Bubble Popper: Considering Body Contact in Games

Cagdas 'Chad' Toprak, Joshua Platt, Florian 'Floyd' Mueller

Exertion Games Lab

RMIT University

Melbourne, Australia

{chad, josh, floyd}@exertiongameslab.org

Figure 1. Two players competing in Bubble Popper. The player on the right uses his arm to block the opponent.

ABSTRACT

Exertion games, digital games that involve physical effort, are becoming more popular. Although some of these games support social experiences, they rarely consider or support body contact. We believe overlooking body contact as part of social play experiences limits opportunities to design engaging exertion games. To explore this opportunity, we present Bubble Popper, an exertion game that considers and facilitates body contact. Bubble Popper, which uses very simple technology, also demonstrates that considering and facilitating body contact can be achieved without the need to sense body contact. Through reflecting on our design and analyzing observations of play we are able to articulate what impact physical space layout in relation to digital game elements, and physical disparity between input and digital display can have on body contact. Our results aid game designers in creating engaging exertion game experiences by guiding them when considering body contact, ultimately helping players benefiting from more engaging exertion games.

Author Keywords

Exertion games; exertion interfaces; exergames; movement-based interaction; body contact; sports; game design.

ACM Classification Keywords

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

General Terms

Human Factors; Design.

INTRODUCTION

Exertion games require players to invest physical effort in order to play the game [6]. Today the most well known commercial systems that allow for such interactions are Nintendo's Wii, Microsoft's Kinect and Sony's PlayStation Move. Although some of the games supported by these systems enable social experiences, these experiences mostly require players stand side-by-side, where they do not experience, and are not expected to engage in body contact. We suspect that this is mostly a consequence of the limitations of the involved technology: The Kinect requires players to stay within separate physical spaces as occlusion issues could otherwise occur. Wiimotes and Move controllers are not designed for body contact and cannot be hit against other players. Although we acknowledge that body contact can be a cause for injury at times, we believe one of the reasons why these systems have been criticized

for missing opportunities for rich social play [3] is because they do not consider body contact. We take inspiration from such rich body contact experiences ranging from the playful Twister to team sports such as basketball, where players push and block one another to gain an advantage in the game, experiencing the sharing of the physical space around them as a result of and a reason for body contact. We believe overlooking the potential of body contact in exertion games, as most current commercial systems seem to do, is a missed opportunity to support such rich experiences for players.

To explore this opportunity, we present Bubble Popper, an exertion game that considers and facilitates body contact. This is achieved without the need for sensing body contact, hence Bubble Popper also demonstrates how to consider and facilitate body contact with very simple technology. Through reflecting on our design and analyzing observations of play we are able to articulate what impact physical space layout in relation to digital game elements and physical disparity between input and digital display can have on body contact and how to design games that aim to consider and facilitate it.

RELATED WORK
We are inspired by the use of body contact in play and sports, as mentioned above, however, when it comes to digital play, body contact often seems overlooked. Nevertheless, a few digital play systems exist where studies have reported that participants encountered body contact as part of the play experience.

The users of TouchMeDare [2] engage and respond to each other's body movements on opposite sides of an interactive canvas. The initial design focused on separating the players' bodies by means of the canvas. However, when TouchMeDare was exhibited in a public setting (a large music festival) it triggered the opportunity for more than one player on either side to be present. These players then engaged in rich body contact actions, appropriating the system so that they could engage in intense body contact, even throw one another around.

Similarly, in the shadowboxing game Remote Impact [7] players hit one another's shadows, separated by an interactive surface. During deployment it was observed that players like to play with additional co-located players, which allowed for body contact between them. These experiences, where users appropriated digital systems to support their desire to incorporate body contact suggest to us that players can enjoy body contact even if it is part of a digital experience.

A few game designers have recently presented games that suggest that body contact can be explicitly considered in the game design process. One of these games is Wilson et al.'s digitally enabled folk game J.S. Joust [12] that requires players to bump or push each other's hands or bodies to eliminate them from the game. Move controllers were used to detect motion. From J.S. Joust we learn that digital games can be designed so that they facilitate body contact as a core game mechanic. However, we have yet to gain an analytical understanding of how game designers can support this kind of play.

Similarly, the digital game B.U.T.T.O.N. [11] also facilitates body contact through the game's design, however, interestingly, the system does not sense it. Players must prevent each other from holding down a button on their controller for more than four seconds while trying to do so themselves. A video of the game in action suggests that the game can indeed facilitate very powerful body contact actions, all without the game system sensing it. We build on this idea of facilitating body contact without sensing it, and present an analytical account of how game designers can achieve this.

There have also been a number of art and interactive installations that have played with the notion of popping bubbles [9, 13]. While we are also inspired by the magical experience of popping bubbles, hence the name of our game "Bubble Popper", our work differs as it deliberately considers body contact through game design as part of the game experience.

