in coming to terms with one's own mortality or nearing death. They are usually small and easily transportable and can therefore be used in different environments. Most residents prefer the contact with human hospice staff, but the robots have been proven useful for some people who did not feel confident discussing personal details with others or did not want to be seen in this situation.

All of the robots we analysed have in common that they are supposed to stimulate and support a spiritual preoccupation with oneself and the world, but there are big differences in how this is achieved. While some robots aim at a more contemplative activity with pictures, meditation and music, others try to encourage the person in question to reflect on his or her own life through conversation. Some robots sit at the borderline of palliative care and bereavement work. The "CharonX", for example, can be used to monitor the patient in their final days and record images, videos or

messages that can be passed on to loved ones. This can be considered useful if loved ones were not able to be there. In addition it can be a means to remember important last words or as part of the grief work. Comparable to many of the recovery aids we mentioned above most of these robots have a very subdued appearance. The CharonX for example is embedded into a little sphere, reminiscent of internet cameras of the early 2000s, that can be clipped to the bed in close proximity to the patient. It does not have an interface itself, but connects through an app that can be personalised and shared within a wide range of people, with different groups. The images and data the robots generate though are more reminiscent of the luxurious grief strategies of the Victorian Age, such as death masks. In V2 we see CharonX attached to the bed of a patient, 'scanning' for information through overlaid red beams before it decides to take a picture. In the next scene we see a picture of a favourite dish of the patient, embellished through filters and surrounding emojis as well as a screenshot of the resulting conversation between family members in a chat function.

In addition to providing spiritual support and physical comfort, some of the devices provide practical support and advice. Morro B.AI developed a range of AI-systems that guide the user through the process of setting up a last will or testament by posing questions about beneficiaries, assets and special bequests. Through in-app purchases the device can offer advice in tax matters and gain further financial advice. Further support is connected to social networks, allowing the user to keep control over their networks – and the question whether their death is communicated and in which manner – as well as their physical belongings. A third type of AI guides the user through the process of bringing their affairs in order, by mediating conversations with estranged family members and friends, record messages for loved ones and prompting reflection on the 'bucket list' of users. Some tasks that take place in the house can be supported by the machines, such as sorting out photos or bringing and discussing keep-sakes or memorabilia. The aim thereby is to help users review their life fondly. An extension of this can be added to the messengers of loved ones of the resident which invites them to get in contact with the user while there is still time and prompt topics for peaceful and engaging conversation.

3.4.3 Bereavement & Remembrance. Loneliness in old age is a problem not only due to decreased mobility, but also due to the fact that loved ones and friends have passed away [59]. Particularly in institutional care, there is a need to provide constructive support in the event of the death of fellow residents. Robots in this category aim to guide people through grief or support remembrance of those who have passed. The AI behind many of these devices has been developed by Morro B.AI and does not differ much. Modelled on counsellor sessions the devices mainly support reflection, offer connections to spiritual or religious leaders, institutions, or even the calming presence of another being. The form of embodiment of the systems that support the grieving process foregrounds aspects of support work, which we will explain with the example of "Huggy" and "XSphere".

The robot Huggy is advertised with a thoughtful and quiet video [V26] showing a robot approaching an elderly person, addressed by Huggy as Peter, sitting in mourning in front of a photograph of a deceased friend. It is an abstract humanoid robot with a warm

textile surface. Huggy addresses the person and talks about personality traits of the deceased person. Peter picks up the conversation and naturally snuggles up to the robot – both remain quiet and peaceful. In this case, the robot provides a passively supporting role by participating reactively in the social life of the residents and by assisting the grieving person as a companion.

XSphere [V1, V14] builds on early AI solutions, such as “Replika” [63]. It is an algorithm that can simulate a digital duplicate of a deceased person’s existing chat histories, voice messages or emails to create a digital duplicate of that consciousness. This simulation can then be linked to a silvery, metallic sphere via a standardized interface, but can also be installed as a chatbot on the smartphone. Depending on the data basis, XSphere can simulate conversations with the deceased person or even pass on important information for the bereaved. On the one hand, this complex procedure can contradict the grieving process and has therefore provoked some critics in recent years, because the process of grief work can also be significantly prolonged by such simulated closeness. But on the other hand it can offer valuable support in cases of the sudden death of beloved ones.

