

Talking Intelligence

A Historical and Conceptual Exploration of Speech-based Human-machine Interaction in Smart Homes

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ABSTRACT

This paper offers a historical and conceptual analysis of the potential role of speech-based interaction in smart home settings. By examining current experiences in smart homes and by drawing analogies between human-machine interaction and master-servant interaction historically, the paper will contend that some of the bolder claims attending to speech as a mode of interaction distract from some of the key problems of good interaction design.

Categories and Subject Descriptors

J.4. Social and Behavioural Sciences.

General Terms

Design, Human Factors

Keywords

Human-machine interaction (HCI), conceptual analysis, smart homes, domestic appliances, servants, speech interfaces, history

1. INTRODUCTION

For years now the HCI community has been intoxicated with the imminence of speech-based interaction with computers. The herald call has persistently been heard: "If only we could, but when?" Leaving aside the reasons for the delay in the emergence of these interfaces, there are a number of reasons for the addiction to them: with speech interaction, many think that the 'interface' as we have come to know it (especially the WIMP interface), could be done away with; with speech, anyone will be able to use computers regardless of training or skill (after all, everyone can talk); and lastly, many researchers think that speech-based interaction is simply easier. As some proclaim: the brain is wired for speech, speech comes easily, why not use it with machines?

But beyond these perfectly plausible reasons are ideas about wholly different, often bold and radical notions to do with what human-machine interaction might attain with speech as its

interlocutor. If Turing [14] claimed that tricking people in to thinking a machine was human was a test of machine intelligence then, today, authors like Nass and Brave [11] claim that, with speech interfaces, computers will be able to do much more for us because they are much more like us. In their view, speech interaction is a measure of how computing has, can, and indeed ought to, grow up. Valves, rocker switches and gears, tapes, VDUs and punch cards were merely the DNA of computing; the WIMP interface an evolutionary step; speech achieves the ultimate embodiment through which computers will be able to enact their intelligence.

Put this way, admittedly in rather florid language, the claims might seem exaggerated, quixotic, and perhaps best ignored. But in practice such grand hopes, albeit often implied rather than stated fully, do indeed show themselves in research on speech interaction. Discussions about speech interaction might refer to 'ease of use' and 'social exclusion' as pretexts, but what those discussions are often about are machines that will, one day, somehow, become *like us* because they *talk* like us.

A completely different strand of research, this time in the ubiquitous or pervasive computing perspectives, has a similar view but on another domain or type of technology. It is a view that sometimes seems to be claiming quite modest and seemingly prosaic things about what new interfaces with computers can let users do and yet at other times seems to be claiming something very grand indeed. It is, in the latter case, something of an intoxication for some researchers, a kind of holy grail that they yearn for and seek but have as yet not found. Thus it is one can imagine them saying: "If only we could, but when?" We are thinking here about research into smart homes by which we mean computer-based smart homes (rather than homes made smart by the building materials used in their construction, for example. See [2].)

The term smart home goes back a long way, first being coined in the early Sixties, and can mean some things that seem rather innocuous, such as integrating all the computer-based artifacts and devices in a house so as to unify the interface to all. Here, the term 'smart' in effect means ease of use. This, in turn, also sometimes means doing away with the WIMP interface and turning towards other modalities of interaction, such as touch sensitive screens, handhelds and yes, speech. Here the goal is to design home technologies that help people do smart things. Design in this view focuses on such things as letting users manipulate the powers of interactive systems to leverage new

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opportunities to express themselves when they are at home, for instance; or to ornament their home environment in novel ways for another example; or to communicate from and within the home to others elsewhere in time and space for a third.