These related works suggest that considering body contact in exertion games could be beneficial for facilitating engaging experiences for players. However, how game design can support this has been analyzed only to a limited extent. Our work therefore explores how body contact can be considered and facilitated in exertion games. We do this by reflecting on the design of Bubble Popper and analyzing play observations.

BUBBLE POPPER
Bubble Popper (Figure 1), which emerged from teachings on Exertion Games [8], is a 2-player exertion game. Players are assigned a color, yellow or pink, and then must pop their colored bubbles that appear on the projected surface (Figure 2) by hitting the surface with an augmented glove. When hit, a switch within the glove triggers a mounted infrared LED, which informs a Wiimote positioned close to the projector of the glove's screen position. The Wiimote is not used as an input pointer, but instead as a sensor for the gloves' positions [5]. The Wiimote sends this information to a computer, similar to the work by Bencina et al. [1], which triggers the bubbles to pop with a rewarding sound. The rules of the game are simple; the player who pops the most bubbles of their color within 60 seconds wins.

To facilitate this we made sure the bubbles were not static and instead were moving around the digital projection space and bouncing off each other. This not only supported players to move around to keep up with the bubbles, but also afforded colliding with the opponent and their path. In this situation the players had to choose between moving out of the way and letting their opponent score a point, or

blocking their path to prevent them from scoring while also giving them an opportunity to score a point for themselves.
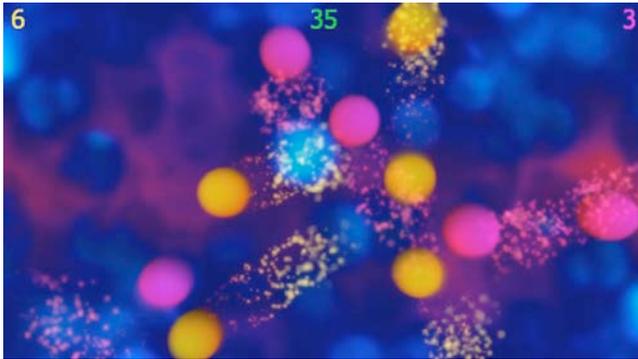

Figure 2. The visuals of Bubble Popper. Two differently colored bubbles, one for each player, a timer (top middle), and a score counter for each player.

INITIAL OBSERVATIONS
We can report on initial observations from three events where Bubble Popper was showcased. Bubble Popper was exhibited in a public shopping mall as part of a digital festival. From our observations of watching the general public play the game we noticed players would initially avoid interacting with one another physically and instead rather politely pop the bubbles closest to themselves. This however was slightly different when the two players were familiar with one another (e.g. those who approached us as a group). We noticed that the players who saw others play using body contact quickly picked up this style of gameplay. Another demonstration was during an International Game Developers Association local chapter meet, with an audience of over 100 game developers. It appeared they played more physical and were less reluctant to holding back. Our final showcase was at a physical health and education conference, we received comments on the potential application of Bubble Popper with children in schools.

FINDINGS
Through reflecting on our design process and observations of play with over 40 participants over the age of 18, we identified the following aspects designers should be aware of when aiming to consider and facilitate body contact in exertion games. We also articulate design strategies on how designers can use these aspects in their work to create more engaging exertion games by considering body contact.

Sensing body contact is not necessary to facilitate body contact and may not even be desired
We do not use complex sensors and tracking equipment to sense body contact as we thought it was not necessary. We believe that designing a game that rewards body contact (through assigning points for successful body contact for example) could take away from encountering body contact as a result of play, and instead may hinder the social experience. Another problem with using sensors to detect body contact is the possibility of the sensors not functioning as intended at all times (i.e. not registering body contact). This could disrupt the game and may frustrate players. Lastly, designers might also need to consider different sensing scenarios such as skin-to-skin contact, skin-to-clothes contact and clothes-to-clothes contact, making successful sensing challenging.

Considering projection size when spawning digital game elements can facilitate body contact
Through testing and modifying the size of the projection screen in relation to the amount of bubbles spawning we found that no more than ten bubbles at any given time worked best with the projection of approximately 2.5 meters high by 4 meters wide. This provided players with enough room to move freely while also allowing for physically crossing paths when moving from one side of the space to the other. We programmed Bubble Popper so that the bubbles spawn in opposite locations across the large surface, so that players need to move around to reach all bubbles, requiring players to cut across their shared space

Varying physical disparity can facilitate body contact
Physical disparity, being the distance between the input device (i.e. the gloves) and the display (i.e. the projection), is constantly changing and varies between approximately 0 meters (hitting the bubbles) to 2 meters (moving away from the wall), unlike with sensors such as the Kinect, where the physical disparity is usually quite constant (around 3 meters). Players have to move towards the display to pop bubbles, and away from it to see which bubble to hit next. This demand to alter the physical disparity facilitated players moving around, fueling the potential of body contact occurring.

