

Mediated Visits: Longitudinal Domestic Dwelling with Mobile Robotic Telepresence

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Mobile Robotic Telepresence (MRP) systems are remotely controlled, mobile videoconferencing devices that allow the remote user to move independently and have a physical presence in the environment. This paper presents a longitudinal study of MRP use in the home, where the first author used an MRP to connect with family, her partner, and friends over a six-month period. Taking an ethnomethodological approach, we present video recorded fragments to explore the phenomenon of ‘visiting’ where MRP users drop into the home for a period of time. We unpack the more ‘procedural’ elements—arriving and departing—alongside ways of ‘dwelling’ together during a visit, and the qualities of mobility, autonomous presence and spontaneity that emerge.

CCS Concepts: • **Human-centered computing** → *Empirical studies in HCI; Field studies.*

Additional Key Words and Phrases: ethnography, videoconferencing, mediated intimacy, mediated closeness

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1 INTRODUCTION

One key promise of video calling is to enable and sustain personal, intimate connections with friends, families, and even partners [19]. Video calling has become even more significant during the COVID-19 pandemic, where travel and visiting others have been difficult or prohibited, meaning that attempts to make up for in-person interactions have increased [21]. Mobile Robotic Telepresence (MRP) combines a video calling system to a remotely controlled mobile base (robot). This enables a remote user to have a physical ‘presence’ and move independently in the local environment of the robot.¹

MRP robots are often positioned as providing a more natural and richer ‘presence’, as compared with video calling. Given that MRP have received positive receptions in healthcare, education [30], and office work [3, 31, 57], it is reasonable to perhaps think of them as substitutes to being in-person. Indeed they are marketed and talked about in media as a superior option to videoconferencing, with the experience described “as if you were in the same room” [45]. Taking this as read, there are still absences: research into MRP use in the home has been quite limited [61–63] in particular. Further, few studies are reporting on the lived experience of MRP use, with some exceptions in healthcare and education [10, 25]. Studies after extended use has ‘taken the edge off’ novelty, and studies that focus on the long-term experiences of local users of MRP and their intimate closeness with family, friends or partners are also lacking.

¹Following the existing literature, we use the term *remote user* to refer to the person driving the robot, *local user* to refer to a person located in the same space as the robot and *local environment* to refer to the location where the robot is situated [47].

This ethnographic study reports on what it is like to be *visited* via an MRP robot as a routine part of close relationships. We report from one household's use over a six month period, and explore how that may reflect on the meaning of mediated presence. We are especially interested in how Ingold's [23] notion of 'dwelling' may be more useful to thinking about mediated closeness than versions of 'presence' which rely on levels of imitation or fidelity to in-person encounters [22]. Ingold uses "dwelling" to describe "being" as the intransitive act of producing our lives together as we live them—contrasted, for example, to the transitive act of "building" with a planned, imagined outcome that is often used to distinguish humans from other animals [23]. We are not particularly interested in thinking of MRP as 'natural' or providing enhanced 'presence'; rather, we want to understand them for what they are without setting up potentially mistaken comparisons.

Research and design work in computer-mediated communication often aims to improve interactions by attempting to better imitate the capabilities of meeting in-person. MRP was also created with such an intention [38, 58]. However, as Hollan and Stornetta argue in *Beyond Being There*, simply enhancing information richness may never get us close enough for computer-mediated interaction to be interchangeable to in-person interaction, *nor should this necessarily be the goal* [22]. Instead, they propose framing communication in terms of needs, media (anything that mediates communication), and mechanisms (ways to meet needs, enabled by the medium)[22]. Their ideas have been most clearly adopted in works of mediated closeness, where rather than trying to emulate in-person presence, artifacts are created in an attempt to capture the needs of couples and families over distance for a more understated form of presence. Often this is a need to simply let one another know that they are thinking of the other, such as through a pair of lamps that light up when someone is passing by the other one [55]. Dourish et al., drawing on their own longitudinal experiences in media spaces, note that in-person interactions need not always be the point of comparison. Complex communicative practices arise over time in any media, and these are worth exploring on their own right [8]. In adopting this stance, we explore MRP not in order to evaluate its ability to imitate in-person presence but to understand what communication needs it supports for intimate relations. Where we mention in-person or video-call interactions in our analysis, it is not to make a judgement on whether MRP imitate or improve on these; rather, we employ them as a shared reference point so as to better explain the nuances of MRP.

For this study, the first author kept an MRP in her apartment for six months and used it to connect with her family. Whilst the motivation was driven by our research interests, it is fair to say that there were personal motivations for the first author too, in that she could take advantage of the MRP during a time when it was not possible to visit her family in person due to COVID-19 restrictions. Our aim as researcher team was to get a closer look into mundane, habituated use of MRP and understand some of the features of MRP use for personal relationships, in contrast with existing examples of MRP use for work [3, 57]. In addition, this approach allowed us to conduct research during the pandemic without putting any other participants at risk through contact, and gave a closer personal insight into the experience of interacting via an MRP on a long-term basis. We video-recorded the MRP visits in the first author's apartment through cameras placed in the living room and kitchen, capturing a third person view of the interactions. As such our analysis is focusing on the lived experience of the local user. The interactions were examined through the lens of Ethnomethodology and Conversation Analysis (EMCA), focusing on how the situated actions of the participants bring about the interaction. We describe the experience and present fragments of typical interactions—arrivals, departures, looking at things and being together. We discuss how the unique interactional features of MRP, the presentation of self, the remote user's autonomy and the local user's need to accommodate the remote, are oriented to during interactions and the ways in which the medium supports mediated intimacy.

2 RELATED WORK

2.1 Computer-mediated closeness

There is considerable amount of work in HCI on the use of video-conferencing technology for families and couples [19, 37, 41]. Kirk et al. in 2010, at a time when the medium was gaining in popularity for personal use, interviewed UK households who regularly made video calls with personal relations and recorded their use habits [28]. They found that people used video to mediate closeness with family members and friends through trying to be involved in activities and routines but also to be present, recognised and show dedication. At the time, it was perceived as an intimate act that they would only share with a people they felt very close to. Neustaedter and Greenberg, among others, have looked at the use of video calls by couples in long distance relationships [40] and showed that despite the many benefits of being able to see each other, users were limited by the lack of physicality. Rintel, exploring how couples in long-distance relationships coped with network jitter in video calls, found that couples are able to adapt and even incorporate issues such as missing words and frozen video into their intimate conversations [49]. Such technological troubles, he contends, are an omnirelevant aspect of video calling, and become part of the way closeness is achieved.

An extensive exploration of long term video calling use in everyday life shows that it is used for more than just conversation and factual communication [42]. A study of asynchronous video sharing by young girls connecting with their friends also suggested that the medium was suitable for intimate friendships and was used to have rich conversations and share various aspects of the user's life [24]. More recently, Gan et al. looked at video call use by migrant parents and their children who were looked after by grandparents in China [12]. Their study shows the facilitation work done by the grandparents, but further reveals the need for reciprocal exchanges and the role of embodied configuration and framing in achieving it. This research indicates that people interact with others in close relationships differently, with strong inclinations to share more and include each other in their lives through video mediated communication. As such, media aimed for personal interaction should strive to support more expressive communication and allow users to share intimate aspects of their lives.

Research on computer-mediated intimacy has also focused on supporting feelings of presence-in-absence (a feeling of being 'with' someone not physically present) [18, 27]. Kjeldskov et al., who look at presence-in-absence through artifacts point out that despite being ubiquitous in everyday life, capturing intimacy can be challenging due to its ephemeral nature as it often exists in the background of close relationships as well as due to a lack of an established language for it [29]. Their research suggests that intimacy involves emotional rather than factual communication and ambiguous, incomplete acts often drawing on a shared view of the world, as well as vulnerability and self-disclosure. Work in the area supports this and further finds that intimacy is constituted through reciprocity and display of personal effort [16, 59]. Overall this literature suggests that MRP technology for intimate connections should allow for non-verbal (whether symbolic or embodied) communication and support the reciprocal expression of emotions, trust, commitment and self-disclosure.