These are but the prosaic goals: at the bolder end of the scale are those researchers who want to design homes that are smart in themselves: here it is not the people that are made smart, it's the systems embedded in the building itself that are smart. (See [13]). The latter approach is more common in the ubicomp and pervasive computing domain. Here, the turn to novel interfaces and speech in particular is not merely intended to allow ease of use but also, and perhaps more importantly, to allow for and support ways of 'being' with computers that are much more ambitious and radical than what has hitherto been imagined possible. With smart homes of this kind, the hope is that computers can judge the emotional state of the user, for example, adjusting the lighting in the home to relax the agitated mind or to wake up the slothful one; with smart home technology of this kind, kids can learn at home in ways that have not been possible before; with 'smart' smart homes, loneliness and isolation can be allayed. The goal is not to make the computer a better tool for the user; rather, the goal is to make the computer a partner for the user. Thus Aldrich [1], in a review of the history of the term, defines smart homes as "residence(s) equipped with [] technology which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security, and entertainment". In this view, smart home research is not about designing for ease of use or ubiquitous access, then; this research is about making technologies in the home *like us* because they think *for us*.

In this paper, we want to try and draw these two strands of research together, by positing the suggestion that an extreme take on speech interaction and an extreme take on what smart home technologies might have in common are ideas about the role of computers and their relationship with people. More particularly, if the ambitions of speech interfaces researchers were melded with those of the smart home brigade, one would find the following declaration a unifying credo:

"...users will not simply talk at and listen to computers, nor will computers simply talk at and listen to users. Instead, people and computers will cooperatively speak with one another." [11 p184].

Our choice to bring these two together is not arbitrary or for the convenience of argument. Nor are we concerned with exploring what the respective claims might entail: the one a kind of philosophical possibility, a claim about what it might 'mean to say' that bricks and mortar and a few silicon chips are smart; the other a technological agenda relating to how elaborate and complex the registers of language need to be for a machine to pass muster as a 'cooperative, conversational partner'. No, our concern is somewhat more specific and yet general, combining some ethnographic data, some history and some conceptual analysis.

Let us put it this way: we are bringing these strands together because in our studies of smart homes we have wanted to understand why it is that people (users in these contexts) say, 'I wish I could just tell it what to do'. This has led us to look backwards, historically, at the evolution of tools and technology in the home to the point where many tasks that currently we hope

computers could do were, then, done by people, servants in any other name, who were commanded by speech. Our investigations in to this have led us to believe that the interaction between what was then called 'master and servant' can be treated as an analogue for contemporary human-machine interaction. Though the term master and servant offends modern sensibilities, and though, further, this relationship might seem a long way from claims about interfaces, we think that there are lessons we can take from an historical examination of this relationship. We will argue that the patternings of human relationships embodied in the master-servant dyad can be seen to have implications for the patternings likely to evolve with human-machine dyads.

2. SMART HOMES: OUR OWN CASE STUDY

The study we want to start with is one we undertook for the UK mobile operator, Orange. The Orange@home project was an attempt to explore what a smart home might be and how it would feel to live within one. It entailed converting an old house in to a state-of-the-art smart home designed around integrated systems that could allow the users—members of the families that volunteered to stay—to do everything from control the locks on the doors to run a bath. Our own task involved interviewing and observing the users and analysing what their experience indicated about the future design of smart home technologies. Orange obviously had an interest in those applications and devices that could be supported by 3G networks; our own concern was with this and any of the possible technological instantiations that smart home settings might provide [12].

More particularly, the project involving the Orange@home experience highlighted a number of issues, not all of which are pertinent to our topic here, though worth mentioning to give some sense of what smart homes are about. Smart homes, including the one that Orange built, do offer values of various kinds (and this is to leave aside, for the moment, any grand claims about smartness and so forth). For example, in the Orange@home setting, several families found delight in the use of webcams for special family events. This was especially so when remote uncles and aunts could use the webcams to see the height and looks of their nieces and nephews. The deployment of very large projection screens too, had, in this house anyway, another set of values: it led to the invasion of the parental bedroom by children seeking the ultimate multimedia experience: the main bedroom in the house had the largest screen.