Predispositions that digital games require players to refrain from engaging in body contact may exist
Our preliminary observations suggest that game designers need to be aware that players may have a predisposition that discourages them from engaging in body contact. We suspect that this could be due to the limited amount of digital games that have supported physical interaction between players in the past. One way of addressing this could be by showing depictions of players engaging in body contact whilst playing, for example as part of an introductory trailer. Another idea could be to dress players in sports uniforms, furthering the idea that body contact can be a fundamental part of the game experience.

Offering other contact opportunities might promote body contact
We believe that the tactile feeling of hitting a wall to pop the bubbles is one of the success factors of Bubble Popper. Unlike with a TV display, Bubble Popper's projection system allows players to engage in contact with the wall without having to worry about any damage. Through this, players are constantly reminded that contact is "ok",

fostering the notion of engagement through body contact, working against the predisposition that digital games require players to refrain from engaging in contact.

Familiarity between players
Our observations suggest that body contact appears to be facilitated between players who are familiar with one another. Familiarity between players and an audience might also affect body contact, as players are performing when playing Bubble Popper; such a performance might affect and be affected by body contact as part of the experience.

Body contact might lead to aggressive play, raising safety issues
We also want to point out that designers should also consider any negative effects body contact may have, such as overly aggressive play. Previous research in sports science has investigated if body contact affects aggression in sports [4]. In sports such as soccer and basketball, a referee moderates overly aggressive body contact. At this stage we have chosen not to impose rules in this regard. Although research suggests that considering risk can be beneficial in exertion games, limiting the potential for injury should always be priority for game designers. Previous research in sports science suggest that there is a difference between contact and non-contact sports players when it comes to their pain apperception [10], suggesting that body contact in exertion games could affect the physical risk and the perception of this risk.

FUTURE OPPORTUNITIES
We believe further research that explores body contact between more than two players will expand the understanding we put forward. Furthermore, balancing players who have different physical abilities in body contact games could also be a fruitful avenue for future research, extending prior work on non-contact exertion games [8].

CONCLUSION
We have presented Bubble Popper, an exertion game that supports considering and facilitating body contact in digital games. Through reflecting on our design and analyzing observations of play we have articulated what impact physical space layout in relation to digital game elements and physical disparity between input and digital display can have on body contact and how to design games that aim to consider and facilitate it. Our results aid game designers in creating engaging exertion game experiences by guiding them when considering body contact, ultimately helping players benefiting from more engaging exertion games.

ACKNOWLEDGMENTS

REFERENCES
1. Bencina, R., Wilde, D., Langley, S. Gesture ≈ Sound Experiments: Process and Mappings In Proceedings of The 8th International Conference on New Interfaces for Musical Expression (NIME08), Genova, Italy, June 2008. p197 - 202.

2. Boerdonk, K. van, Tieben, R., Klooster, S. and Hoven, E. van den. Contact through canvas: An entertaining encounter. Personal and Ubiquitous Computing 13 (2009), 551-567

3. Bogost, I. Persuasive Games: The Missing Social Rituals of Exergames, (2007). http://www.gamasutra.com/view/news/103581/SGS_Feature_The_Missing_Social_Rituals_of_Exergames.php

4. Keeler, L. The Differences in Sport Aggression, Life Aggression, and Life Assertion Among Adult Male and Female Collision, Contact, and Non-Contact Sport Athletes. Journal of Sport Behaviour, Vol. 30, 1 (2007)

5. Lee, J.C. Hacking the Nintendo Wii Remote. IEEE Pervasive Computing 7, 3 (2008), 39–45.

6. Mueller, F., Agamanolis S., and Picard R. Exertion interfaces: sports over a distance for social bonding and fun. In Proc. CHI, ACM Press (2003), 561-568.

7. Mueller, F., Agamanolis, S., Gibbs, M. R., Vetere, F. Remote impact: shadowboxing over a distance. In CHI '08 Ext. Abstracts on Human Factors in Computing Systems (2008), ACM Press, 2291-2296

8. Mueller, F., Vetere, F., Gibbs, M.R., Edge, D., Agamanolis, S., Sheridan, J.G., Heer, J. 2012. Balancing Exertion Experiences. In Proc. of the 2012 ACM annual conference on Human Factors in Computing Systems (CHI '12). ACM Press, 1853-1862.

9. Muench W., Kiyoshi F. Bubbles (2000). http://hosting.zkm.de/wmuench/bubbles

10. Straub, W., Martin, S., Williams, D., and Ramsey, A. Pain Apperception of Contact and Non-Contact Sport Athletes. The Sport Journal Vol. 6, 2 (2003).

11. Wilson D. Brutally Unfair Tactics Totally OK Now: On Self-Effacing Games and Unachievements. Game Studies, Vol. 11, 1. (2011)

12. Wilson D. In Celebration of Low-Process Intensity (forthcoming)

13. Wyman B., Francois A. Bubbloo (2007) http://youtube.com/watch?v=ewjcVk480Qo