2.2 MRP use in the home

In more recent years, research into MRP has also looked at how the technology can be used in the home setting to support long-distance intimate relationships. An interview study of two long distance couples who used MRP to communicate for a month found that the autonomy of the remote user helped foster a sense of connection[63]. The movement of the MRP offered a more enriched use of body language during interactions that allowed for more meaningful and serious interactions between the couples. The movement also allowed the remote user to have new perspectives into the life

of the partner, which sparked more conversations. They also point at the quality of unpredictability—which is not typically part of video calling systems—and the possibility of this unpredictability making interactions seem more real, as if the other person is just popping in from the other room. Yang and Neustaedter further explore this subject in an interview study of seven couples [61]. They find that the MRP was used in order to participate in everyday activities, create a sense of sharing a home, foster connectedness with friends and family of the partner, help each other with tasks, and experience a quiet companionship. In their next study, Yang and Neustaedter, looked at the use of an MRP coupled with control over smart home devices in the local user’s home in a three-month autobiographical study of the first author and her partner [62]. This aimed at a solution to one of MRP’s main limitations, the inability to manipulate objects in the local environment. It is also a way to enhance the users’ ability to help, participate in tasks and have a sense of sharing the home. The remote user had access to a series of devices (television, lights, vacuum, printer) that could support with helping the local partner and with performing joint activities. This helped both partners feel a sense of ownership over their home, create a sense of normalcy (e.g., turning on the television and lights to welcome the partner when he comes home) and enhanced the things they could do together.

Kang et al. further expand the potential capabilities of telepresence in creating a sense of living together by presenting a two-way system that uses maps with meaningful locations of both partners’ spaces and autonomously moves the MRP accordingly [26]. For instance, if one partner moves to their kitchen, their corresponding MRP in their partners home also moves to the kitchen in that home. Finally, whilst not a study of home use, it’s worth mentioning a study by Yang et al. of couples using MRP to shop together over distance [60]; this study reported on the playfulness with which the mobile medium allowed participants to interact. Remote users also felt better able to capture their partners’ attention and contribute to the activity than if they were confined to a tablet handled by their partner. Still, the disparity in the abilities (the local user moved faster, more flexibly, had wider field of vision and was not dependent on an internet connection) led to the local users feeling responsible for helping their partners, even if the remote users did not feel that they needed the help.

Overall, this research shows the potential for more investigation of MRP systems in home use or use for mediating intimacy. In part, this is because none of the studies above really explicate the practical accomplishment of MRP visits between close relations. In doing so, research thus far has tended to miss the ways in which mediated presence (and intimacy) for uses of MRP is pragmatically constituted, particularly for domestic settings.

3 STUDYING MOBILE ROBOTIC TELEPRESENCE IN THE HOME

We have adopted an ethnographic approach to this longitudinal and autobiographically oriented study of MRP use. Within that frame, our sensibility is ethnomethodological and conversation analytic (EMCA). EMCA-oriented research attempts to understand what constitutes the accomplishment of social organisation—the situated methods of achieving intersubjectivity between each other and therefore producing the stability of everyday social order (and hence what we point to as ‘society’) [7, 14, 53]. In conducting a longitudinal (six month) study, we were able to move beyond novelty and drive towards understanding the production of habituated, routine and deeply ordinary forms of MRP use between remote and local users. We recognise, however, that the focus on a single household does limit the types of experience we are able to explore.

Autobiographical here refers to the fact that the first author was also the main participant of the study— as the local user. From an ethnomethodological perspective, there is nothing ‘special’ here in that there are many extant autobiographical works (e.g., see works by Sudnow [54] or Livingston [35])—ethnomethodologists point out there is no ‘time out’ from society and one cannot but bring oneself ‘into’ a given study, which indeed is *necessarily how*

understanding is generated. From an HCI perspective, it could be argued that having the researcher in the position of the subject can help uncover more detailed, subtle understandings of a system that other users-oriented studies could not have yielded [43]. As Buxton [6] argues, “the only way to engineer the future tomorrow is to have lived in it yesterday”. An autobiographical approach was similarly used by Yang and Neustaedter in their study of MRP with smart home tools [62].

3.1 Bringing the MRP into the home

For this study, the first author brought a telepresence robot into her apartment and used it to connect with friends and family over a six month period (from 27 January to 28 July 2021).

For part of the data collection period, the United Kingdom, where the study took place, was under lockdown restrictions due to the COVID-19 pandemic, limiting people’s ability to meet indoors and outdoors with people from other households. Living by herself, in a different town from her family and partner, the first author had limited possibilities for in-person social interactions, so the research team collectively felt this might provide an interesting opportunity to explore MRP use in detail by turning the lens of study on ourselves.

The main remote users visiting the first author through the MRP, and the ones this study will be looking at were her mother (M) and her partner (J). Each visited the researcher almost once a week, for visits that lasted between 40 minutes to an hour. These interactions mostly took place in the evenings and were planned in advance. J also made a few shorter visits (of about 15 minutes) during lunchtime and in the earlier months of the study dropped in spontaneously just to say “hello” a few times. During the period of the study, the first author also interacted with the two visitors regularly through messaging and video calls.

A close friend of the first author also visited twice and her brother (with his family) visited once, but there was no interest in continuing to use the MRP. Specifically, the friend reported finding being able to see so much of the first author and her life a bit “creepy”. It is worth noting that the first author’s home has a single floor and it thus is possible for the MRP to drive everywhere without assistance (apart from opening doors).

Finally, we as a research team conducted a number of meetings using a mixture of the MRP and video calling, both prior to the deployment in the first author’s flat and during the study. The point here to note then is that the other authors of this paper also developed some basic experiences with the MRP in use, thus informing how we jointly made sense of the collected video data.

3.2 The robot

The telepresence robot used in this study was the Double 3 by Double Robotics. [51]. As shown in figure 1 (a), the device consists of a tablet-like screen, on which the remote user’s face appears, equipped with speakers, a microphone and a camera. The screen is mounted on a slim pole of adjustable height, which is in turn attached to the base of the robot, which is made of two large wheels that allow the robot to turn and move in all directions and brakes that keep it stationary when parked. When not in use, the Double is parked in its dock, which sits on the floor and is plugged into a power supply, so that the Double can charge when parked (shown in figure 1 (a), behind the Double itself). The dock is slightly taller than the robot’s base and it features an opening with two “arms” which the robot autonomously detects and slides into in order to park.

To use the MRP, the remote user has to log into an online interface from their desktop, tablet or phone. Once they are online, the MRP is activated in the local environment; its brakes disengage (making a noise as will be mentioned later) and it slides a few centimeters away from the dock.

From their interface the remote user can see and hear through the MRP camera and microphone, and they can be seen and heard by the local user (as in traditional video calling). Additionally, the remote user can drive the MRP using their arrow keys, or by clicking on visible areas of the floor which the Double 3 can recognise. The remote user can also adjust the loudness and the height of the MRP using sliders in their interface and they can zoom in and out of specific areas in their field of view.

The Double 3 can dock autonomously, but some work is still required by the remote user to initiate that process. The remote user needs to face the dock and move towards it. At a certain distance, an augmented reality symbol of a thunderbolt will appear on their screen as if floating above the dock (as shown in figure 1 (b)). When clicking that symbol, the Double will move into the dock and its brakes will come down for it to park. The remote user can then log off. Of course, the remote user can log off at any point, without going through the docking process. If they do so the MRP will simply park in place and the local user will need to move it to the dock to charge (either by manually picking it up or by logging in and driving it there).

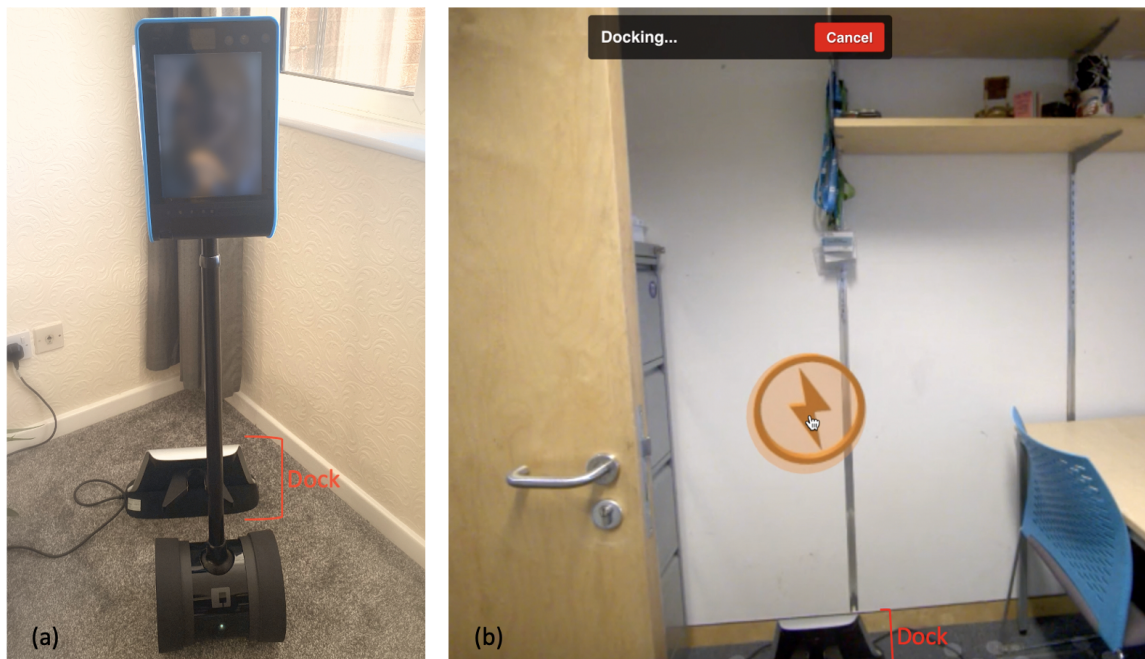


Fig. 1. (a) The Double 3 mobile telepresence robot, positioned in front of its dock; (b) Screenshot from the Double's interface showing the remote user's view as the robot is parking in its dock.