3.4.4 Growth & Development. While the above robots might give the impression that older age is governed by illness and death, a range of emerging robots tell a much more positive picture as they emphasise the opportunities for growth and development. Robotic systems in this area benefit highly from the development of telepresence robots [27]. Many offer opportunities for exchange, for example as a means to “*learn not only a language, but immerse in a culture*” [V4] when travelling remotely through the world and facilitating exchange with people along the way. “TalkneF” (Talk to a new friend) is a small, slim telepresence robot that not only enables contact with friends and relatives, but also focuses on language learning with a tandem partner. According to the manufacturer, TalkneF can not only be stowed away compactly and accompanies you over stony ground (“*Nothing stands in the way of a walk in nature*” [V24]), but can also be combined with augmented reality glasses. Small challenges should lure the user outside the front door and thus increase mobility. This way you can “*show your new friends your world easily and discreetly*” [ibid.]. Tandem partners can be chosen from over 15 countries and, if desired, bring different generations together.

A bit closer to home for many people but similarly focussed on exchange is the “Conference Buddy” [V2] that enables elderly people to attend academic conferences remotely and take part in academic exchange. This was made possible through the Silver Scholar initiative, launched after the protests against academic publishers and conference providers who benefitted from the research undertaken with public funding had led to international guidelines that these resources had to be made open to the public.

Beyond scholarly learning, the sharing of crafts also has improved through this type of robot. Many telepresence robots are currently connected to social networks, such as “II” – lifelong learning, which enables exchange via a remote controlled robotic platform about specialist topics, ranging from gardening over crafting to art. While exchange was previously mainly limited to text and maybe photos or video, through the telepresence robots it has been made possible to actually get an impression of a landscape, see the

whole pantry or craft and chat together. While it was expected that elderly people would mainly serve as experts and share their skills, predominantly with younger people, the first studies have shown that many people prefer to stay in their own age range and, even more important, within their own level of expertise. Rather than introducing new people to a task, most users of these platforms want to learn from the experiences of others and ‘newbies’ can easily be discouraged by the level of expertise. An exception from this rule are so-called ‘TA’s (teaching assistants), who offer low-level advice or motivation to start a craft in exchange for bitcoins.

These robots not only were considered useful as tools for learning, but also for social exchange and civic participation. Many families already benefit from the “Nanny Cam 3000”, which connects residents of a care home to families in the area remotely. This robot allows them to take part in everyday routines, such as meals and in return enables them to take on little tasks in the house, such as babysitting or handiwork. The commercial in [V8] shows, for example, how various members of a small family are supported in their daily activities by the robot remote-controlled by grandma. The video shows for example, it (or: grandma) helps the mother to design an invitation card, goes out with the dog instead of the husband and reads to the daughter to help her fall asleep. It is also emphasized how the complex actuator technology of the robot serves as a new extension of the old body, thus causing a transformative rejuvenation of the grandmother.

3.4.5 Transcendent experiences. Robots are only the newest addition to the wide range of artefacts that have been developed to support transcendent experiences. We understand transcendent here as building onto those experiences that are described in the growth and development section, but which “*give a sense of deep connection to something larger than oneself, whatever that may be [...]*” [9]. As a result, they support longer lasting experiences, rather than short term relief in contrast to the robots described above and therefore are less pragmatic in what they want to achieve. While learning a new language might not be done for a specific purpose, it is nonetheless related to an aim. In classifying the different robots, we draw on previous work by Buie [8] who suggests a classification for transcendent experiences. We do not use all categories, but only those that we considered expressed by the robots.

Spiritual. The definition of spirituality is a recurring discussion point and sometimes not easy to separate from religion. A major difference is the monopoly claim that most religions will demand, thus opposing the diversity of free religious beliefs. Its word origin has “spirituality” from the Latin *spirare*, which translated means breathing, breath and living, and from the Latin word *spiritus*, which can be translated as spirit and soul. This also gives us the present picture of spirituality. It has emerged as a component of modern life, which is oriented towards sustainability, nutrition, health, life support and coaching. The so-called salvation of one’s own soul should be strengthened and enhanced.

