

PushMe/PullYou: Embodied Play and a Digital Tug o' War Controller

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Abstract

In this paper we discuss the potential for interactive technologies to serve as “objects to think with” in explorations of fundamental questions of philosophy. We describe the construction of a two-person digital tug o’ war game controller. We then discuss how such a device can facilitate exploration of some theoretical concerns in the realm of the phenomenology and the ontology of play.

Keywords

Play, Ontology, Phenomenology, experimental philosophy

ACM Classification Keywords

H5.m. Information interfaces and presentation: Miscellaneous.

General Terms

Game controllers, Philosophy, Play

Introduction

HCI has, in the past, turned to philosophy in order to develop explanatory, actionable theories regarding experience and how to design for it [14], physical and social embodiment [3], and metaphor and creative thinking [1]. Conversely, philosophers have turned not only to thought experiments and a priori reasoning, but

empirical research to explain some of the most fundamental questions of consciousness and experience. Merleau-Ponty's theories of perception and action owe a significant debt to a brain-damaged patient called "Schneider" [15]. Dennett's theory of consciousness is based on the results of cognitive psychology experiments [2], as are Lakoff and Johnson's notion of the "embodied mind" [1].

We contend that interactive technologies present us with yet more opportunities for empirical philosophical investigations — experiences and experiments that can uncover insights to some of philosophy's fundamental questions around epistemology, ontology, phenomenology, and intersubjectivity. As an "object to think with" we have developed a two-person digital tug o' war controller as the notional basis of a platform for studying haptic and kinaesthetic experiences in digital games. This goal is of interest to philosophers exploring questions of embodiment and intersubjectivity. We suggest that the embodied intersubjectivity of shared physical experience can be explored by mediated situations such as digital games and interactive art works.

The payoff for these questions will be a delineation of how embodiment may be transmitted digitally: what qualities of embodiment can be most effectively digitally mediated; what experiential effects may accrue from technical decisions around sensors, sampling, and signal processing, etc. Reflection on user experience, haptics, and digitally mediated games can help drive our future research on philosophical questions regarding intersubjectivity and experience, embodiment, and play and aesthetics.

Collaborative Play and Objects to Think With

Within HCI, collaborative play and collaborative tangible interaction are certainly objects of interest. Especially with the explosion in recent years of commercially available "embodied" game controllers like the Wii, Wii U, Sony Eye, and Kinect, the study and design of collaborative gameplay has risen to prominence. Such research includes the design of rope-based games for both collocated and distant tangible play [23], and observational studies of collaborative gestural gameplay both on conventional screens [8] and tabletops [9]. Tangible interaction research in particular has been able to generate many insights with regard to embodied collaboration and intersubjectivity, in part because it brings digital interactions into the more easily observable and accountable physical world [16]. Collaborative tangible interaction projects have resulted in significant theoretical contribution to HCI, with clear relevance to design: Hornecker and Buur's framework, for example, encompasses interaction from the low-level tangible manipulation of objects, to spatial embeddedness, to the emergence of expressiveness and representation through and around the system [8]. There is no shortage of valuable theoretical work on embodiment and tangibility in HCI (e.g. [9, 3]), and such theoretical contributions tend to be framed in terms of their applicability to HCI: opening up new design spaces and understandings of user experience.

Likewise, the use of probes and similar "objects to think with" is a well-established research method in HCI. Likewise, the use of probes and similar "objects to think with" is a well-established research method in HCI. This ranges from cultural [7], to technology [11], to urban [13] probes, all used to inspire design by provoking reactions and defamiliarizing everyday

situations. Ethnographic studies of technical systems have also sometimes relied on prototypes introduced into homes, in order to shed light on family's everyday practices of, for example, coordination [16] or photo display [4]. The project presented here uses similar methods, relying on a provocative prototype along with participant-observation and informal interviews, to develop insights of interest to philosophy.

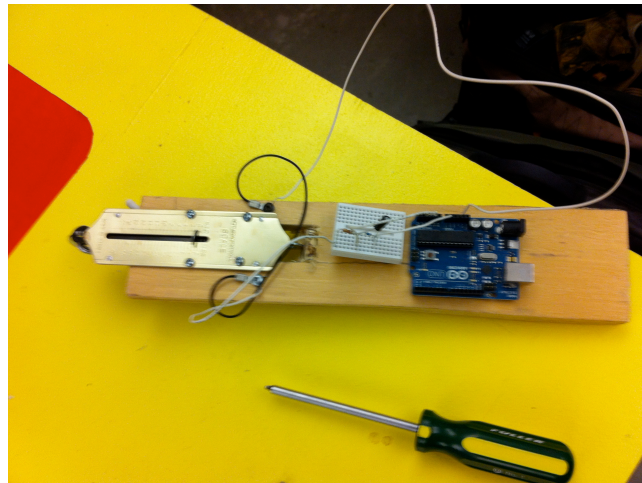


Fig 1. The first implementation of the controller.