3.3 Recording MRP use in the home

Recordings were collected in audio and video format using cameras placed in the first author's living room. We note that this captured a third-person perspective of the interactions and, as such, the point of view of the remote user is not available in the data for analysis. The first author placed those cameras in appropriate locations in advance of planned interactions and when moving to other rooms she moved the cameras accordingly (e.g., taking it and placing on the

kitchen counter). She also took notes to help contextualise the experiences in her memory and preserve any additional relevant information.

3.4 The corpus of recordings

The corpus of recordings is comprised of 23 videoed MRP visits. Of these, 11 were with the first author's mother, 8 with her partner, 2 with a friend, 1 with her brother and 1 with her PhD supervisors. Several more visits took place with the mother and partner but were not recorded due to lack of planning or because none of the participants wanted these particular visits to be part of the corpus.

3.5 Long-term use

Naturally, we found that initial instances of use were characterised with more exploration of the MRP's capabilities. Over time there was less use of the MRP, as participants would instinctively opt for video-call unless reminded by the first author to use the Double. It is worth noting that the author's partner's reluctance to use it was mainly due to not wanting to stay at his desk after work. He found that the desktop interface was a lot easier to use than the phone application, but after spending the day working from home on his desktop he did not want to stay there any longer. Another reason for reduced use for J maybe have been that he and the author were much more used to interacting via video calls as they have been in a long-distance relationship for a few years. Indeed, the author's mother was much more consistently keen to keep using the MRP throughout the duration of the study. Additionally, we found less novel use over time. As the users settled into a familiar routine of weekly visits, those visits more and more resembled each other, with remote users not experimenting with the capabilities of the MRP as much. This may be because they felt they had already exhausted its capabilities and seen everything worth seeing in the local environment. After a while, most visits typically included a brief look around the flat, some time spent in the kitchen as the local user prepared her meal or coffee and most time spent in the living room chatting. Still, we found that the effects described in the following sections persisted throughout the study period.

3.6 Analysis

As noted above, we approach the recordings and our understanding of them through the lens of the first author's personal experiences, coupled with the rest of the research team's familiarity with MRP use. Although the recordings provide rich resources to repeatedly examine moments during the six months of the study, they mainly act as 'aids' or 'reminders' for our own understanding of how and in what ways our routine experiences with MRP use—particularly the first author's of course—produce 'visits' as socially organised phenomena constituted of the great spectrum of social actions of participants [13, 35]. In line with this we describe the experience as a 'visit', which is also the term participants employed to name this kind of MRP use.

As such we present the beginnings and endings of the visit, and some routine features of the interaction in between, that demonstrate how e.g., intimacy is achieved as an interactional accomplishment. The fragments we have chosen to show are of incidents typical of the first author's experiences with MRP visits. We present these using the conventions of conversation analysis [20] and we use *#fig* according to Mondada's rules for multimodal transcription to indicate the time within the transcript when the image was taken [39]. We use yellow arrows to indicate the movement of the local user and red arrows to indicate the movement of the remote user. The conversations between the researcher and her mother were conducted in mixed Greek and English, but for simplicity they are presented here translated into English.

4 HAVING A VISITOR ON THE MRP

We now present four vignettes that exhibit typical scenes of everyday life with MRP-enabled visits. Our first two vignettes address more ‘procedural’ elements of visits: arriving and then departing. The next two vignettes then show aspects of everyday ‘dwelling’ for which MRP seem to provide interesting capabilities. Before this, however, we need to briefly discuss how pre-visit preparations featured as routine elements to prepare for MRP visitors.

In this section we switch to a first-person description, positioning the first author of this paper as ‘I’ in order to render our fragments of data with a constant reminder of the autobiographical nature of the study.

4.1 Pre-visit: Preparations

Before a visit, preparations were often made. This was because I knew that visitors would be present in my private space. Through their wide field-of-view and ability to move, they could, with relative ease, look at potentially anything in my flat as well as myself from any angle (not just head and shoulders as in traditional video calling), and do so largely autonomously. This created a sensitivity towards what was visible in the flat and its general appearance and state when visitors were to arrive, as well as towards my own appearance, dependent upon who is visiting and the situation when they were to visit.

In that sense, the setting of the social interaction with the MRP user and the framing and control thereof has expanded from the domain of the video calling screen (which is largely in control of the user) to the entire flat (or as much of it as can be reached by the MRP) [17], which is far more difficult to meticulously manage than the static, immobile view provided during video calling. This meant that in the first few months of use, I would always tidy up the space before a visit (pick up dishes, fold blankets) in an attempt to control the presentation of the flat and by extension, myself. I found that doors were also a way to maintain a ‘backstage’, in Goffman’s performative sense [17]—MRP users couldn’t open doors themselves. Unfolded laundry could be kept in the bedroom, behind a shut door. This changed how the whole flat was viewed, it was no longer my backstage but an extension of my performed self. Over time, I stopped controlling the state of my flat and let people close to me experience being in my unedited space, and in doing so experience being with me on a more sincere level.

4.2 Arrivals

Visits start with arrivals: a period of establishing that a visit has started to happen. Unlike telephone or video calls where the transition to the reason for the call follows relatively rapidly after a short greeting sequence [9], in the MRP visit greetings would be followed by or mixed with an acknowledgement that the other person has arrived. Then the remote user would drive the MRP out of the dock, occasionally encountering and solving minor troubles and commenting on their actions, followed by a negotiation with me of where to proceed next.

In the earlier visits, those periods were characterised by a lot of awkward laughing, pauses, uncertainty on how to proceed, but also excitement. After 2-3 visits, these interactions became a normal part of our routine, and correspondingly the period of ‘arrival’ became shorter and more straightforward.

To understand what the social organisation of these arrivals tended to look like we have selected the following fragment (see figure 2). In this fragment, J (my partner) is visiting me. The visit had been arranged only loosely; me suggesting to him previously to this moment that he visit some time in the afternoon. This particular fragment took place on the sixth month of use, and we were well used to the routine of arrival by then.



Fig. 2. Fragment 1.1: Showing the first author welcoming her partner who has just arrived

The sound of the MRP’s brakes mechanism releasing is distinctive (line 1), and indicates that a visitor has logged in. There is an element of surprise owing to the broad specification of “afternoon”, but certainly the visit is not unexpected. The sound occasions me to look towards the MRP and produce a greeting (line 2). In Figure 2, 1a, you can see me approach the MRP (which is facing the wall), say “hey” and lean between it and the wall to look at the screen. Having logged in, J announces his presence by singing a tune—Also Sprach Zarathustra made famous by the movie 2001: A Space Odyssey—forming a little joke. Still singing, he moves out of the docking station and starts driving towards me, now that I have stood up and taken a step back.

