
Interpersonal Touch as a Game Interaction Method

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Abstract

Interpersonal touch is a key element of social behaviour, yet is largely ignored in HCI. In this paper, we describe two games which explore two extremes of interpersonal touch, and discuss key research questions relating to them.

Author Keywords

Interpersonal touch; touch; force; pain

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

Introduction

Most computer games are designed so that players are kept at a safe distance from each other. This is in part due to technological limitations of controllers and sensing devices. For example, the Microsoft Kinect relies on players not being too close or occluding each other in order to correctly sense their bodies. This paper describes two games in which players are deliberately encouraged to come close to and touch the other player.

Touch between people is a key way in which we communicate socially, from the early bonds developed by caring touch between parent and child, to the many

adult uses of touch to communicate friendship, sexual attraction, violent aggression or physical competition [7]. Touch is also a part of many sports and games, such as rugby, martial arts and Twister. In children vigorous physical contact play serves both long-term developmental functions (cognition, emotional coding, fighting skills) plus more immediate functions (strength and endurance training, social dominance functions) [6]

However, whilst interpersonal touch is part of many social activities it is largely absent from computer gaming. There are a few exceptions to be found outside mainstream gaming - Musical Embrace [3] is a game in which players must hug each other whilst turning their bodies in order to move through a maze. Party games B.U.T.T.O.N. and Johann Sebastian Joust, by the Copenhagen Game Collective [8] both encourage players to physically grab each other's game controllers, which often ends in player collisions.

In this paper we describe player experiences of two games which use physical touch between players as an input, and discuss further research and technical challenges for interpersonal touch interaction.



Figure 1 Desktop Touch-O-Matic Controller

Touch-O-Matic Airship Adventures

The Touch-O-Matic is a new dedicated sensing device for exploring gentle inter-personal touch. It consists of two metal poles connected to an Arduino board. Each pole is held by one player. A program running on the Arduino firstly detects whether someone is holding each pole (via capacitive sensing), and then senses the resistance between the two poles. If two players are holding the poles, the resistance drops significantly when they first touch, then smoothly decreases as they touch each other harder and harder. Because of the combination of capacitive and resistance sensing, Touch-O-Matic is able to enforce its use by two players and avoid a single person playing the game by holding both poles. This is done by it requiring to have detected capacitance on both poles with no connection between them before allowing the resistance sensing to work.

We built two versions of Touch-O-Matic, a desktop controller (**Figure 1**), and a full sized arcade cabinet. The arcade version is currently deployed at the National Videogame Arcade, Nottingham, running a game called Astonishing Airship Adventures. Players must touch each other skin-to-skin in order to fly an airship through an increasingly hilly terrain, whilst aiming to fly low enough to pick up coins. If players touch firmly, the airship flies higher (and uses more fuel). If players touch too gently, or release the touch for an extended period, the airship will crash, ending the game.

Playing Airship Adventures

We are currently running a long term study of Airship Adventures, and have at the time of writing recorded 920 pairs of players. We do not have any formal analysis yet, the following are first impressions from our informal observation of this large dataset.



Figure 2: Touch-O-Matic Airship Adventures

A Thrilling Discomfort: Playing Airship Adventures requires people to touch each others' skin gently for extended periods of time. This is an unusual and uncomfortable experience for many people, due to an association of gentle touch with intimacy. The touching involved in this game is a deliberately 'uncomfortable interaction' [1], with players expressing a real mixture of discomfort and pleasure. Because it doesn't constrain touch, at the beginning of games, players can be seen to negotiate about how they are comfortable to touch; for example one pair of male players even enlisted a third female friend to stand between them because they were uncomfortable with touching another man.

Physical Negotiation: Two players must play Airship Adventures, yet there is only a single one-dimensional control input to the game itself. Because of this, players must negotiate levels of touch, for example when the airship is flying towards a mountain, there is a trade-off between flying close to the mountain and scoring points, versus the risk of crashing into the mountain. This can lead to physical negotiations as one player

tries to leave it later, and moves their hand away, while the other player is trying to push harder against them to fly upwards. In some cases these roles change throughout play with neither player necessarily asserting dominance. In others, one player takes a more passive role through the whole game. However, these tactics seem to be negotiated "on the fly" and mostly through the medium of touch rather than deliberately discussed.

Participant Experimentation: The game interface does not enforce any particular type of touching. While most players touched hands in some way or other, players also experimented with touching other body parts, such as slapping each other on the face, punching in the arm, tickling, and chaining via other players. In a way, the fact that this interface only measures a simple correlate of skin-to-skin contact enhances the game, allowing people to interpret the instructions as they wish.

Balance of Power

Touch-O-Matic explores the gentler end of touch, players must use extremely gentle and subtle gestures to fly the ship well. In contrast, Balance of Power (BoP) takes the opposite approach; a computer game to encourage deliberate brutal violent contact between players. It is played by 2 teams of players on an international standard squash court [10], chosen because it is easy to find them in most places.

