The Feel Dimension of Technology Interaction: Exploring Tangibles through Movement and Touch

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ABSTRACT
This paper presents concepts to extend our understandings of bodily aspects of technology interactions. The aim of the paper is to offer a way of looking at the role our haptic and kinaesthetic senses play in experiencing tangibles. We approach this issue by framing it around how our bodies establish relationships with things. Four themes *body-thing dialogue*, *potential for action*, *actions in space* (consisting of *within-reach*, *out-of-reach)* and *movement expression* are introduced. We discuss the role these themes can play in our thinking about and exploration for, tangible and non-tangible technology interactions. The idea is that these themes can help us consider, not just how a design or a technology might look, but also how it might *feel* to use.

Author Keywords
Body, Embodiment, Interaction, Interaction design, Kinesthetic sense, Movement, Phenomenology, Tangibility, Touch

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H.5.2. [User Interfaces] Ergonomics, Interaction Styles, Theory and Methods, User-centered design.

INTRODUCTION
Gibson said that the world unfolds itself in potential for action [11]. We perceive the world in relation to what we can do with it. Thus, the world is inherently meaningful for our body and by moving we can gain access to that meaning. Current technology interactions are primarily addressing the visual sense, and to some extent also hearing and touch. Graphical user interfaces (GUIs) rely heavily on one or more of these modes of interaction. ~~So w~~When we close our eyes, block our ears, shut our mouths and withdraw our hands, the interactive dimensions seem to collapse. To quote Buxton [2], "there is more to interaction than meets the eye".

This paper addresses the relationship between the use of things and our proprioceptive and haptic senses. (Note: we have deliberately chosen to use the non-specific term *thing* because we want to refer to non-specific objects). The haptic and kinaesthetic dimensions, or what we refer to as the *feel dimension*, of human-computer interaction (HCI) is rarely explicitly considered in the study of technology use and we believe it is underutilised in technology design. (Note: we use the terms proprioception and kinaesthetic sense interchangeably, when referring to the sense that allows us to know our body position and the movement of our limbs.) In this paper we draw upon both theory and results from our own fieldwork in an attempt to contribute experiential understandings of certain aspects of tangible interactions.

The first section of the paper positions our work among related approaches to conceptualising body-thing relations. We then explain the way we understand the body's role in perception; this section provides the ideas necessary for us to introduce our themes later on. A study of the lived experience of learning bodily skills in Capoeira, Pilates and yoga is briefly described to support a fuller description of the themes. The themes describe the establishment of relationships between our bodies and things, and further how we use touch and movement in this process. Our themes *body-thing dialogue*, *potential for action*, *actions in space* (consisting of *within-reach*, *out-of-reach)* and *movement expression* are introduced in detail, drawing on our understanding of the body's role in perception, as well as examples from our study. We end with a discussion of the role these themes can play in our thinking about and exploration of tangible and non-tangible technology interactions.

RELATED WORK
Embodied approaches in HCI are not new; the thinking presented in this paper builds on work by phenomenologically-motived researchers who emphasise human actions (including cognition) as embodied actions

(e.g. [8], [13], [24], [25], [28]). This recognition is seen as fundamental to ways of theorising the relationships between embodied actions and technology design and use.

Robertson [24, 25] drew on the phenomenology of Merleau-Ponty and a field study of cooperative design to develop a_—taxonomy of embodied actions that serve communicative functions in cooperative work. In later work she relied on Merleau-Ponty's phenomenology to stress the importance of the public availability of actions and artefacts for maintaining awareness in distributed activities.

Dourish [8] emphasised the role of embodiment in the design of interaction when he described embodied interaction as an approach that hinges on the relationship between action and meaning as part of a larger system. Interaction design undertaken from this perspective "turns our attention away from the artefacts themselves and toward the ways in which people engage with them in different settings." Svanæs [28] promoted the application of the phenomenology of Merleau-Ponty to the design of context-aware technology, noting that phenomenology's first-person focus on the lived body and its relation to the environment enabled understanding of such systems from the user's perspective. His analysis recognized that context must always be understood from the perspective of those whose context it is. Hornecker proposed *embodied facilitation*, "how the configuration of material objects and space affects and directs emerging group behaviour" as a major theme in her framework for the design of collaboratively used tangible interaction systems [13, p. 439]. She recognized that any technology offers structure that implicitly directs user behaviour by making some actions easier, while constraining others. In tangible interaction systems, structure is as much in the physical actions that users perform as it is in the software itself [see also 23].