Yet smart homes, and this included the Orange@home house, also offer numerous sources of frustration and complaint, and these are perhaps more salient to our larger argument. Indeed, in the balance of things, these frustrations and complaints were greater than the 'added values' of smart homes, as the Orange marketeers would put it. In the Orange@home, there were no wall mounted light switches, for example, and the handheld devices provided as an alternative were often hard to find. Access to the central multimedia entertainment centre allowed anyone to control the music replayed in any of the rooms and this often resulted in teenage children having their preferred pop music blasting out of every speaker, against the express wishes of parents and, if not parents, certainly their siblings. Such centralised systems seem commonplace in smart homes though some deal with this problem of control in more sensitive ways than others. A further problem

related to such systems has to do with locks and security. In the Orange house, for example, the door locks could be centrally controlled but it was difficult to select some doors and not others. An additional concern, one that appears common to all smart homes, is that the systems occasionally crash and thus lock everyone in or out. Such failures are not always visible straight away, either. On more than one occasion, children were found to have been locked out of the Orange@home house, sometimes for extended periods of time, without the parents knowing. And for one final example, a problem that seems to afflict the majority of smart homes has to do with such apparently prosaic tasks of controlling central heating systems. Smart homes such as the Orange one require navigation through numerous screens that offer not just heating control but control for many other things too: the washing machine, the running of baths, access to the Internet. All these options make for distraction and muddle and confusion. Some of the people we interviewed explained that they would avoid these problems by keeping the control of devices separated rather than integrated. In their view this appliance-like approach would make things easier to use.

Smart homes, then, at least the ones that have been ‘lived in’ (and disregarding what that means for the moment), do not offer entirely positive experiences, though there are certainly joys to be found. The negative experiences are essentially of two kinds: related to unnecessary complexity, having to do in large part with ‘solutions’ that were thought both substitutive of previously devised ones and which are more ‘integrated’ than those ‘prior art’ solutions; and second, to a lack of control that those solutions produce.

More precisely, the end result of these various experiences, the way the technologies within smart homes are integrated, the design of their control dialogues, their occasional failure and so forth, lead to a general feeling that smart home technologies are a step beyond what is practical or desirable. Smart home technologies combine poor usability with inappropriateness; excessive integration and deficient centralisation; the problems that smart home ‘solutions’ produce are made conspicuous by the lack of robustness. In general, the consensus from user studies is that the future is not so bright for smart homes, Orange’s included.

How does one learn from such experiences? One could assume that part of the problem here is that the Orange@home experience was just badly done and that other instantiations might afford better experiences; another interpretation might be that, however well executed this particular smart house, the technology used in it had not yet reached a point of development where ease-of-use is attainable and so these complaints ought to be disregarded. Indeed, many of the families who occupied the Orange home thought that: in their view, smart homes were just a step too far for current technology.

These seem rather pessimistic views and are certainly not what we took from the Orange@home experience. Our own interpretation was driven in large part by the stubborn enthusiasm for the prospect of something better that all of our subjects exuded, despite their poor experience. This was reflected in their suggestions about how to create a better future. These were diverse, needless to say, and often related to the specifics of particular devices (preferences for the order of screen dialogues

and such). But sometimes they were more general, and evoked more fundamental solutions.

One of these suggestions was mentioned by several of the Orange@home occupants and had to do with the use of voice as a method of control. Part of the hope that was exemplified in a quote about lights:

“Things must be simpler to do than in a normal house ... I don’t want to work through a menu just to turn off the lights.....I hope this will be improved with voice control.”

Now, one can interpret this suggestion—and others of equal intent—in various ways. One could assume that this comment was authoritatively indicating a direction to take. Since the user in question did not actually have any experience of voice activation in the Orange@home this was doubtful, though this user (and indeed others who mentioned speech interfaces as a way forward) had used voice interaction on telephones elsewhere for various commonplace interactions with banks and utility suppliers, for example. Our view was that comments such as this were better understood as laments, not recommendations. The phrase ‘I hope’ was meant to illustrate a contrast, a contrast between the inordinately complex and opaque interaction design of the systems in the smart home and the apparent ease with which words could be spoken within the home. The call to voice was not, in our view, a direction so much as a point on a compass: ‘Go this way’, these subjects were saying; they were not saying: ‘End up here’.

If it is a pointer, a way forward though not necessarily a goal, how does one explore it? Evidently there are some difficulties in building what one might call ‘experience prototypes’ for smart homes: the technology, even if only for trial purposes, is simply not there yet. A better and certainly more practical approach might be, as we have stated already, to look at the past. The contradiction here of course is that the technology we might be interested in was not then available—just as it is not now one can hear the mocking reader exclaim!—so how does one explore the past to discover what the future might be?