20 years ago, the focus was still on apps that were supposed to help people meditate or to appreciate their own lives more as well as to spend the day in a more positive way (see e.g. [9]). An alternative are games such as “*Superbetter*” by Jane McGonigal, which are made to increase physical, mental, emotional and social resilience in order to live longer [12]. The situation is different with the Soulmate

robot series from Morro B.AI. “Soulmate I” focusses on creating awareness. It is a small rolling robot that changes colour depending on the user’s mood. At different times of the day it reminds its user to pause and focus on themselves, through various sounds and colours and motifs/photos projected onto the wall. Using the integrated AI system, Soulmate I gets to know its users better and better over time. It asks questions to get to know their preferences and to identify areas of life where more support is required. The reminder function in particular, is highly appreciated by 85% of users (as stated in [V17] by the producer). Instead of daily chores, it reminds the user of beautiful moments from their life in order to perceive one’s own life in a more positive way. The situation is similar with “Soulmate II”, but this robot also has a focus on preventive measures to stay healthy for longer. In contrast to the healing robots, health is already been addressed beforehand. But a personal training program, tailored to age, risk factors and measured blood values (which requires extra consent of the user in order to access medical data), is designed to increase the user’s well-being and therefore expand their lifespan. Soulmate II gives additional suggestions concerning nutrition (fasting option, recipe suggestions) and, if desired, brings the user up to date with the latest research. In addition, training and support is built in to increase mindfulness, attention and awareness and to bring body and mind into unity, so that various tasks in life can be approached with more devotion, resulting in greater satisfaction and gratitude. The company goes one step further, drawing on the insight that connecting with others can have health benefits. [V19] further shows how Soulmate I and II can be connected to other users if they desire to draw inspiration from or to support each other. This was especially popular in facilities for senior citizens, as users felt happier if they could help someone and were brought to a Soulmate user who had a good fit with their profile. This could also reduce the feeling of loneliness and users reported that they had regained new meaning in life.

Religious. Since decades the realm of the religious has been explored through technologies. This takes a variety of shapes and forms. Buie and Blythe [9] explored apps related to spirituality, Gaver et al. [22] developed speculative artefacts around the concept of praying in collaboration with nuns and even the catholic church has entered the digital realm with the eRosary [61], a device which has been likened to a fitbit [13]. Far Eastern religious communities, such as Buddhism [49, 54], were early open to the use of robots in spiritual practice. For example, Mindar, was introduced in 2019 by Osaka University, and teaches the teachings of Buddhism [46]. In the first robotic versions, intended for domestic use, one could touch the robot by its ‘hands’ (for a more personal approach) and ask questions with religious background. However, these models were not well received everywhere. While it has not been able to converse yet, the robot is already equipped with a video camera in its left eye as a preparation for potential future improvements. Some users felt that they were under the constant control of an instance that monitored every misstep. Therefore, these kinds of robots, such as those made by the company MeaningCircle, are now only produced and sold in small numbers. Introducing robots into spiritual practice was much more difficult for the great monotheistic religions such as Catholicism or Islam. The reason for this could have been difficulties in adapting to the theological tradition, but

also inner-organizational blockades. The technological and social developments of the last decades, however, have led churches to review their practice, so that meanwhile all monotheistic, organized religions develop their own robots and use them within their institutional context. While not directly the work of care staff but more commonly provided through external providers, such as priests, many care homes are affiliated with the church and consider clerical care an intrinsic part of their work. But the robots fulfil tasks of varying complexity.