Fallman [9], McCarthy and Wright [18], Vaughan [30] and Vedel Jensen [31] are among other HCI researchers who have used phenomenology as a basis to study and understand technology use and to develop design concepts. Kinaesthetic aspects of technology interactions have been addressed explicitly in designs by, for example, Djajadiningrat et al. [6], Svanæs [29], Schiphorst and Andersen [26] and Moen [20].

In this paper we extend these phenomenologically motivated works; our approach complements the refocusing on the importance our physicality plays in our acting in the world. This is also our starting point, an explanation of our understanding of the human body's integral role in human action, particularly with reference to how we perceive our physical selves in space and how we perceive when acting through things.

THE MOVING, PERCEIVING BODY

When we sit, stand, reach for our mobile phone when it rings, or run to catch the bus, it is sensory information that guides our movement. Action directs *perception*: we move our fingers to touch; we turn our heads to catch a sound or to see. Merleau-Ponty said that vision is the brain's way of touching [19]. As well, we could say that touching is one way the body sees. Sensing and motor skills are in constant dialogue, performing in concert. The organisation of our movement patterns depends upon our habits of perception.

Proprioception

While we see, touch and hear the world around us, there is also an ongoing process of locating ourselves from inside. Dance theoretician Laban talks about the kinaesthetic sense this way "…the sense by which we perceive muscular effort, movement, and position in space. Its organs are not situated in any particular part of the body, as those of seeing and hearing…" [15, p. 111]. This is also manifested as a sense of our weight and perceived boundaries defined by where skin meets world. These sensations from "within" make up the "somatic self", telling us where we are and where we end. Damasio has suggested that a large part of what allows us to feel like the same person from day to day is the sameness of these signals from the body day after day; "somatic markers" tell me that I am still "me" [5]. Many of us have only a vague sense of our bodies on this level [16]. However, proprioception can be cultivated to gain an appreciation and awareness of this sense.

Spatial Perception

Locating ourselves in space is another side of the physical sense of our bodies. Using primarily sound and vision, we orient ourselves to the world around us. Using the physical sense of our bodies as our point of reference, we construct the spatial relationships we perceive. This is the boundary where our "inner" world of perception meets an "outer" world. Using our spatial perception, we are aware of our bodies as an object among other objects. When we reach down to scratch a knee, we act within the spatiality given by our bodies. When we reach over to press the 'on' button on our laptop we act within a space given by the relationship between our bodies and the action we want to perform, i.e. turn the laptop on. Our spatial perception, hence our bodily space is constituted by our *potential for action* in the world.

Touch - Haptic Perception

Gibson, much quoted in HCI for his concept of affordance [11] identified two forms of haptic perception, *active* and *passive* touch [10]. Active touch corresponds to what most people call touching. That is, active touch occurs when people move their fingers and hands to explore properties of an object. Passive touch does not involve movement of hands and fingers. Stimuli are simply pressed into the skin. The difference can be explained by trying this example. Close your eyes and have another person press an object into your hand, try identifying what it is. Now, try this again, this time you can use your hands to explore the object (still with your eyes closed). Active touch, being allowed to explore the object, makes it much easier to

identify the object. In addition to sense receptors for touch we have receptors in our skin for temperature and different types of pain. Game controllers are one example of using the haptic sense in technology design, e.g. the Nintendo Wii [21]. For more on the dynamics of touch, see for example Carello and Turvey [3].

Use of Things (Tools)

When looking for theories of embodiment in HCI, we tend to look to the phenomenological philosophers, particularly Merleau-Ponty [19]. Heidegger [12] and Clark [4] have also made important contributions that allow us to explore the notion of embodiment. In conceptualising the relationship between bodies and things (and bodies and technology), we refer to the now familiar image of how the blind man's stick becomes an extension of the lived body, an extension of self [19, p. 165]. Merleau-Ponty explains how the world perceived does not begin at the point where the hand holds the stick, but at the end of the stick. Heidegger's hammer is also frequently cited to theorise how we use tools, in his example of distinguishing the *hammer* and *nailing*, as *present-at-hand* and *ready-to-hand*, respectively [12]. Through skilled use, a hammer becomes transparent; it is ready-to-hand, part of the given situation the act of nailing, an extension of the lived body. If the hammer breaks or stops working, it becomes an object in the world again: present-at-hand. The world reappears in the form of objects with their potential for use [12].