This is of course an old chestnut, but it seems to us that the trick here is to recognise that though one might use different technologies to do things, an essential aspect to the kind of work that goes in to ‘making a home’ has not altered that much. Now by this we do not literally mean that Victorians had surrogates for DVD players. Nor do we mean that the work was done less (or more in some cases) efficiently then now. It is not the work itself we are interested in, but rather in how instructions about its doing were issued. In other words, we think we can learn from the past by not looking at the work, but in how the work, irrespective of what it might be, was controlled, commanded, altered, managed, and reflected upon. Talk, speech, was central to this. It is similarities in this aspect of what-gets-done-in-the-home that we think can provide insights for the future.

3. A HOOK INTO THE PAST

One way we can get ourselves into this topic, an entry point if you like, is through a curio: in 1999, a UK TV channel set up a late Victorian London house and installed a family in it for three months [10]; this could be seen as a kind of reverse of Orange@home project. In this ‘Victorian house’, what one might call ‘the servant issue’ emerged as one of the key themes. A family in that position in 1900 would have employed a maid-of-

all-work and so such a person was provided here. But the twentieth century wife was uncomfortable with her role as mistress of this person and eventually fired the maid and choose to undertake all the housework herself despite the fact that she wanted to be able to come home and find all the work done:

“which is exactly what my little electric slaves do for me in 1999. I load up the washing machine, I go to work, I come back, it’s done. But I feel more comfortable about having an electronic device to do it for me than a human being” [10 p146-147].

The important words in this short, somewhat caustic comment are: ‘electric slaves’ versus ‘human beings’; and this contrast alludes to such concerns as the need for ‘exactness’; and, somewhat separately, the awkwardness or lack of comfort that comes with being the mistress of the household. It seems to us that something about smart homes and about how smart home technologies can be—ought to be—interacted with can be learnt from these juxtapositions and concerns.

How to control domestic workers was a subject of much discourse and indeed discord throughout the Victorian era and indeed right up to the Second World War. Managing servants was a major theme of advice books of which Mrs Beeton’s *Book of Household Management* [3], first published in 1859, is perhaps the best known.

Three aspects of the employment of domestic servants in the nineteenth century we think relevant to our concern with smart, ‘speech-enabled’ domestic appliances. The first is the issue of specificity or control: that is to say, having to do with the ‘what’ that servants were required to do. The second was regard to the trust that those ‘whats’ were executed. The third was the manner in which those ‘whats’ were done: here, though, it was whether they were done in ways that were discreet, behind closed doors, out of sight. A good servant was somehow ‘non-present’ despite the fact that a servant’s work might be everywhere, even in the most visible parts of the house.

The first issue is control. Flanders [6 p82] reports that “supervision extended to every aspect of the relationship between mistress and servant”. Beeton [3 p7] was very firm about this:

“We would point out here an error – and a grave one it is – into which some mistresses fall. They do not, when engaging a servant, expressly tell her all the duties which she will be expected to perform. This is an act of omission severely to be reprehended. Every portion of the work which the maid will have to do, should be plainly stated by the mistress, and understood by the servant. If this plan is not carefully adhered to, domestic contention is almost certainly to ensue, and this will not be easily settled; so that a change of servants, which is so much to be deprecated, is continually occurring.”

Another recommendation, by a later Victorian writer, was that the mistress should give every servant a book in which was written the daily work as well as other details of the household’s routine [6 p79]. In other words, servants should be given clear and very detailed job descriptions: exactitude was required, not ambiguity; specifics, not generalities.

The second issue had to do with trust. This might seem a long way from smart home technologies but as we shall see, it has its parallels. Servants “were frequently treated with distrust” [9 p268]. Whatever one might think of the master-servant relationship from our own point of view and time, the view from

the master’s point of view (or mistress’s) in the Victorian era was that servants were, in general, ‘not to be trusted’, most especially for tasks like the shopping. Beeton [3 p6] stated:

“It is desirable, unless an experienced and confidential housekeeper be kept, that the mistress should herself purchase all the provisions and stores needed for the house”.

Lack of trust and eagerness to get good value for money resulted in many householders undertaking the ordering themselves, even of household basics (see e.g. [8 p61]).