At this point, we concentrate on only one of these models, namely the PriestBot, used by the Catholic Church in rural areas to provide basic spiritual care both in the church itself and in nursing homes. This robot is not characterised by modern technical equipment or attractive appearance. Rather, it is a functionally designed robot in black robes, which has an extensive but not particularly flexible program of different ceremonies and devotions, which it provides in different nursing homes as needed. Since this robot is only used by the catholic church, it is neither advertised nor sold, which is why we derived our observations from amateur video recordings and from its description on the product portfolio pages of the company which produces it. From a theological point of view, it is exciting that this robot – despite or perhaps because of its limited capabilities – is granted sufficient personal and spiritual status by the Church, so that the robot can not only provide assistance, but also enter into religiously binding acts with the residents of nursing homes as explained by a Professor of Theology in [V28]. Contrary to initial scepticism, such robot ceremonies are now widely accepted by the Catholic religious community. From a feminist perspective, however, it is disturbing that although robots are granted a special status, women are still not allowed to participate in priestly ordination.

Transformative (Healing). Besides robots that perform a decidedly religious function, we have also found other robots on the verge of spiritual caring work – we have called them transformative robots, because they aim to support and guide their human counterparts in a transformation of their own personality or habits. Both of the robots we analyzed were developed in response to human-induced climate change and society’s reactions to it.

The GreenDeal robot (also termed sarcastically “BoomerBot” by its critics) developed and distributed by the EU, for example, is designed to inform and advise older people about the necessity and concrete possibilities of energy saving and is thus intended to reduce differences in climate awareness between older and younger people. Although this project was aimed in particular at older people living at home, it is also used at regular intervals in nursing homes to inform residents about the correct ventilation techniques, amongst other issues. Although the GreenDeal robot was co-developed and funded by the EU, it was built by an external company and distributed by the private sector. It is therefore not surprising that the commercial highlights the fact that use of the robot permits to effectively reduce the energy consumption of a household, resulting in significant cost saving. The commercial [V22] shows the spherical robot engaging in a friendly conversation with individual residents of a nursing home (and in another scene with the staff of an office) and indicating climate-damaging behaviour. The care provided is not directly visible, but we would argue that the robot’s actions

are aimed at protecting and preserving the ecosphere. Hereby the concept of care is extended to more than human worlds [29].

3.4.6 Intimacy & Sexuality. Following the engagement with the topic in the popular TV show “Grace & Frankie” [64], in which an unlikely duo among other things develop and distribute an ergonomic sex toy, a couple of suppliers took up the topic of sexual fulfilment and developed sex toys specifically for elderly users. Some of these were extended through robotic systems, that, compared to non-smart sex toys, promised additional functions by mimicking human behaviour. When originally launched, these devices received a lot of attention, positive and negative. Newspaper headlines lauded the “*Next step in the sexual revolution*”, claiming, “*The boomers are at it again*”, while at the same time, critics discussed the potential “*dehumanisation of care*”, which revealed our “*recoil from the elderly body*” and the aim to hide away “*those who had lost their sex appeal*”. In hindsight, both of these visions failed to come to pass. Sex robots for the elderly remain a niche product, which is rather limited in function and high in cost. Our review led us to two videos of competing robots, the “XXSilver” and the “ToyBot++”. The ToyBot++ is a realistic representation of a human body, mostly female, though male or androgynous bodies are also available. The XXSilver instead caters more explicitly for limited movement and strength for use when lying down. The application is attached to the bed and can be drawn over the body – like a heavy blanket – for use. It stimulates the body in specific areas with either pre-set or customized patterns with little input by the user themselves. This robotic system has received much more interest by people who identify as female and those who have an interest in widening their sexual experiences beyond hetero-sexual experiences.

We would argue that the lack of engagement with these systems is based in their representation in these videos, which utilize highly veiled language and imagery. The video for the XXSilver, for example, draws heavily on the joint hands, often used as a symbol for care, in their imagery. The closing scene shows a red rose passed on from one hand to the other [V30]. In the background is a picture of the robot, discreetly laid out on a bed. Sexuality and sexual acts are rarely mentioned, the focus is instead on functionalities of the device, either the bodily features of the doll or the different zones of the blanket, which are presented as highly desirable. Little context is given that could enable the customer to project their own phantasies on the device, and use cases are mainly described as “*unlimited opportunities*” or “*hours of joy*” [ibid.]. The makers refrained from breaking any taboos around aging sexuality which in turn made it easy to avoid discourse around these technologies altogether. Another problem we saw was the ‘medicalisation’ of the sexual act as expressed through these technologies. Both devices are equipped with sensors that monitor heart beat and are prepared to emit an emergency call in case of heart failure. In addition to this blatant example, the videos also promote the positive aspects of sexual activity on health and wellbeing, such as enhanced agility or improved blood pressure.