In both these examples the lived experience is that of the body and thing as a moving couple; we are inattentive to the properties of the thing and absorbed in the activity of walking and nailing as long as everything is working well. Tools extend our potential for action emerging from our interactions with the physical world: a tennis racket becomes an extension of the hand, and a car becomes incorporated into our bodily space. In skilled handling of a tool we are absorbed in our activity and the tool exists to us as part of the activity. However, if something changes or the activity is interrupted, e.g. we hit the tennis ball off centre in a serve; our focus reverts back to dealing with the tool rather than being fully engaged in our activity.

The centrality of the body's role in perception and its ability to incorporate various objects as part of our bodily space and perceptual relationships with the world, framed our study. In the next section we briefly describe the study, along with our motivations and some findings that made us believe that this might be of interest to interaction design.

STUDYING EXPERIENTIAL BODILY KNOWING

The Study

Our study is part of a larger project aimed at extending our understanding of bodily aspects of technology interactions. This particular study explores experiential knowing by focusing on peoples' experiences of learning bodily skills in different activities (with and without things). Here we focus specifically on our findings related to peoples' experience of using things (or *props* as they are sometimes called) in the activities studied. The study used a phenomenological perspective, informed by Merleau-Ponty, to explore the lived experience of skill acquisition in fourteen Pilates, yoga and Capoeira practitioners.

Pilates is a system of mental and physical conditioning focusing on trunk stabilisation. In Pilates the main types of equipment are the *Reformer* and *Cadillac*. These two pieces of equipment shapes the execution of many of the core exercises in Pilates. The *Reformer* and *Cadillac* consist of various adjustable parts that provide resistance and/or assistance to varying degrees in exercises for the core abdominal muscles, spinal flexibility and the shoulders in order to strengthen the back and stretch the body. This is achieved through restricting or aiding movement in certain directions for full range of movement in different exercises. Exercises on the Reformer are often carried out on a gliding platform; the challenge is to keep the platform moving while maintaining core balance. An important aspect of Pilates is an emphasis not only on the performance of movement, but on how the rest of the body behaves while the movement is being performed.

The physical aspects of Yoga involve the performance of different poses, the asanas. There are many different forms of yoga. The Iyengar tradition introduced the use of *props*; blankets, blocks, bolsters, straps, pillows, chairs and ropes are now widely used. The purpose of the objects is to assist in attaining ideal alignment in the poses, even if the body is not yet flexible enough. In Iyengar yoga there is a correct way to do each pose. However, the overall aims of yoga are of balance and unity of mind, body and spirit, and more about spiritual wellbeing than physical activity.

Capoeria is an Afro-Brazilian acrobatic martial art game. The game is played by two capoeristas (players) with the remaining capoeristas forming a circle while singing and playing instruments. The two players try to outsmart or trick each other by demonstrating flair and mastery of movement. Objects used in Capoeria are the uniform, the music, the instruments and the other capoeristas.

Interviews, participant observation and case studies were used to gather data for understanding the transformation of the lived body as skills were acquired. The lived experience of learning a skill was explored in relation to both kinesthetic experiences and external feedback involved in the acquisition of skills in these activities. The data revealed the structures of the experience as an interplay in which the practitioners engaged in an intimate reciprocal interaction between their body, their world, things and other people in a situated, social and collaborative process. The transformation of the body was described by one practitioner as "coming back to inhabiting my body." The essential features of the lived experience of increased skill were described as the changing capacity to act, through the learning of specific skills. The exploration also revealed the profound and irredeemably situated nature of skill acquisition.

Each of these movement disciplines bring about different types of movements, there are different aims for the movements and different purposes for the objects used. Capoeria, Pilates and yoga were chosen for the study in order to explore whether the way objects are used in these activities would be perceived as experientially different from, for example, tennis rackets, golf clubs or soccer balls. In this study we were not concerned with people's interactions with technology per se. Our intention deliberately focused on the nature of the experience of learning skills and the experience of the things as part of this process, in order to explore whether additional experiential insights could be gained.