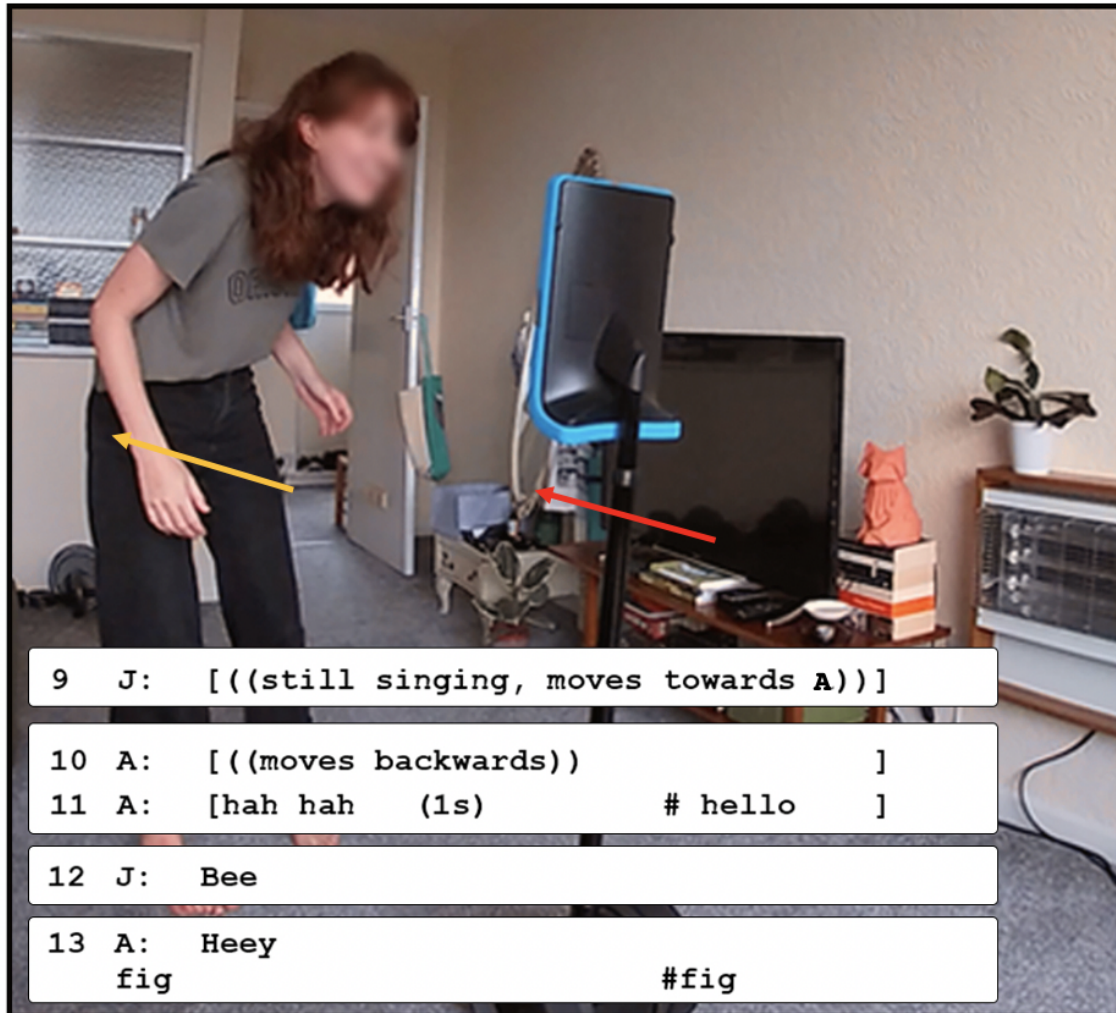
In 1c, J is still singing and playfully driving towards me: I continue moving backwards to avoid him. In line 11, after I’ve once again said hello, J stops singing and acknowledges me using a personal nickname. Within our close relationship, this acts as a greeting. I say hello again, and then we proceed to talk about how our days have been.

At the beginning of the visit, the remote user establishes their presence and capabilities, and the tone of the visit is set. A significant element of this is connected with the remote user’s autonomy and ability to express that autonomy in various ways via the MRP’s technical capabilities.

I do not answer a call; rather, the visitor, J, arrives on his own. As soon as he logs in, he is within my space. The sound of the MRP’s brake lifting can be said to act as a summons—hearing it informs me that J is here and that I should join the interaction. [52]. In that sense, it is akin to the ringing of a doorbell or phone. However, unlike in those cases, I do not have the option not to answer, or to wait—to take a moment to prepare—before answering.

Still we see that, in this case study, the visitors take the time to announce their arrival, and in doing so perhaps they mitigate the intrusion.

The visitor is also technically free to arrive at any time they choose, albeit, in our case, within the parameters of the prior visit ‘frame’ that has been established between us (“come visit me tomorrow afternoon” as opposed to “visit at 11:00am tomorrow”). The remote user can be spontaneous, in line with the possibilities furnished by this prior framing



1c

Fig. 3. Fragment 1.2: Showing the first author welcoming her partner who has just arrived

of the situation. J also makes a show of his ability to move as part of the start of the visit. This is not strictly ‘necessary’ since it is possible to hear an MRP user by voice alone, however J integrates the initiation of movement with his arrival. In other words, the movement, the singing by J, the appearance of J on screen, all constitute what it means to ‘arrive’ in my flat. Of course, these ways are intimately bound up in our particular relationship in determining what is relevant, appropriate ways of using the MRP to reflect this relationship. In this sense, the arrival is not just anyone’s arrival, it is J’s arrival.

There is also close coordinated action from myself with respect to this. I am not in control of the remote’s position and actions (of course, a local user can forcibly power down the MRP). As such, I need to adjust my own actions to

those demonstrated by the MRP user. In this fragment, I come up to the MRP when I hear the distinctive sound of it ‘coming alive’, and orienting to this as an ‘arrival’, arrange myself so that I can correspondingly receive that arrival appropriately: I place my face between the wall and the MRP by leaning, so that I can be visible to J, reciprocating acknowledgement of this arrival. When J is out of the dock, I ensure that I am visible by standing directly in front of him. When J moves towards me, I need to move backwards to avoid the MRP but also to ‘play along’ in the game of movement he initiated. In 1c, whilst moving backwards to avoid him, I also lean forwards, so that I can see his face better and so that he can see mine—as he has chosen to keep the MRP at the low height. So in being a local user I must move along with the MRP and position myself sensitively to the way J acts in the MRP.

The arrival of the MRP thus entails a whole range of *coordinative actions*—bodily, verbal, mechanical, etc.—which present quite different phenomena (and interactional possibilities) to standard video calling systems. These actions are put to use in effectively welcoming the MRP user to the home space, and they are attentive to structuring the start of that visit.

4.3 Departures

In principle, a remote user can depart the MRP at any time by shutting down their software client. However, this leaves the MRP away from its docking station, and source of charging. It would also result in the MRP being left in a potentially inappropriate place within the flat, acting as an obstacle or annoyance, and so on. So, departing is not just about ‘saying goodbye’ but also about ‘parking’ the MRP—departing ‘considerately’. Having used MRP previously, and having read the literature, I was well aware of this. When it came to my visitors, I suggested to them on their first visits that it would be nice of them to park the MRP before logging off, but I did not pressure them about it. Nonetheless they understood that it made sense for them to do it, and on most visits took it upon themselves to do so—even though this usually meant remembering to do it last minute during the “goodbyes”.

There were departure sequences, where upon deciding to end the visit, the guest topicalised their intention to park and I accompanied them to the docking station. It is well known that side sequences or insertion sequences might prolong or interrupt a leaving process several times [11]. Button has also shown that the sequential organisation of closings allows for mutually achieved movements out of the closing [5]. So, on the MRP, an announcement that it’s time to go is not the departure itself but the *occasioning* of a coordinated sequence of actions that then lead to the actual end of the visit. This announcement was usually followed by the remote user remembering and often saying out loud that they need to park. Unlike actual in-person visits where one cannot ‘depart’ if one does not physically leave the building, parking the MRP is an *additional* action which is not *required* by departure. After the MRP user initiates movement to go park, typically I would walk together with the current remote participant towards the dock, chatting and saying more goodbyes on the way, somewhat similar to escorting an in-person guest to the door.

Like arrivals, departures come to be mutually organised in particular ways to bring them about, the features of which we want to unpack in this section. We have chosen the following fragment for brevity as it contains less talk than many other instances of departures, with their often prolonged sequences. As with the arrivals, departures became shorter and more routinised over time, as the remote users got more adept at driving the MRP. That said, closings would still contain conversation sequences that would often prolong the remote users’ completion of their departure (i.e., exiting the MRP client software). The following fragment is from the third month of use, where my mother, M, is completing a visit.