Nor were servants to be trusted with supplies once the goods had been purchased and delivered to the house and there are plenty of examples recorded of dishonest servants [8 p153-154]. “The good housewife” should “keep everything locked and under her supervision” [6 p116]. In larger establishments many housekeepers were given the control of household stores, in effect the role of the mistress, and exerted similar control over the lower servants: as a result, housekeepers were characterised as carrying large bunches of keys [8 p59-61, 14 p118]. A strict control was maintained even in small households. Ideally, according to the household management guides of the day, the mistress would give out what was needed in terms of food and household necessities from the locked storeroom daily. “Soap, candles, matches should all be handed out only as needed, otherwise servants would run riot with them” [6 p117]. This behaviour was confirmed by ex-maids. They reported having to ask for “every pot of jam or box of matches” and “never being allowed to use the key even after many years of service” [6 p83]. Another tells how her mistress “went into the storeroom every morning and gave out the stuff that had to be cooked and she would count out the prunes” [7 p15].

The master-servant relationship was then, at least from certain commentators’ points of view, a troubled one. But the troubles were not confined to control and trust; another had to do with visibility, the third issue we mentioned. Keeping servants meant having people in a home who were not members of the family whose home it was; keeping a servant also meant having one in the house who would not be of the same social class as the occupiers, an important distinction in nineteenth century Britain (as indeed it was and still is elsewhere). In his famous survey of York in 1901, Rowtree used the keeping of servants to distinguish between working class households and “higher orders” [7 p3]. This gave rise to tensions. Horn [7 p248] quotes former servant keepers saying that they welcomed not having to “keep up appearances” and preferred the privacy and freedom of a life without servants. Consequently, houses were designed to keep the servants out of sight and out of earshot. Moreover, there were rules about where servants could go, and when (see [5 p15]). In 1864, in his book *The Gentleman’s House*, architect Robert Kerr put privacy above “comfort, convenience and cheerfulness” and his greatest concern was that that “the Servants’ Department shall be separated from the Main House, so that what passes on either side of the boundary shall be both invisible and inaudible from the other” (quoted in [6 p1vii]). In an article in the *Fortnightly Review* of 1888, it is stated that “Life above stairs is as entirely severed from life below stairs as is the life of one house from another” [8 p123].

“It had always been the custom in great houses that servants....should keep out of sight as far as possible” [15 p263].

A gardener in a “big house” the middle of the twentieth century describes how the gardeners “must never be seen from the house” and although he had to go into the house every day to change the flowers, the “Lordship and Ladyship must never see you doing it” [4 p118-119].

In some cases, there were back stairs that linked the basements in which the servants often spent their days and the attics in which they slept [8 p123].

“Within the house, [the maids] were restricted to certain rooms – except when they were cleaning the others – and they had to use different entrances and staircases from the family when going to and from the house, or moving around within it” [7 p14].

Even in small houses in suburbia, the single servant girl was isolated [15 p235].

If they could not be invisible, servants were expected to be deferential and preferably silent. According to the *Servants Behaviour Book*, (quoted in [8 p121]) a servant should never reply without saying “Sir, Ma’am or Miss” and “every girl who wishes to live in a gentleman’s family must learn to keep guard over her tongue”. A manual issued by the Ladies Sanitary Association entitled *A Few Rules for the Manners of Servants in Good Families*, published in 1895, “contained over twenty pages of ‘Do’s and Don’ts’” including: “Never begin to talk to ladies or gentlemen, unless it be to deliver a message or to ask a necessary question and then do so in as few words as possible” (as quoted in [8 p121]). Servants were not to speak until spoken to and were advised not even to say “good morning” or “good night” other than in response to a similar greeting [6 p114, 8 p124]. Even as late as 1923, Mrs Beeton was advising that “a too-easy rule and undue familiarity are bad alike for mistress and maid” (as quoted in [7 p168]). And the mid-twentieth century gardener reports that he was told “Never speak to [Lordship and Ladyship] – not one word and no matter how urgent – until they speak to you” adding “Servants were just part of the machinery of the big house and people don’t thank machines” [4 p119].