Thing-related Findings

Pilates and yoga have a somewhat similar focus on enabling management of one's own body, and the way the things are used in these activities supports this. The things used in Capoeria are also integral to the activity the game, but in a less explicit way in relation to the haptic and kinaesthetic senses. In our analysis of the data, we did recognise that things were experienced as *extensions*, for example the blind man's stick, as described by Merleau-Ponty [19]. However, this notion did not seem to cover entirely the experience described by our participants. This was particularly relevant for the way things were used among our participants who are Yoga and Pilates practitioners. Rather than being described as an *extension* of the body, the things used in Yoga and Pilates were described as *accessories, aids* or *mediators* with purposes such as providing feedback to create awareness, extend reach, lengthen, take weight/pressure off, isolate/access specific muscles, or enable connections between parts of the body.

It was the process of trying to understand this experiential difference that raised the questions we are investigating in this paper, i.e. what can it teach us about new, ongoing learning relationships with technology; relationships which seem to be an ever increasing part of our lived bodily space and interactions in the world. The questions we asked ourselves were whether these things were another type of extension, and if so, what kind of extension.

By synthesising the theoretical and empirical work described so far, we now introduce the *feel dimension* themes. The ideas presented here have developed over time in an iterative cycle between reviews of the literature, bodily engagement, our studies, evaluation of systems, and reflection on designs. The resulting concepts are therefore the synthesis of previous work by us, as well as many others.

FEEL DIMENSION OF TECHNOLOGY INTERACTIONS

One reason things are interesting to us is because of their potential to teach us about new and ongoing learning relationships with technology. As noted by Merleau-Ponty [19], whether we feel with the stick or feel the stick itself, depends on our way of incorporating the stick into the movements of our lived body. The *feel dimension* of technology interactions is this process of using our kinesthetic and haptic senses when incorporating a tool into our bodily space, so that it becomes an extension of our bodies. There are four themes to the feel dimension *body-thing dialogue*, *potential for action*, *actions in space* (consisting of *within-reach*, *out-of-reach*) and *movement expression*. The themes are intended as a conceptual tool that might provide us with ways to come to an understanding of the *feel dimension* of technology interaction. The themes are all interrelated, aiming to address different aspects of the *feel dimension*. Each is elaborated below with examples and keywords (after [13]).

Body-Thing Dialogue

In order to isolate the *feel dimension* within the body, try to imagine that the kinaesthetic sense is our only sense modality. To perceive or experience anything we have to move or be touched. Further, if we do not know what kind of body we have, we have to move to discover this as well. To perceive, we have to act. To perceive is to act. In a world where the *feel dimension* is our only sense modality, aspects of technology interactions are now based around what happens when our bodies couple with things. In the process of incorporating things into our bodily space, there is a *dialogue* between our perception and the thing, which is enacted as a change in our potential for action. In this dialogue we are monitoring what it feels like for the body to do what it is doing. This is similar to any learning process in which we try out what something feels like, the buttons on a friend's new mobile phone, a new stethoscope or a tennis racket. It is a process of constant monitoring how it feels to do what I'm doing, trying out and evaluating different feelings and measuring the effect of those feelings as actions in the world.

The *feel dimension* of technology interactions is this ongoing dialogue. It is a dialogue where movement is the mode of communication. In a movement dialogue there is an encounter of a willing mover and an inviting space in which to move.

Establishing the Dialogue

We are, through our haptic and kinaesthetic senses, in dialogue with all the things we interact with. Different things engage us in this dialogue in different ways. The extensions as described by Merleau-Ponty with his stick [19] and Heidegger with his hammer [12] are of things that we act *through* or when it breaks down, act *on*.

Our questions about the nature of the experiential difference reported in our study seem to lie in the way in which we attend to the thing when establishing the relationship. This experiential difference arises out of our particular perspective (which is different from Merleau-Ponty and Heidegger's motivations). Our perspective is one of proposing categories for technology design based on phenomenological accounts of the experience of things and

establishment of people/thing relationships. We believe the aspects below explain this difference, and that they are experientially distinct.

- *Orientating to the thing.* Very quickly we *orient* ourselves to the thing. At this point we might not even have touched it, but based on our prior experience we make a judgement about the thing, i.e. how heavy it is, how we can pick it up, how we will be using it and so on.
- *Attending to the thing* and *acting on the thing*. This is when we are very much aware of a thing, when we are new to the thing or the hammer breaks. We are focusing on the thing itself; it is present-to-hand.
- *Acting through the thing*: The thing has become an extension of the body. In our activity we are unaware of the thing, we are acting through the thing to complete our activity; rather than attending to the thing, we feel the end of the stick or the tennis racket; they are ready-to-hand.
- *Attending to and acting through*. We are aware of the thing, but it is not our focus of attention. The thing allows us to focus on something else, it has become a mediator. This is how some of our participants described their experience of things in Yoga and Pilates.