In 2a, we have already said goodbyes—the terminal components of a closing sequence, according to Button [5]—when my mother remembers she needs to park. Button’s analysis reveals that movement out of closings occurs either

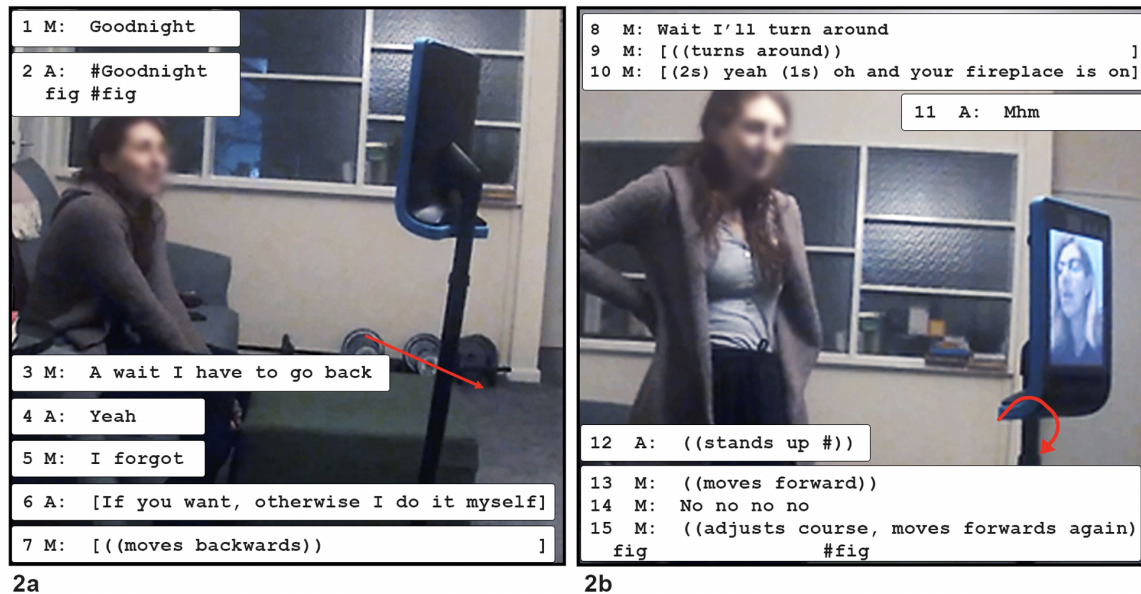


Fig. 4. Fragment 2.1: Showing the researcher seeing her mother off at the end of a visit

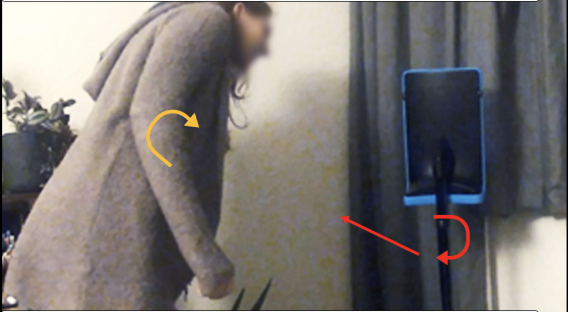
before the terminal components or at the first terminal component. But here we see that the MRP’s “necessity” for parking can lead to this more unusual pattern. As such, instead of ending the call, my mother exclaims, “A wait I have to go park”. Her use of this turn also deviates from an expected movement out of closing, where someone would signal that they are open to continuing the conversation but let the other speaker “lock” that movement by responding. My mother establishes that we are interrupting the closing altogether in one turn. This is in part due to the MRP simply requiring parking; it can’t be helped and it isn’t something we need to mutually agree on. I do tell her that I can park it myself but the prolonged sequence is already in motion; she proceeds to drive to the dock herself (“wait I’ll turn around”, line 8).

The closing sequence is thus prolonged with several more turns. At this point we haven’t entirely moved out of closing, we are still working towards it. Despite our intentions to say goodbye however, the duration of this sequence is dependent on however long it will take for my mother to park. It should be noted also, that the additional turns create more space during which further sequence types that can more drastically disrupt the closing can occur [5].

In addition, as the sequence takes place along with movement around my flat, the environment—our seeing it whilst moving through it—provides more opportunities for interactions too. Indeed, in 2b, as she turns around, my mother notices that the electric fireplace is on and comments on it. We can see in this, the basic mobility of the MRP and the ability of the user to do casual ‘looking’ (explored in a later fragment); this is crucial as a resource brought to bear during moments like this, in this case prolonging the ‘goodbye’. This happened often in our interactions. For this particular case, we were both quite tired, and although the fireplace is brought into play, I do not take it up as a possible opening for further talk (instead: “Mhm”).

As frequently occurred, docking is not a trivial activity and requires some measure of skill (and practice). So, some trouble is encountered on the journey to the dock. In 2b, the angle the MRP arrived at after the turn is not appropriate;

M finds herself driving towards the dining table, then accounts for the trouble with a “no no no no”—almost as if she is talking to the MRP (which she named “Yonas”), asking it to stop, whilst alerting me to the emergence of a problem. This time M fixes the problem herself by stopping, and adjusting her angle to face the right direction. She then proceeds to move forwards in a straight line, and as we see a second later, in 2c, she arrives close enough to the docking station so that she can park.

| | |
|---|---|
| 16 M: A he found it (1s) [docking] | 24 M: Yeah |
| 17 M: [((#moves towards dock))] | 25 A: Great |
| 18 A: [Ah good] | 26 A: ((leans between wall and MRP)) |
| 19 M: let's see if he does it correctly fig #fig | 27 MRP: [((brakes come down, makes noise))] |
|  | 28 M: [bzzz] |
| 20 MRP: ((stops in front of dock)) | 29 A: Okay |
| 21 MRP: [((moves into dock))] | 30 M: It's parking he parked |
| 22 M: [It goes by itself now I don't need to do anything] | 31 A: [Well done yeah] |
| 23 A: Yeah if you clicked docking yea | 32 M: [Yayy] |
| | 33 M: Bye Yonas # |
| | 34 A: [Hah hah bye Yonas bye mum] |
| | 35 A: [((Waves with right hand))] |
| | 36 M: Bye my darling fig #fig |

2c

2d

Fig. 5. Fragment 2.2: Showing the researcher seeing her mother off at the end of a visit

In 2c, M finds the docking button and announces that. I lean in closer to look at her; as we saw in the previous fragment, as a local user of the MRP, I became sensitive towards how visible I was to the remote user—and here part of doing ‘departure’ and escorting involves maintaining my own visibility to M (i.e. working to support some measure of reciprocity of perspectives [1]). Similarly, M displays her involvement in or engagement with docking by narrating the process: “let’s see if he does it correctly”, “it goes by itself now”. This mutual show of engagement—between local and remote, in what the MRP is doing and being made to do—is vital to what makes the visit.

In 2d, the MRP has been docked, M playfully imitates the buzzing sound of the restraining mechanism. She then announces that it has parked and I jokingly congratulate her for managing to do it all without help. Often at this stage in a departure, further topics of conversation might emerge, temporarily moving us out of closing. There have been visits where I had been standing in that position—leaning between the wall and the MRP—for extensive periods of time chatting with my mother. This is perhaps akin to a ‘doorway conversation’.

In this instance I simply congratulate my mother at the successful parking and say goodbye. My mother even says goodbye to the MRP, which she often refers to and treats as a person (“Yonas”)—this separation between the equipment and the user was strategic and routinely plays a role in coordination with remote users. We suggest it is ‘strategic’ because it enables remote users to momentarily call attention to, to foreground, the MRP itself, whereas during more

habitual long-term use, the MRP naturally loses some elements of its topicality owing to its immersion into mundanity. In other words, it is a method to account for possible troubles in interaction between local and remote user.

This fragment shows how an MRP visit closes, and like the arrival, demonstrates how the particularities of the MRP play a role in social interaction. For instance, having to drive to the dock gives someone various opportunities to expand on their goodbyes, to notice and spot things which open up further topics for discussion (e.g., the fireplace). We don't entirely move out of closing, as parking is a necessary part of closing, but the closing sequence, from its initial close components to the terminal components (goodbye) is likely to contain many more turns. Indeed as we see here, (although not necessarily always the case) upon successful parking, the closing sequence is not re-initiated—it is mutually acknowledged that a closing is taking place. It is simply completed.

Because the MRP is quite slow, these possibilities arise at a certain temporal pace. Of course, this is not a necessary condition for mediated intimacy, and the slowness of the medium is not by design. It is simply another interactional possibility furnished by the MRP that may be used as a resource by local or remote.

Finally we note that like arrivals, there is a significant role of the capabilities of the MRP both enabling the remote user to engage in courses of action (like moving away from the dock, or moving to the dock), but also for the local user to accommodate, attend to, and overall to *care for* the MRP user. In this sense, whilst arrivals and departures have their technical considerations (e.g., is the MRP functioning in a desired way?), they also integrate demonstrations of care for one another in and as intimate relations.

4.4 Looking around

In the next two fragments we want to switch from the more 'procedural' features of visits, and turn to look at how the MRP enabled more 'diffuse' practices of dwelling with one another. We start with an obvious consequence of the mobility of the MRP, which is the ability to (relatively) independently 'look around'. In the final fragment after this one we then examine what it means to simply 'be together'.