In BoP, the court is split down the centre line, with a projection on the back wall of the court showing silhouettes of all players, along with a large white see-saw (teeter-totter) showing the 'Balance of Power'. Players must try and get their opposing team onto their side of the court. As more players are dragged onto one side of the court, the balance tips towards that side. Every 10-30 seconds, a 5 second countdown starts, after which the side that has the balance scores a point. The first team to score 3 points wins the game.

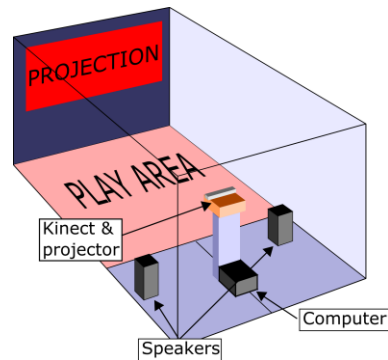


Figure 3: Balance of Power Squash court layout



Figure 4: Players and the screen in Balance of Power

Playing Balance of Power

We studied Balance of Power with two groups of experienced rugby players, the following is an extremely brief summary of our analysis (see [4] for full details).

Self-restraint: Even with our participants, specifically chosen for their expertise in forceful contact and a game which explicitly encouraged the use of force, players exercised self-restraint in their behaviour. When asked, players said that this was for two reasons; firstly because they didn't want to seriously hurt each other, and secondly because they felt that if they took it too far, other players would fight back similarly hard.

Enjoyment of Pain and Dominance: It is clear, both from what players said in interviews afterwards, and also from watching the smiles on player's faces as they forced other players to the ground, that players enjoy using physical contact to dominate others. On the flip side of this, players also reported enjoying the feeling of having been on the receiving end, even enjoying the feeling of having been hurt and "war wounds".

Balance and Fairness: Players discussed how differences in physical strength and fitness had an effect on relative ability to use force. This raised an issue that when using direct physical force between players as an interaction method, physical differences between players can be very hard to adapt for. However one might argue that a future dynamic intelligent game interface may be more capable of this than the static ruleset of a traditional sport; there is a case that mitigating technology could allow those less physically capable to enjoy the “rush” of sports without feeling overly disadvantaged by their physical attributes.

Imagination in Violence: Players were extremely imaginative in how they forced other players onto their side, dragging, pushing, carrying, running across and tempting the other player back, throwing players across. Because Balance of Power only interprets how many “player” pixels it can see on each side, players have a lot of flexibility to bring people over by whatever means they wish to use.

Research Directions

In this section we discuss some further research directions relating to interpersonal touch that have resulted from this work:

Mobile sensing of interpersonal touch

Both the systems described here use fixed infrastructure, in the case of Balance of Power, a Kinect camera is used to sense players; in Touch-O-Matic, a fixed user interface is used which relies on a common electrical ground. Detecting interpersonal touch using mobile or wearable devices is a difficult technical problem; potentially some of the functionality of Touch-

O-Matic could be created using similar technology to that used for on body gestural interaction [2,5].

Different things to sense (and for what applications)

In both our systems, we only sensed extremely simple correlates of touch. Balance of Power senses the movement of pixels, which correlate in part to movement of players, which in turn is the by-product of interpersonal touch. Touch-O-Matic measures electrical resistance, which is strongly correlated to touch pressure at a given touch point, but also varies depending on the surface texture and hairiness of the parts being touched. There are many aspects of touch that could be detected – identity of the toucher, how hard they’re being touched, location(s) of touch on each person, size and shape of touch area, how the touch is being moved; we could even consider measuring “nearly” touches through capacitive or RF based methods. As these games demonstrate, exactly what to measure is strongly application dependent, and in fact, as these applications demonstrate, sometimes we may wish to strongly limit what we measure, rather than getting the most accurate measurement possible.

Interpersonal touch interfaces and social norms

As Touch-O-Matic demonstrates, gentle touch in particular has strong emotional meaning. When developing interpersonal touch sensing, we need to consider how and when use of these sensing systems may be appropriate, and be aware of how their deployment may encourage breaking social norms.

Promoting awareness and enjoyment of the physical

These games encouraged players to attend to, reflect on, and appreciate, the physical qualities of their own bodies. Often video games designers are concerned

with engendering strong feelings of 'presence' [9] in virtual worlds. We are excited by the potential of interpersonal touch games to encourage players to explore feelings of 'presence' in their own bodies and their physical surroundings. Playful exploration of the capabilities, limitations and affordances of our own bodies, as well as the affordances of the physical environment, is a common part of children's rough and tumble play, but something that is often lost in adulthood. We argue that games designed to playfully encourage focus and reflection on physicality have the potential to encourage a renewed wonder in, and playful engagement with, the physical environment, and their own and other's bodies as a key part of that environment.

Conclusion

With the rise of wearable technology, digital systems are increasingly present and active throughout our social life. Many of our most exciting, thrilling, painful or intimate moments involve elements of interpersonal touch. Inter-personal touch is however largely unstudied in current interaction design. As a signal that has strong emotional meaning and a vital part of human communication, the fact that current digital systems are largely unaware of and unresponsive to it is likely to become a real problem.

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