The Controller

A length of stretch sensitive variable-resistance rubber is attached to a fish scale. The scale registers up to fifty pounds of force, requiring considerable effort to use it. Pulling on the fish scale elongates the stretch sensor, raising its electrical resistance from 5K ohms at rest to 15k ohms at approximately fifty pounds of force. The stretch sensor is electrically connected to an



Fig 2. The team play-testing the first version of the controller

Arduinomicro-controller via an RC low-pass filter. The sensor data is sampled every ten milliseconds and communicated via the USB-Serial port to Processing. In this case, the device was used to control one player's paddle in a Processing implementation of the early digital game *Pong*, created specifically to allow for easy testing of a variety of prototype game controllers.

Preliminary results

The PushMe/PullYou controller was initially prototyped during a Bizarro Game Controllers workshop held at Concordia University over the course of two days in October of 2011. It was further refined into a more durable device for the Montréal Mini Maker Faire in August 2012. At the Mini Maker Faire, it provoked multiple responses as people found they had to negotiate a physical interaction as they pulled on the controller, gauging both force and the reaction on the

screen. We have found it is a useful way to focus attention on the physical elements of digital play.

The maker faire deployment consisted of observation and informal interviews. We were testing the device itself, but sought to gather preliminary data to refine our approach. Typically, game controllers are designed to disappear- their operation should be transparent to the user. In this case, we wanted the controller to be the dominant element in the interaction, but simple enough that it required almost no instruction to use. We wanted to see how people would respond to an unfamiliar device that presented a familiar action i.e. pulling a rope.

One of the most noticeable interactions occurred when participants tried to lift the controller to make the pong paddle go up initially instead of pulling. Some participants received brief instructions as to how to operate the controller i.e. Pulling together on the controller makes the right-hand paddle rise, releasing pressure allow it to descend. Some people seemed to be unclear whether referring to the pong paddle or the controller itself.

Another factor arose from some confusion as to whether they were working together or competing. Many participants did not initially realize they were working WITH their partner to control the paddle. When they didn't get the reaction they expected they'd try to lift the paddle – sometimes the partner would do the same and sometimes not.

In cases where people got it, people would look at each other and pull, giving only peripheral attention to the screen. People would verbally give cues, but that

seemed NOT to help performance. Looking at each other seemed to help provide better control, and some participants seemed to better understand that the pulling sense was fundamental to controlling the system. It may be hard to describe physical feeling in a useful way for this sort of interaction -- at what point do verbal cues actually become counterproductive?



Fig 3. Participants playing with PushMe/PullYou at Montreal Mini Maker faire, 2012.

Theoretical Concerns

The concept for this controller did not originate as a transparent User Interface(UI) for operating another system, but specifically designed to emphasise certain characteristics that most controllers seek to avoid, or otherwise de-emphasise.

- This controller requires a great deal of force to operate, though the game could be controlled with much less effort
- This controller is larger than necessary, requiring two people to cooperate in its operation
- In the context of its use, the User Experience(UX) focusses on the controller more than on the application that is to be controlled

The reason for making such a present-at-hand controller is to attempt to reveal certain underlying elements of of experience of the world; it is an "object to think with". In philosophical terms, this device helps us to think about how we relate to the world when we engage with the world with our bodies. The reason some philosophers engage in thinking about the world in this way is that both our thinking and our bodies are part of the world, so thinking about these relationships between our experiences and how we think about those experiences should yield better questions about the fundamental structures of the world, a structure which philosophers term an ontology.

The specific interests explored had to do with the phenomenology and ontology of play. These concerns have been discussed explicitly by notable authors such as Ludwig Wittgenstein [22], Hans-Georg Gadamer [6] and Eugen Fink [5]. They in turn have parsed the significance of play, especially as regards artistic/aesthetic creation, in the work of other philosophers, including Plato. One implication is that eros, the creative genitive force discussed in classical thought could be considered as play. This playfulness, a notion that is increasingly derogated in popular discourse, may be a facet of "how the world works," an ontological facet of reality, in so far as human beings are

concerned. Building a plaything intended to explore this is the purpose underlying the construction of the PushMe/PullYou controller.

In his essay *The Oasis of Happiness*, Eugen Fink argues that play always occurs socially, and with playthings [5]. His definitions include place as a thing, and recognizes that human play occurs with an individual that must exist in a social milieu. He goes on to argue that discussion, philosophizing about play, indeed all "serious thought" must be playful.

How do we describe the forms of play? We say game, or art although Fink's subcategories also include play expressed as work, love. This is because Fink argues that play underlies all that we do. It is an ontological category, rather than an ontic (a simply physical, pre-categorical, non-reflective) phenomena merely arising from something else.