Quite naturally visits contained many instances of 'looking around' and also more pointedly 'looking at things'. The basic mobility of the MRP enabled both of these—i.e. unfocussed and more focused 'looking'. Whilst this may seem trivial, it forms a key part of much of what is entailed in a visit, how a domestic space is treated both by occupant and visitor, in and as the situation of their particular relationship. For instance, a remote user might comment on objects visible in the environment as they moved about—perhaps brought about as a result of a change of perspective as seen in the previous fragment with M commenting on the fireplace. The remote user might notice new items in the flat—new furniture, kitchen appliances, plants, or simply just changes in the view out of the window. 'Looking around' in the course of doing other things with the MRP user would lead to conversations about matters of personal significance to myself and the given visitor (e.g., relating to a shared interest, or items with family history). The long-term use of the MRP, repeated and habitual visits and the access to my personal space over time allowed something like the features of 'dwelling' to arise, where changes (plants growing, changes in the view from the window with the seasons, a new object, etc.) became available for topicalisation in talk, and in doing this, myself and a visitor such as my mother or partner could better maintain a sense of growing together even in a period where we were essentially forced to be apart.

Here we show a fragment from the first time my mother visited the flat. We chose this early interaction as it is a clearer example of a phenomenon that persisted. Shorter instances of looking at things, amidst other conversations, happened often in all future interactions, however we draw on this moment because it furnishes us with a distinct instance of this kind of looking—in this case, the novelty of the MRP and how it enabled my mother to 'check out' my accommodation.



Fig. 6. Fragment 3.1: Showing the researcher preparing coffee whilst her mother explores the kitchen

In this fragment, my mother and I are in the kitchen. I am making coffee whilst she is looking around. We have taken up stances in the space that anticipate the thing being done. So, my mother is positioned in the middle of the kitchen—a straight line from the door through which we came into the room—towards which she will subsequently move backwards. Meanwhile, I will be moving back and forth to the two sides of counters, in a perpendicular path.

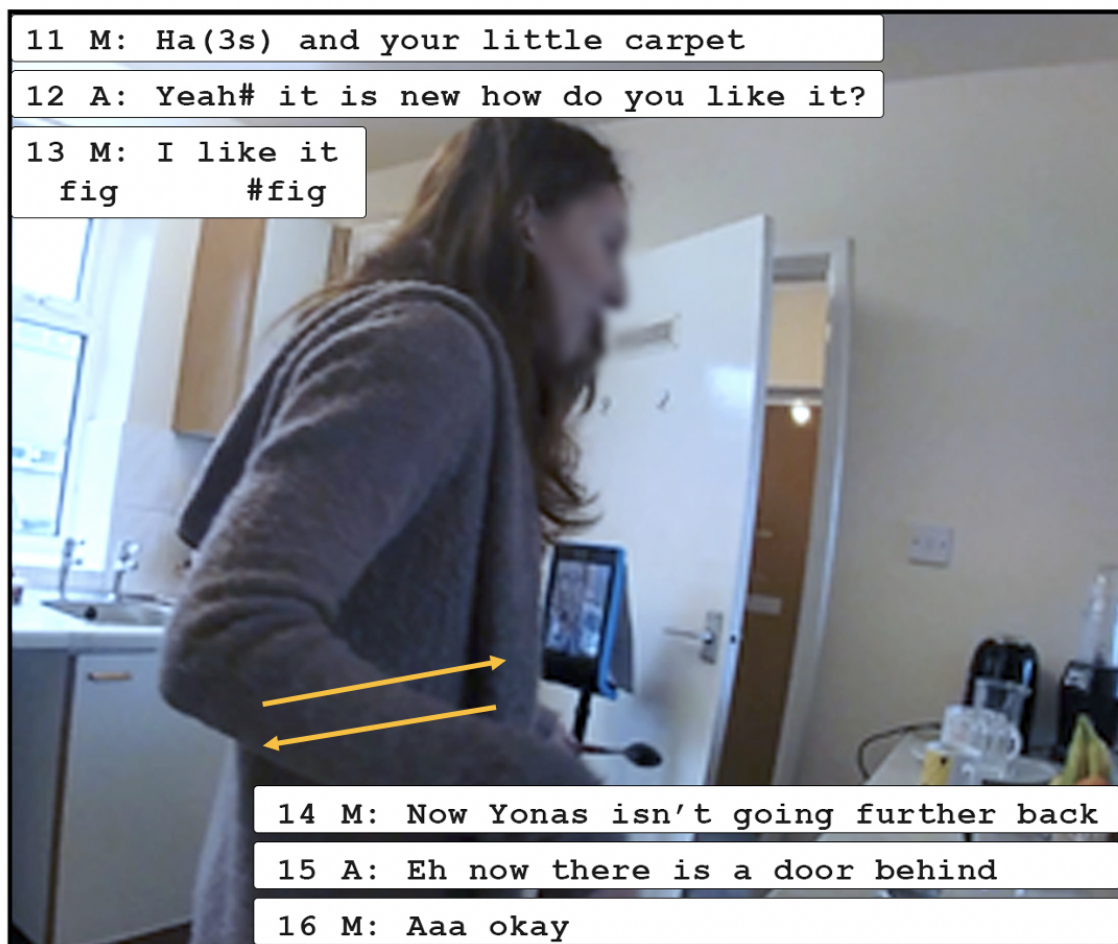
M sees the microwave in front of her (3a, not visible in pictures) and exclaims “ah and here is the microwave”. She then starts moving backwards in reverse, and at the same time I move to the other side of the kitchen, coordinating our positions in the kitchen.

Whilst still moving, in 3b, she says “come back a bit to see the kitchen”. The imperative “come back”, here, is not directed at me but at the robot. We can infer this because I was not in her line of sight, as well as from the fact that she regularly addresses the MRP in this way. With such remarks, she is building a distinction between the MRP and herself. This can also be heard as an account of what she is trying to do and perhaps indicate that she finds the MRP a little challenging. (We have also seen this behaviour in a study of assistance recruitment during a collaborative task [4].) While she is still moving in reverse, I switch back to the side of the sink. We nearly bump into each other but I manage to avoid the robot. It’s worth noting here that the robot is moving rather slowly in comparison to a local user and, as we have described, the local user often needs to take into account the capabilities of the MRP, such as in this case an inability to glance behind. Whilst we are both able to move independently and ‘multi-task’ to some degree, there is still a significant asymmetry in capabilities between us—I can move faster as well as interact with objects in the environment. This is what Luff et al. describe as a “fractured ecology”, as the remote visitor and I have different access to the environment and what is happening in it, as well as differing capabilities to monitor each other’s gaze and intentions, thus affecting the understanding of our mutual perspectives [36].

As my mother almost reaches the furthest back possible, she accounts for her noticing the little chair with “and the little chair”. We have translated this from Greek, in which little chair is a single word in diminutive form. The chair is indeed little in size, but the phrase also carries an endearing meaning. It’s a chair I have had since childhood. Without having to look, (knowing what exists in my space, and broadly having some familiarity with what my mother will be

able to see from her position and what she might recognise), I understand what she is referring to. As we see later, my mother clearly names the things she notices, as the first step towards topicalising them, which also contributes towards us mutually orienting to the objects. Because mutual looking is somewhat difficult with the MRP—one can not estimate gaze easily, although gross direction is available—users need to develop methods of aligning practices of looking, particularly at objects. Here, the naming of objects verbally provides for this between my mother and myself.

I proceed to explain to my mother that I now use it to reach the window handles, briefly looking up and pointing at the windows before moving back to the right side of the kitchen and continuing to prepare the coffee. Earlier work on video-mediated conversations has looked at how showing things is accomplished from an EMCA perspective [32, 33]. Whilst a local user might still bring an object into view of the remote MRP user similar to video conferencing, we see here that conversation around objects can be initiated (or sustained) through the remote user's autonomous looking around in the environment (coupled with the aforementioned methods of coordinated looking).



3c

Fig. 7. Fragment 3.2: Showing the researcher preparing coffee whilst her mother explores the kitchen

In 3c, no longer moving backwards, M points out the carpet. Again using a diminutive form to refer to it, more as a form of endearment than a comment on the size. We had previously spoken about how I wanted a carpet for the kitchen. “Yeah do you like it?” I ask her, without shifting my attention from the coffee. “I like it!” she replies with some emphasis. M mentions a problem with “Yonas” the MRP not “going further back”: M is unable to see the door of course, which I remind her of. As I finish making the coffee, we continue talking about the kitchen.

One of the possibilities opened up by the MRP is the autonomy of looking, which is enabled both by its mobility and some measure of legible ‘intentionality’—that I can roughly see what M is likely looking at by inspecting the MRP’s orientation. This fragment shows just some of the ways in which M is able to locate parts of the kitchen on her own (“here is the microwave”). She is also able to topicalise things which are meaningful to our relationship (“and the little chair”). In and through this she can demonstrate a parental interest in where I am living and what my flat is like. The importance of this has been noted in previous studies of mediated intimacy [59]. The MRP, then, allows the remote user to do that and demonstrate that they are doing it on their own accord, rather than relying on the local user to show them things. It is not a one-sided interaction, but one in which the remote user can also take initiative and influence the definition of the situation, unlike, for example, when a home is being shown in video-calling, where the home’s host can control what the other person is seeing [34].