4 DISCUSSION

In this paper we present the results of a fictional review, placed about 20 years into the future. We present non-existing robots as a means not only make observable trends in the current discourse

about robots ‘tangible’, but also to critique the state of the arts of care robots and especially the way care work is conceptualized based on a limited understanding of the field itself.

This paper has been developed alongside the practical work on the ReThiCare project, a multi-disciplinary three-year research project that deals with the development of alternative visions of care technologies. Three of the authors have undertaken extensive, hands-on work field work in care homes, ranging from a couple of days to months, giving us a good understanding of real-life needs and requirements specifically in the field of elderly care. It revealed areas of care work to us, that we did not see addressed in the current literature on robotics in care or the current existing technologies that we reference in the paper. In the development of the fictional robots discussed here, we deliberately did not draw on theoretical notions of care, but rather took an approach inspired by the view on care as it is expressed in science and technology studies (STS). As Martin, Myers and Viseu [36] note, care is hard to grasp and “*any attempt to define it will be exceeded by its multivocality in everyday and scholarly use*.” Therefore, we as authors came together in four sessions to discuss our understanding of care as influenced by the extensive ethnographic work by bringing in metaphors, our own understanding as well as current examples of technologies that can be understood as caring, which are referenced throughout the paper. We included those categories that we could all agree on as including or relating to an element of care. Through discussion, our individual understanding of what care could mean grew and developed.

Nevertheless, while we come from different disciplinary backgrounds (design, psychology and sociology), we all have been brought up with Western notions of care which influence our understanding of what care can be. The robots here – and also those that we did not include – were also limited by our understanding of this term. While we considered practical help through machines that could be around in the final hours, we refrained from discussing assisted suicide here. It is therefore important to explicitly state that the representation of care presented in this paper is by no means exhaustive, nor is it meant to be. Instead we understand it as a tool for debate and look forward to future work that will extend our ideas and contributions. We further found the method of collaborative writing useful to find common ground for our future work in the context of the project that this paper evolved from. Giving shape to our ideas led to deep discussions about our understanding of care, the role technologies can play in this, and the needs we perceive in this sector, including needs that currently are not yet discussed much for the context of elderly care.

Su et al. [51] summarize a series of classification of current robots that include telemedicine robots as well as therapy or surgical robots, robots that take on service tasks in elderly care (such as transport robots) and social robots (such as companion robots). Each of these has a distinct user group, ranging from surgeons and general practitioners, caregivers to those being cared for. As we outline in our introduction, we extend the range of tasks that the robots might take over in the future. By doing so, we also break with the current trend that care robots are often anthropomorphized, with large eyes (see e.g. Pepper [66]) or even projected faces (see Ryan [65]). Instead we reframe care robots either as abstract shapes (like XSphere in 3.4.3, Bereavement & Remembrance section) or practical

devices that are embedded into furniture (such as the rehabilitation robots embedded into hospital beds). With the robots in these two sections specifically, we did not go too far from current practices and what might already be technically feasible, but tried to find new forms of expression through such robots. Our aim is not only to make the current bias of humanoid robots tangible and debatable but also to provide alternative versions of what robots could look like by drawing on different embodiments and alternative technologies. This might to some extent be considered ‘easier’ in this format as we are not bound by technical limitations. Many of the robots we created for this paper are not possible as technical feasibility of movement, vision or automation is not there yet (see e.g. [28]). By reframing the robot from anthropomorphized companions to more practical devices we suggested a means to rethink the care robot to overcome some of the current limitations. But our contribution with this paper goes far beyond technical feasibility and giving potential new frames of the term care robot by questioning underlying assumptions about old age and the role of care in this sector.