This last experiential aspect is interesting also, because this kind of relationship could lend itself to a "bodily standing back", allowing for reflection and learning. It was inspired by Polanyi, who coined the term *tacit knowledge* [22]. He used a similar distinction when describing elements of tacit knowing, knowing as involving connecting two entities tacitly - that *from* which we attend (such as our sense of music or pressure of the muscles in our fingers), and that *to* which we attend (playing a simple tune).

In either of the experiential dimensions, the experience is that of an interplay between our bodies and the world available to us, where our bodies are engaged in a dialogue with the thing, allowing and enabling certain *potentials for action*. The ways in which a thing allows coupling (or not) are described as *within-reach* and *out-of-reach*, while *movement expression* talks about the movements used in the dialogue.

Some keywords for this theme: orienting, attending, acting.

Potential for action

Potential for action is made up of what we want to do and the kind of body we have. Different bodies have different sets of movements available to them in relation to a thing. People's movement possibilities are based on their bodies, experiences and skills. Factors such as different types of clothing, use of tools, the setting one is in, also give rise to different movement possibilities and hence different potentials for action. When we move in a body-thing couple, we couple our movement possibilities to the thing's movement possibilities and feel the consequent change in our potential for action. When we move freely (e.g. dance) we can feel only our own movement possibilities. When we move in relation to a thing (e.g. play an instrument) we can feel properties of the body-thing couple, we can also feel properties belonging to the thing, as well as our own movement possibilities. For example, if given a bat, a person rugged up to cross the South Pole and a person dressed for an Australian beach, would have different movement possibilities.

Some keywords for this theme: bodies, movement possibilities, skills.

Actions in Space

Our actions unfold in space organised by our intentions. This space can be organised into several co-existing spaces; *personal*, *extra personal* and *far* space [1, p. 98]. Personal is within our body limits and is perceived by our proprioception. *Extra personal* space is within our bodily reach. Extra personal space can be extended with things, touch is important in these experiences. Then there is *far* space. Integrating with these spaces are the spaces within which we act in relation to other people and to things. All of these spaces act as references for how we use movement and touch to organise perception and action.

Within-Reach and Out-of-Reach

The ways in which a thing allows itself to be coupled with (or not) within these co-existing spaces give rise to the next two notions, *within-reach* and *out-of-reach*. These are not to be taken in a purely physical sense; the *feel dimension* of the technology interactions is based on whether our actions are having the desired effect in the world, not only in terms of being within-reach or out-of-reach in a physical sense. An interaction can be out-of-reach due to *physical constraints* (e.g. shape, weight etc) or *cultural/social constraints* (e.g. inappropriateness).

Within-Reach

Interactions taking place *within* bodily *reach* are characterised by the fact that they are taking place on, near or fairly close to the body. Examples could be wearables that we feel as weight or pressure on our body, tangible interactions such as moving tagged objects in an augmented reality environment, moving a can of beans with a RFID tag near a cash register or skipping to the next song on the MP3-player in our pocket. Within-reach interactions are also those that would not normally be possible, but that are enabled through the use of another thing (e.g. a crane to lift a container), or interactions that would be understood in a certain context (e.g. a gesture to a sensing system). The commonality is that the thing allows us to couple our movement possibilities with the thing's possibilities and have the desired effect in the world.

Wearables and wearable structures can also be seen as tangibles as they also address our haptic sense by changing our sense of weight, relative position and the scale of the body (relative size) by influencing our paths in space, use of force and centre of attention.

Some keywords for this sub-theme: proximity, position, reach.

Out-of-Reach

Interactions that are *out-of-reach* are out of reach either due to physical constraints (e.g. automatic door), cultural/ social constraints (e.g. self-flushing toilets) or both (e.g. technology's lack of understanding of context). These are interactions which tend not to have tangible elements. They depend on a user's position and/or location sensed by either stationary or moving technology located in the environment. Positioning is also an important aspect of out-of-reach interaction. In a museum with an audio tour, trying to find the position to trigger the correct recording can sometimes be a challenge and take up more attention than looking at the exhibits and listening to the recording.