Here, the remote user themselves is instead able to select what areas of the environment to look at and topicalise (and need not request it as they’d need to in the video-calling example). At the same time the local user loses some resources to act as a guide. The fractured ecology of the situation may limit the host’s control of the situation, as they are not entirely able to monitor the remote user’s gaze [36]. The remote user can ‘hide’ in a sense behind the flatness of robot’s screen and lower fidelity of the camera—they can even zoom to parts of their view without the local user knowing they are doing this. So whilst limited in their mobility and perceptual abilities, the remote user has more freedom in leading the activity.

At the same time, the fragment also reveals some of the ways the local user—myself—must further accommodate the remote user’s autonomy of looking, by stepping out of the way, so as to avoid obstructing their view. Further, mutual awareness within the space of the kitchen is still occasionally problematic as I go about preparing coffee.

4.5 Being together

Some aspects of visitors using the MRP were what might otherwise seem to be non-moments: gaps in more obvious moments of interaction that nevertheless are replete with possibilities for sharing intimacy. These are difficult to describe, in that I found many points where I was simply with the visitor and seemingly doing little more than sharing the space. The physicality of the MRP enables a visitor to do this readily: to be ‘present’ with local user, without much conversation, little obvious ‘interaction’ in a conventional sense, but nonetheless a strong sense of being together. These were common throughout in interactions via the MRP.

In the following fragment I am making coffee in the kitchen whilst my partner, J, is observing me (and he is himself eating his lunch). Making coffee often happened in the beginning of a visit. I would then take my coffee in the living room and continue a conversation with the visitor.

I told J to follow me into the kitchen where I would make a coffee. In 4a, after arriving in the kitchen and looking around, J sees me by the counter and approaches. In 4b, J has positioned himself next to me to watch me making coffee as he is eating his lunch. He comments “hi smiling” presumably having seen that I was smiling and I briefly look sideways at him.



Fig. 8. Fragment 4.1: Showing the researcher making coffee while her partner is observing her

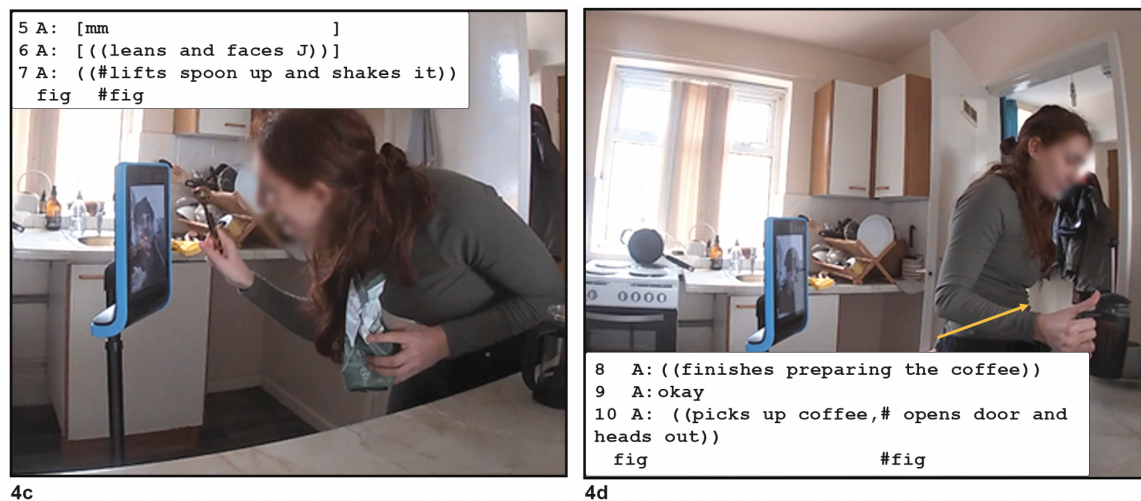


Fig. 9. Fragment 4.2: Showing the researcher making coffee while her partner is observing her

In 4c, a second later, I respond with an “mm?”. As I do this I turn and lean towards him so that my face can be in his frame of view. I also lift the spoon I was using, making it visible to him, and wave it playfully. To me, the spoon is significant because we bought it together; so J’s intentional presence by my side watching me, and the relevance of the spoon as not just any spoon but *this particular spoon* then leads to the moment in 4c. In 4d, I finish making the coffee, “okay”. I pick up the coffee, open the door behind and exit the kitchen, while J follows me.

In 4e, J turns towards the door to exit the kitchen too. Given the slower speed of the MRP, it takes him a while to follow me. The door begins to close by itself while he is still moving through it. Seeing this unfold, I say “quick before the door closes”. As he is moving, J screams “aaa” but manages to exit on time. It is a moment of levity in amidst the



Fig. 10. Fragment 4.3: Showing the researcher making coffee while her partner is observing her

routine of coffee making, which comes about in part because of the physical capabilities of the MRP, coupled with a lapse of sorts from myself in ensuring J could exit the kitchen so as to move along with me.

There are many technical aspects we could draw out of this fragment. The resolution of the camera and the see-ability of the spoon as ‘this’ particular spoon, or the difficulties in moving swiftly around with the MRP. Yet at the same time, the distinctive formation of 4a points to the ability of the visitor and myself to very recognisably ‘be together’ in some sense. As such this fragment attempts to capture some of the subtleties of intimate ‘non-moments’ that would happen regularly across my use of the MRP in the flat. Being in the presence of the other person, even if they are not doing much can be enough. Speculatively, if J were to watch me make the coffee via a phone or laptop using video call, this sense of ‘being together’ would be different because the added dimension of mobile autonomy would be absent. Thus, it is perhaps the fact that he is observing me on his own more autonomous terms that makes a difference. As such, the possibilities of this physical autonomy of the remote user helped make such presence feel intimate. He chose to move to the position in 4a and sit and wait for me. This formation enables the smile, commented in 4b, as a fleeting and routine smile done and readily shared with the other in the course of a familiar activity of making coffee.

We also see an example of playfulness in this fragment. Instead of holding the door open for J, I let the door close on its own and leave J to race to get out on time. Both of us laugh about it. Simply, this arises from the fact that visits like this with the MRP mean two independently moving people in this space and not one controlling the position and view of the other. At the same time the (opportunistic) joke which unfolds acknowledges the limitations of the remote user. In having him “race” against the speed of the closing door, the slow speed of the MRP is funny. In the context of intimate interactions, in a domestic situation, the limitations of the MRP may well be approached in a very different way or attitude to other contexts. In our case, they had potential to become sources of play and conversation rather than frustration, something which has also been noted in the case of network distortions in couples’ video calls [49].

Table 1. Summary of Features

| Features of MRP | Interaction possibilities |
|-------------------------------------|--|
| Access to the local environment | Pre-visit preparation, the environment as part of self-presentation, less control over self-presentation |
| Remote user autonomy | Looking and topicalisation of the environment, spontaneity, multi-tasking, playfulness, remote user can express engagement in relationship/interaction, being together as a mutually achieved activity |
| Local user accommodating the remote | Opportunity for local user to care for the remote user, local user adjusting to the remote when framing self and showing objects |

5 DISCUSSION

Instead of concerning ourselves with the ways in which MRP attempt to replicate the experience of ‘being there’ in-person, we have sought to select a few vignettes that exhibit how MRP visits are practically organised to bring about arrivals and departures, as well as the more diffuse activities of looking around, and sharing a space together. Our fragments drawn from the first author’s personal video recordings have highlighted how the practical organisation of remote and local MRP users is able to produce and sustain moments of intimacy. We first summarise the MRP’s mobility aspects, then outline features specific to MRP that are highlighted by our study, and finally discuss the MRP’s capability to mediate intimacy or closeness in more depth.

5.1 The mobility of MRP

We find that the MRP has specific mobility capabilities and limitations that are central to what it enables and how users orient towards the interaction through it. Through the MRP, the remote user is able to move in any (non-obstructed) direction, rotate their robotic ‘body’ whilst static or moving, and adjust their height. Thus, they are able to move within the local environment and control their field of vision so as to look at the environment from various positions and angles. Notably, doing this means they are also moving the position of their face and affect how accessible it is to local users (this can be intentional or incidental). But the MRP’s movement in space is still limited and therefore so is what the remote user can do by moving. Attributes of the environment, such as narrow passages and closed doors can block its movement. The MRP is also slow (e.g., fragment 4) and sometimes it simply doesn’t work as expected. Encounters of trouble and their resolutions are nonetheless a routine part of MRP interactions [15]. Nevertheless, and in spite of these challenges, MRP capabilities allow the remote user to do more (demonstrate intentionality, topicalise the environment) and change the kind of control each party has over the situation (the remote user can control the environment but not the local’s field of vision).