4. TALKING HOMES: IMPLICATIONS FOR THE FUTURE OF SPEECH INTERFACES

All this seems a long way from speech interfaces, from the claim that smart homes in the twenty-first century won’t just offer machines to do all the work that servants once did, but would offer more, a sensitivity, a thoughtfulness, an intelligence that would result in spoken (quite literally!) dialogues of cooperation between human and machine.

Our claim, though, is that the master-servant dyad has its parallels with the human-computer dyad. The parallels are not, of course, exact or precise, but we think still useful. The key similarity in both dyads turns around a notion of intelligence or, if you prefer philosophical parlance, intentionality. The problem for the Victorian mistresses was taming the intentions of their servants. One problem was that words were often ambiguous and imperfect for this task. This was not necessarily the fault of words themselves, though; it was often the fault of the mistress who did not say enough. As we have seen, things were too often left unsaid, implied rather than stated, pointed toward tacitly rather than expressly. A second problem related to the fact that even if words were complete, the taming of intentions could be thwarted

by servants speaking back. This might not be due to their intentional rudeness but the servants sometimes had queries, and sometimes, one would imagine, suggestions about how something might be done more effectively or efficiently. What we have seen is that mistresses did not want such interactions, such answering back about what the servant ought to do. They simply wanted the servant to do it. And finally, servants would sometimes intentionally disobey commands and instructions. Their very will, if you like, led to their wilfulness. In sum, the dyad here had the following characteristics: an ineffective medium of exchange, namely verbal instruction; second, a tendency towards excessive interaction (back chat); and third a conflict of intentions and wills: the fact that more than one mind was operating in this dyad was not a benefit, but a source of trouble.

Now it is clear that the use of new computer-based technologies to undertake some of the ‘work’ needed to be done in today’s home, and the fact that speech can be used to control the machines that do some of this work, does not in and of itself lead one to recognise exact parallels between this human dyad and the human machine one. For one thing, what goes on in the home today and the technologies used to support that ‘work’ are not exact substitutes of what was done in the Victorian era. The issue here is not that our contemporary homes are full of domestic appliances and theirs were not, however. The issue is two fold: on the one hand a difference in both what and how it’s done; and on the other, in the processes through which those tasks were and are controlled, interacted with and affect the user.

As we now move to our conclusion it is necessary to remind ourselves of these important but easily muddled distinctions. Let’s take some examples. In the Victorian era, servants would light the fire at the start of each day and shake the embers at the end of each day and thus a central heating system of sorts was provided; maids would put the laundry on the clothes line when the wind was up and take it down when rain was threatening and thus a tumble dryer was provided; the cook would take instructions on what she should prepare and would then hand the list to a boy to collect from the nearby store: thus, an on-line e-grocery was provided not by the Internet but by young hands and legs. The issue, for us, is not that labour of this kind has become automated. We have seen that what is thought to make a modern home ‘smart’ is how more than automation is on offer. It is made smart by the ways that devices like central heating systems, washing machines and devices that store grocery shopping like fridges and larders are capable of doing ‘the work’ in ways that are sensitive to the ‘needs’ of the user.

The key is what this sensitivity might entail and whether it results in actions which are, as it were, mechanical, or by way of contrast, demonstrably thoughtful, sensitive, and yes, ‘intelligent’. The difference here is we think important. The former would result in smart home technologies undertaking their work as it were unobtrusively, even with out the householder being aware of what they are doing; the latter would have to be manifest, visible if you like, obtrusive to the user so as to be recognised for offering what we saw at the beginning was their claimed ‘cooperativeness’, a cooperativeness achieved through speech.

If we are to take Nass and Brave [11] seriously, it would mean that technologies of the latter kind, ones in the home that are smart, are made smart because of the accounts they offer for their

'assistive' behaviour. In other words, what we are saying is that the systems in question would not simply listen, they would talk back: they would have to, if they want to assert their smartness. They would demonstrate their value, for instance, in their exclamations that 'this would be better' or 'that' as against what they were commanded to do. And if they did not talk back during conversation, they might well do so at other times, making their intelligence visible even when the householder was not thinking about it. Thus one can imagine silent moments being interrupted by the smart machines communicating to the user that they are 'doing this' or 'doing that', even though the user had not instructed them to do either. That fact that they do so is, again, a measure of their cooperativeness, their smartness.