Each of the robots presented in this paper embodies a facet of ‘caregiving’ by highlighting specific and often not noticed tasks of care practice above others. These developments are often technology-driven and frame problems in the care sector in a way that mirrors and enables technological developments and – even more substantial – even also enables funding opportunities in robotics [33]. In addition, in Human-Robot Interaction a similar trend can be observed [39] to that noticed by Vines et al. [57] for HCI, in that ageing is framed as a problem that needs to be solved through technology. We encounter this view by venturing out into areas which are not currently addressed widely by technology makers. The last three sections of our ‘review’ aim to reframe old age as a space for opportunity, (ongoing) growth and joy. We offer this as a talking point to which extent these tasks are part of caring for someone. As we outlined above current robots only take on specific tasks. But the wider field of technologies for care, ambient assisted living (AAL) or ageing-in-place has comparable limitations in what tasks are addressed and how people in their later lives are understood. Here, maybe even more so than in other areas, people are seen “as obedient and predictable users and consumers” as Dunne & Raby [16] state. Taboo topics, such as intimacy & sexuality or death, are rarely discussed, even though they might play an important role in the lives of potential users. While spirituality is not a tabooed topic as such, it is rarely acknowledged in the life experience of older adults when it comes to technology design. Whether or not technology is suitable to be used in this area needs a frank and honest discussion. Increasingly the HCI community is starting to engage with these topics as a rising number of workshops in the area show [7, 25, 37]. With this paper we want to extend the debate specifically to elderly people.

Sharing these robots that do not (yet) exist, we not only provide alternative views of what care can and should look like, but also “make strange” [4] existing technologies. We therefore decided to keep the tone of our review relatively neutral. We do not offer our view on what we consider utopian or dystopian. “*The future is already here – it is just not very evenly distributed*” as for example quoted by Chatterton & Newmarch [11] and it is unlikely

that these technologies would be available to everyone or suitable for everyone. We therefore laid out some considerations of how the robots might come into being, which are based on current trends. The current discourse on healthcare and technology is in addition often techno-optimistic and side effects of the increasing bio-medicalisation, such as increased surveillance of people in care, are often left out (compare also Joye et al. [24]). Our paper mirrors this dominant voice and presents the technologies described here as inherently positive. By applying measures that are almost predominantly used in healthcare technologies, such as the measurement of physiological measures to robots that are ‘deviant’ as they deal with sexual pleasure, we pose the question of where to draw the line on where these measures are acceptable. We do not provide an answer, but ask readers to position themselves. Tensions, such as the techno-optimistic response to climate change are deliberately not resolved. Instead, we left them here to pose the question whether or not these changes are real, as Dunne & Raby ask: “*The viewer should experience a dilemma, is it serious or not? Real or not?*” [18]

Building on work by Puig de la Bellacasa [29], this paper poses the questions: “*Who cares?*”, “*What for?*”, “*Why do ‘we’ care?*” and mostly “*How to care?*”. Technology is by no means neutral [39, 40] and technologies that are used in care have to some extent the ability to “define care” [15]. As the first robotic systems move into the realm of care it is therefore a suitable time to take stock and not only question what can be done at the moment, but also what might be preferable. While the development of robotics is hindered by what is technically feasible, design fiction allows one to move beyond technical feasibility and into the realm of acceptance. It allows one to engage with technologies that do not yet exist [47, 53] and pose the question whether they are needed or wanted. By extending the view of what is currently available we have opened the discourse about what robots in care can do. With this paper we invite the HCI community to question the current paradigm of technologies in elderly care (maybe even against the backdrop of global changes through the climate catastrophe) and join us in imagining richer futures for ourselves.

5 CONCLUSION

Care robots are powerful tools that frame and shape how we perceive care, whether they come to be or not. In this paper we have used design fiction to imagine potential future robots as a means to open up the discussion of what care robots could potentially do. Derived from this speculative work, we contribute a series of alternative frames of what care can entail in order to open up the debate on what we as a society want from technologies for care. With this we not only developed an example of how design fiction can be used as a tool for reflection, but also provide further definitions of how care can be understood and mediated through technology as a resource for the HCI community.

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