5.2 Features specific to MRP

The aim of this study has been to examine MRP for its unique interactional capabilities and unpack any assumptions about the medium that are commonly taken for granted. Taking the approach of Hollan and Stornetta in *Beyond Being There*, we are not interested in how well the medium provides a simulacra of in-person interactions, but rather what mechanisms it specifically provides and how these are used to serve communicative needs; this is in contrast with the ways in which MRP tend to be portrayed in marketing material, treating them uncritically as mediators of the

experience of 'being there'. In contrast, we think MRP have various qualities which make them distinct: to this end, we uncovered several developed practices in use, as demonstrated in our chosen fragments and outlined in table 1.

One of the most distinct features of this MRP use is that it allows the remote user access to the local environment—they can see and, to the extent the technology permits, autonomously explore much of it. Therefore, as discussed earlier, when used in the home setting this leads to the environment (the apartment) becoming a greater and more diverse feature of interactional relevance (e.g., self-presentation, 'looking around' together) than for more conventional video calling. In addition, the whole body of the local user can be seen from any angle. This creates the need for preparation on the part of the local user before visits. Whilst this may be seen as just more work for the local user, it also enriches the interaction by enlarging its time-frame (the process starts at preparation) and—to use a Goffmanian metaphor—the 'stage' (there is more available in the environment). Decisions on what to leave in the space, how much to tidy, what to wear became part of MRP interactions. However, this is not necessarily always a benefit of MRP: whilst 'possibilities' may imply a positive connotation, we use it to express a range of potentialities for an MRP visit without wishing to prejudice their sentiment in interaction.

Through the lens with which we explore MRP we thus find that, unsurprisingly, mobility sets the medium apart. More specifically, it is the autonomy that is granted to the remote participant through their ability to move on their own that allows them to interact with the local user on a more equal level of communicative capabilities. With the ability to move comes the possibility to look around and comment on the environment, making it a topic of conversation [64]. Moreover, the remote user's mobility gives them a range of ways for expressing their interests and personality. The remote user can be spontaneous—they can arrive, leave and do things as they choose (within the limits of the MRP), without being reliant on the local user to pick up, hang up and show things, and therefore without necessarily having to plan and announce their intentions before doing so. As such, in topicalising the environment, the remote user can further express their interest in the local user's life and engage with them on their own initiative, giving their actions more weight in the interaction. Finally, this also allows for multitasking and playfulness, as the local user is able to converse with her visitor whilst doing other things, trusting that the visitor can use their mobility to follow along.

At the same time, the remote user's embodiment dictates that the local user needs to adjust their behaviour accordingly—to frame themselves within the remote user's vision but also in a way to 'look after' the robot. The local user is not in control of what the remote is seeing, and therefore act specifically to be visible to them—leaning closer, intentionally bring things into their view. At the same time, the local user accommodates for the remote's needs—moving around the robot, helping, being caring, and so on. As such, engagement within the interaction is required of both users for the social organisation of the visit.

5.3 MRP-mediated intimacy in home use

We have shown what MRP use in the domestic setting can look like. Although it is not the medium's primary use, there are people who do use it at home [46]. We found that the interactional possibilities of MRP can support intimate interactions between people in close personal relationships. The MRP's most prominent attribute is its mobility, which predominantly aids the achievement of intimacy through non-verbal communication and reduced boundaries. As noted in previous literature, intimacy involves communication that is more emotional and ambiguous (relying on inside jokes or common view of the world) [29]. Furthermore, embodied cues and coded, symbolic language can sometimes better carry personal and intimate meaning [29, 48]. The remote user here had the ability to communicate with embodied cues as well as perform acts that express interest and commitment in the local user's life—they could move close to look

at things together, 'sit' next to them as they prepare food, or actively explore the environment, displaying interest in the local user's place of living.

There are further secondary features of MRP that related to the achievement of mediated intimacy. Yang et al, highlight unpredictability as a positive attribute of MRP interactions in long-distance relationships, as the remote user can surprise the local with unplanned visits since they don't need to have their 'call' answered [63]. Indeed, in the first fragment, we show an element of this spontaneity even in relatively planned visits. Register and Henley, in their phenomenological exploration of intimacy, describe a similar idea in the theme of destiny and surprise [48]. In addition, we find that MRP can support the experience of time, another of Register and Henley's themes, by contextualising the interaction within the user's day as a visit, that encompasses a preparation, beginning, middle and ending, leaving perhaps a stronger mark of the experience [48]. This could be further explored with the scheme of conditions, constituents, and yields of intimacy presented by Vetere et al. [59]. In line with that, MRP suitably lends itself to the conditions of trust and commitment. Given the invasiveness of MRP in the local users' space, trust in the remote user is likely required, and at the same time it is a way for it to be expressed and practiced in a mundane but meaningful way. Commitment is also required and expressed as it is a medium that requires more effort from the users in attending to different capabilities, like increased mobility and greater autonomy. Following with Vetere et al. MRP also particularly support the constituent of reciprocity in that it grants this autonomy to both users [59]. Although the remote user is somewhat limited in what they can do, they are still able to move and invite the local user to adjust to *them* rather than be entirely passive in the activities.

Furthermore, playfulness has not been specifically examined in the mediated intimacy literature, but we found here that it was a rather prominent element of the interactions. Inhabiting an MRP and interacting with a robotic body are, perhaps inherently, amusing situations that add a layer of fun to the interaction. The users took advantage of the medium's mobility to play for fun, such as by chasing each other, which expressed the remote users' autonomy and highlighted their presence in the local user's life. Seeing intimacy as not a specific 'interaction' but an attribute of everyday interactions with close family and friends [56], we nonetheless find that the features of MRP suit, to some degree, the needs of such attributes.

Finally, many aspects of mediated intimacy from MRP visits feel like 'dwelling'. Writing about a medium that is significantly different from MRP's apparent 'presence', O'Hara et al. [44] point out that in WhatsApp, "togetherness and intimacy are enacted through small, continuous traces of narrative, of tellings and tidbits, noticings and thoughts, shared images and lingering pauses; this is constitutive of dwelling". Their underlying argument is that the richness needed for dwelling doesn't reside in the fidelity of interaction to in-person interaction, but in the flexibility of engagement and in the indexicality of what can be achieved in a medium. Now, similar things might be said of MRP in the home. MRP is richer than standard video calling, but the crucial point is that the value of the presence is in the dwelling—the shared togetherness—not in measuring up to an in-person equivalent. The technology does not disappear; indeed it is omnirelevant [50], but even when it is clearly artificial or has gone wrong, as long as it can be treated as part of the ways of being together then it is constitutive of 'dwelling'. The threshold for such presence does not rely on imitative fidelity to in-person, but rather intersubjectivity. As Biocca argues [2], this is presence characterised by actions perceived as *interdependent* with the actions of others.

5.4 Limitations and future work

There are many interactional issues with MRP that occurred during the study period, but limited space precludes sufficient examination in a single paper. Further studies could explore negotiating asymmetries in perspectives, the accomplishment of positioning and framing oneself, or dealing with many different forms of technical and social trouble.

Our study trades off a broad understanding of domestic MRP use by focusing on just one household. Future studies would also benefit from looking into MRP use in different and more diverse types of families. Whilst for the present participants the use assumed the format of a visit, this may look different in other kinds of households, such as with children and more family members. The practices of long distance couples may also vary. It is worth noting that the first author and her partner have been in a long distance relationship for several years and have never lived together; as such, they did not have an inclination to simulate living together as other couples might.

Finally, our study has specifically looked at the experience from the perspective of the local user, both in terms of the data as well as the autobiographical perspective of the first author. For a complete understanding of the medium, future studies should capture the experience of the remote user as well.

6 CONCLUSION

This study aimed to explore the interactional possibilities of MRP when used in the home setting. We conducted a longitudinal, autobiographic ethnography, in which the first author used the MRP to communicate with close family from her home for a period of six months. We presented fragments of use where calls were conducted as visits—following sequential procedure of arrivals and departures as well as typical activities performed during the visit driven by the capabilities of the MRP medium. We find that the autonomous movement of MRP enables its users to interact on a more equal level—with both participants being able to show initiative, express interests and exert influence over the situation. It also allows for more natural conversations, with much playfulness and spontaneity. These features set MRP apart from traditional video calling, not because MRP use simulates ‘being there’ in-person as some marketing material suggests, but because it shapes its own set of interactional possibilities that are drawn upon to achieve a sense of intimate dwelling or ‘being together’.

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