Tilghman argues that we do not teach children the definition of the term *games*; we play games with children and so they learn the meaning of games through praxis[20]. These include attitudes toward play such as fairness, the accepted rituals around various types of play and other elements that transcend the description of games and play as a series of simple transactions. Moreover, we recognise both American Football and Parcheesi as games, yet yet they share very little in common, as Tilghman notes.

The same may be said of art, in Tilghman's view. He points out that to compare a painting by Titian with one by Mondrian begins to stretch the grammatical possibilities for comparing examples of what is broadly called art. Moreover he argues that the language used

becomes increasingly metaphorical, as when we use the term tension to describe a work of literature, a painting and the architecture of a given building, with all examples emerging from the same time period. He also points out that these terms seem to take on different meaning depending the era in which they were made. He points out that we do not teach children a definition of art, but rather by looking, listening and making art do children come to recognise art. At more sophisticated levels we teach children and young people to expect different experiences from different art works. He contrasts Elizabethan theatre with the classical theatre of France arguing that we would expect different styles and themes in each. His conclusion is that the diversity of objects that are categorised by some as "Art" means the question "Is it really a work of Art" is a meaningless question. None-the-less although Tilghman points out that an art historian may have a different and more positive response than say a university grounds keeper to a sculpture made of railroad ties placed in a heap, Tilghman points out we can still ask questions about how such a work looks in relation to its surroundings, formal elements, what the materials remind the audience of and so on.

This view of objects inspiring or activating an audience speaks, I think, to the idea of Fink's that I mentioned earlier. People are lovers, warriors, makers and players. These are all active roles and are meaningful only in the context of action. For example, you can not call yourself a lover or a maker if you do not love or make. This is discussed in relation to the thought of Wittgenstein in Michael Scott's 1996 essay that presents Wittgenstein's philosophy as one of action[14]. In this case, we have chosen to use this

controller to allow for playful action. Where as most philosophical thought occurs through thought experiments, we thought to build a controller that mimicked a traditional game, tug o' war, that presented an obvious, highly physical form of play. The philosophical problem we wanted to explore is two fold: How does volition work as we choose to move our bodies, and how do we understand others' volition. What follows is a brief discussion:

Scott starts by quoting the following from Wittgenstein's book *Philosophical Investigations*:

"Let us not forget this: when 'I raise my arm', my arm goes up. And the problem arises: what is left over if I subtract the fact that my arm goes up from the fact that I raise my arm?"

Scott argues that this question seems to be fundamental to understanding, but offers no obvious answers; he compares William James' [14] argument that volition, the sense of movement as recalling a memory of moving to Wittgenstein's account of volition. Scott, quoting Wittgenstein writes that the experience is phenomenologically not one of memory. That is to say, we don't remember the motion of a limb in order to move it. One simply moves. And that apparently is fundamental to our experience of being physically in the world. Wittgenstein also raises the issue of volition at rest. That is to say, that we choose to relax, to remain at rest. Other accounts that Scott mentions cannot account for such Thus an element of ontology is that we move ourselves. If play is part of that ontology then perhaps play can reveal something about volition that has not been clearly described before. The argument that Fink and Gadamer make, an that

Wittgenstein offers a rationale for is that play is fundamental to our origins within the universe and how we are in the universe. However their definition of play is more complex than merely amusement, but as we alluded before, a creative principal.

Within the context of this paper we have tried to gesture towards these arguments and counter arguments, but constraints don't allow an extended discussion. What we have tried to do is show that play is active and fundamental to human experience. The rationale for building a game controller was to help us consider how we move and rest, how we interact with each other and with objects(toys?) while playing.

Fink does not argue that play is the sole element of human ontology. When he says humans are warriors, worker and lovers as well as players, he explicitly sees these ways of being as intertwined. However, he does see play as being different, partially because it is not done to achieve something other than itself. Play, he points out, is sufficient unto itself. Much of our other activities lead to another goal, usually realised in the future.

The possibilities of exploring a simplified control, with the possibility of digital information lets us explore play as game, play as art and play as...play. As yet the possibilities for particular aesthetic experiences, and the possibilities for expression are only conjecture. The exploration of these future endeavors will raise the possibility for new knowledge and constitute a form of play in itself.

Conclusions and Future Work

The possibilities for research both within HCI research and that of the humanities that controllers like PushMe/ PullYou rely partially on the novelty of such devices. Test subjects cannot rely on well-honed reflexes developed on commonly available controllers such as provided by commercially available controllers. By studying these unpracticed responses we hypothesise that new interface affordances would be discovered.

Future versions include systems using sound cues rather than screens, systems of lights and other sensorial experiences that would eliminate the need for a screen. At this stage, players must still look at a screen in order to play the versions of Pong or Space Invaders we used- the emphasis, however, is still on the interaction between the players via the controller itself.



Fig 5. The second version was larger, sturdier and given a "steam-punk" finish.

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