Some keywords for this sub-theme: distance, position, situation.

The Relevance of Touch to Within-Reach and Out-of-Reach

Technology interactions can, of course, consist of both tangible and non-tangible elements. For the *feel dimension* there is a distinct difference between things we can touch and those we can not touch. Things we can touch can be experienced, and hence interacted with, in ways different from those we can not. This is because with things we can handle we can couple our potential for action with the thing's movement possibilities and feel the subsequent change in our potential for action. A thing that we cannot couple with provides less information about its, and therefore our, potential for action, through the *feel dimension*. Whether something can be touched or not might seem to be the major difference between the *within-reach* and *out-of-reach* themes. It is not. The difference lies in whether our actions are having the desired effect in the world. If no coupling is possible, there is no room for us to engage in a dialogue to establish the body-thing couple through the feel dimension. In an out-of-reach, information to compensate for this.?????

Movement expression

Movement expression refers to the way in which we execute a movement to establish a coupling in an interaction, whether the interaction is happening within-reach or out-of-reach. Experientially, this can be described in a continuum of intensity, for example: stroke, contact, seize, push and strike etc. Labanotation is a well developed vocabulary for describing expressive movements (e.g. [14]). For example, when interacting with the SONY Playstation2™ Eyetoy® [27] the way in which a movement is executed does not matter [17]. In this system, this is an advantage as it allows people to interact with individual movement expressions. A kiosk with a touch screen in a public space should be designed so anyone can walk up to it and start using it. However, systems which will be used over extended periods of time and require some effort to learn could be designed to capitalise on individual movement expressions. To our bodies, the way in which a movement is executed always matters. There is always an intentional purpose for our movements for perception. To technology, movement expression matters only sometimes. Whether it matters for individual projects should be based on considerations such as tasks, target users and context of use. However, the degree to which movement expression in technology interactions should be choreographed is a significant ethical issue which needs to be considered carefully by technology designers [23].

Some keywords for this theme: space, weight, time, flow

DISCUSSION

In any technology interaction, we are reliant on the potential for action that technology creates for us, i.e. that has been designed into the technology. Just as we learn new skills, devices and ways of interacting with technology are incorporated into our bodily space, and change our bodily space.

Things engage with our physicality. We have described the *feel dimension* as a particular kind of dialogue between bodies and things, and introduced four themes that can act as conceptual tools to help us understand how this dimension is experienced. Within HCI and interaction design, we believe these themes can be useful as conceptual distinctions by providing a language for thinking and talking about tangible and non-tangible interactions as embodied interaction. As noted by Dourish, ethnography and ethnographically inspired work within HCI can contribute in other ways than as "implications for design" by "…the models it provides and the ways of thinking that it supports" [7, p. 549]. In this vein, our work provides ways of exploring and/or inspiring empirical work in the area.

We are not seeking to contribute a design method, but a set of themes extracted by looking at the experience of learning skill with things from a particular perspective - the perspective of technology design. The themes then are not as much about categorising as sensitising to a particular perspective.

Designing for the feel dimension is inherently ambiguous; people have different potential for action as different bodies have different movement possibilities. However, an awareness of this diversity opens up a design space where we can think in terms of giving bodies inviting movement problems to solve or explore, in order that people can achieve what they wish with the technology.

Based ~~in~~ on empirical understandings of how we as human choose to move in different situations and settings, this paper has outlined one way of looking at the haptic and kinaesthetic senses in relation to technology use. We ~~are~~ think ~~particularly interested in this to~~that this will make a contribution towards what we have chosen to refer to as the *feel dimension* of technology interactions. We hope that the ideas we have presented here can inform our discipline,

which we believe is in need of practice-based understandings of human movement.

Our focus on the *feel dimension* is not intended to reduce human interaction with technology to the haptic and kinaesthetic senses alone. In lived experience the *feel dimension* would not be isolated. Our different senses make available the worlds in which we can act, but they are not reducible to each other. Each sense immerses our bodies in our worlds in different ways. Our intention is to look at the specificity of the *feel dimension*, because it is different from the much better understood visual dimension. We see ~~it~~ the *feel dimension* as an area of HCI which has received insufficient attention, but ~~it~~ one which is becoming increasingly important due to emerging technologies. Better understanding the *feel dimension* allows us a fuller understanding of user experience by focusing not just on how something might look, but also on how it might feel to use.

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