All of this 'talking' might seem technologically implausible at the current time, of course, and certainly well removed from the impoverished experiences that current smart homes offer users. As will be recollected, the state-of-the-art in smart homes is not too good: smart home technologies tend to combine poor usability with inappropriateness; excessive integration and deficient centralisation; a lack of robustness making these problems all the more conspicuous. It is not these current technological deficiencies that concern us, though. Ours is a concern with the bolder, longer term visions, ones wherein smart homes technologies produce something more extraordinary. It seems to us that it is the 'accounting' (as we have put it) of smart home technologies that is the extraordinary goal, and is what must be meant by the term cooperation and the term smart. If the smart home did not talk back in the ways we have just described, it seems to us it would not be displaying its intelligence; it would so to speak, be dumb; doing as it was told until instructed otherwise. We have proposed labelling this as a kind of accounting, as a kind of 'intentionality', an idea of intelligence or 'will' embedded as it were in the machine. This intentionality is made manifest in speech interaction. Our view is that this might be the very thing that users, if they are at all like Victorian masters and mistresses, would not want. Though this intentionality is sought for by certain researchers, it seems to us that what we learn from history is that users want to issue commands, not participate in conversations; they want the housework done, they don't want to listen to suggestions about how it might be done better. To paraphrase the twentieth century mistress, whatever it is that needs to be done, 'they just want it done'.

Let us put this another way: if, today, claims are made that speech could enable intelligence (in the machine and in the interaction afforded by the machine) so, in the past, the evidence would seem to suggest that speech was viewed as the source of inefficacy and unintelligent consequences of the master-servant relationship. The evidence we have presented—short, to be sure, a sketch rather than a detailed examination—shows that the spoken word created ambiguity in these relationships; and that this ambiguity could be exacerbated by the fact that more than one mind was involved. On top of this, we have also seen that there was no certainty that the two minds involved were alike in terms of intentions and purposes, despite the nexus of power that kept them tied together. There was a commonly held belief amongst the employing class that the employees were likely to be dishonest, for example: thus servants were not ones who obeyed, but ones who disobeyed.

So it is that our considerations of these historical facts leads us to ponder why it is that today some view speech as a method that will enable control and interaction when then, it was thought of as

a 'method' that caused error, friction and tension. If only 'One can press a button', one can hear the Victorian householder say, 'and the machine would do my bidding'. Yet today, we are encouraged by some researchers to achieve the reverse of that: to let the user talk to the machine so that it would do the user's bidding. We want to say that history teaches us that the opposite would be better: buttons, not words; commands, not conversations.

Does this mean that speech interfaces and the smartness in the home that this gives voice to is a dead end, a cul-de-sac of unachievable ambitions? We do think that when taken to extreme, these are false hopes and ambitions, but this does not mean that speech interfaces are a dead end. But what we think one ought to learn from user studies of smart homes and from the historical record of how things were done in the home. We should learn that current laments about levels of usability are not, we think, clarion calls for more intelligence in the machine but the reverse: they are calls for less intelligence, less talking back; more doing and less accounting; more obeying and less wilfulness; more machine-like behaviour and less human-like action.

This leads us to end on a curious paradox, at least a paradox for ourselves. For many years now, at least since the inception of CSCW if not before, we have persistently argued against the use of the machine metaphor for understanding human action. Here we have wanted to impose a more sociological, and in our view, philosophically better grounded view about what 'minded behaviour' entails. Our target in these discussions was, needless to say, cognitivism. Yet our studies of user experience in smart homes, our reading of the historical record of master-servant relationships in household settings and our conjectures about how to offer better design for the future, lead us to the conclusion that the machine metaphor does have its uses. Though, here, a further paradox—a paradox within a paradox if you like—is that the metaphor should be applied to the machine, not to the human. In our view, smart homes will become smart when the machines become more machine-like; smart homes will become more usable, better places to live in and experience when the computer devices within them offer less human-like attributes and more machine-like ones. Smart homes for us, will be dumb, like a machine. That would be intelligent design.

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