
Gamification and Exertion

Florian 'Floyd' Mueller

HCI Group & Center for Design
Research & H-Star
Stanford University, USA
floyd@floydmueller.com

Firaz Peer

GVU Center
Georgia Institute of Technology
Atlanta, GA, USA
firazpeer@gatech.edu

Stefan Agamanolis

Rebecca D. Considine Research
Institute
Akron Children's Hospital
Ohio, USA
stefan@agamanolis.com

Jennifer Sheridan

Big Dog Interactive
London, UK
jennifer@bigdoginteractive.com

Abstract

Engaging in exertion activities – these are activities that require intense physical effort from users – is beneficial for physical health. Unfortunately, many exertion activities are often considered not very engaging, and turning them into a game – by means of gamification - has been suggested as an approach to make them more compelling. We discuss design strategies particularly suitable for exertion activities that can facilitate this process and highlight the role of technology based on our experience of designing exertion games. By identifying such strategies, we believe better exertion games can be designed that ultimately results in people profiting more from the associated benefits of exertion.

Keywords

Gamification, games, gaming, health, exercise, exertion interface, exertion game, sport, whole-body interaction, exergame

ACM Classification Keywords

H5.2. Information Interfaces and presentation (e.g., HCI): User Interfaces.

General Terms

Design, Human Factors

Introduction

“Gamification” is an emerging umbrella term for the use of video game elements in non-gaming interactive systems to engage users in (sometimes mundane) tasks, hence making the tasks more “fun” in order to change people’s activities for the better [3].

Many previous approaches towards gamification focus on the facilitation of cognitive activities, in this paper, we want to draw attention to the gamification of physical activities. These physical activities require intense physical effort from the user: typical examples are discussed under the term exertion interfaces [6]. Exertion interface interactions resemble sports and exercise activity, and designing for such exertion experiences presents unique challenges, but also opportunities for the interaction designer [7].

As exercise is often seen by some users as not very appealing [10], utilizing a gamification approach to physical exercise might be a viable approach to making these activities more attractive to users, facilitating participation, and as a result, support the associated health benefits. However, what is yet known is how to design for gamification if physical effort is involved, and how designers can utilize the unique opportunities technology offers, while addressing the associated challenges of an exerting body.

This paper aims to contribute to this knowledge by discussing design strategies enabled by technology for the gamification of exertion activities we identified from our own experience of designing exertion games. The result is an initial understanding of the opportunities technology offers to designers who want to create more engaging exertion experiences.

Gamification and exertion

Gamification in an exertion context is not new. The authors recall physical education experiences where the teacher has used game elements to make physical exercises more engaging. Furthermore, in our personal interactions with children, we found a common approach to get children to engage in a mundane physical task is to turn the task into a game to make it “more fun”. We are interested in what happens in this process, what unique characteristics the involved exertion affords, and how technology can support this process.

Traditional approaches to turning exercise into a game generally involve the creation of a competition aspect around the activity. This often means that “let’s do X” turns into “let’s see who can do X the fastest”. An exertion activity that is centered on a competitive element has previously been used to define sports [1], and as such, we propose that the notion of gamification for exertion activity describes the process of turning exercise into a sport. There might be exceptions to this statement, fed by the fact that the definition of sport is not universally agreed upon [5], however, we believe this view can serve designers as useful guide.

One requirement to enable such a competition is to allow participants to compare athletic performance. In order to compare athletic performance, the activity needs to be measurable and hence quantifiable [2]. In conventional sports, traditional devices such as measurement tapes and stopwatches have been used to quantify athletic performance.

New opportunities for the gamification of exertion activities

In addition to these existing “conventional” tools for measuring athletic performance and hence enabling comparisons, we believe digital technology allows for additional means of gamification.

Comparisons over distance and time

Digital technology allows measuring and comparing athletic performance over distance, supporting distributed participants, and over time, meaning that the measurement is persistent and can be compared against future performances. A commercial product that utilizes comparisons over time is the Garmin system that offers a ghost runner feature that indicates how fast a user is running based on his/her previous run, indicated by a “ghost runner” that is trailing or running ahead of the athlete’s current performance [4].

We have designed the Pushing Pixels system [9], which aims to push this notion of comparisons over time further by allowing body-builders to engage with other body-builders, such as a coach, in an asynchronous manner: the coach performs an activity on an exercise machine, which is tracked and recorded, and then played back once the user uses the same machine at a later time, being offered feedback on how much their performances match. This is done in order to facilitate the most appropriate execution of the movements to maximize athletic effectiveness and minimize injury risks.

Comparisons of alternative exertion data

The ability to measure and compare exertion data has been focused on athletic performance so far. However, novel sensor technologies and advanced analysis

techniques allow for new opportunities to measure exertion activity, and hence to compare such data. For example, sensors cannot only measure athletic performance such as distance and time, but also how the human body responds to the exertion activity [7]. Games can be constructed around users’ heartbeats, their respiration rate, their brain activity and so forth. Technology allows sensing new bodily information that was so far difficult to acquire and possibly also difficult to understand, but can now be readily utilized in gaming contexts.

For example, in Jogging over a Distance [8], we have used heart rate data of distributed joggers to enable a novel exertion experience that focuses on bodily effort, rather than on the traditional athletic performance that is centered on time and distance.

Handicapping for more engaging comparisons

Technology can also facilitate the handicapping of a user’s abilities in order to enable “fairer” comparisons: competitions are not engaging if participants are of very different ability, and there is no suspense or excitement because the winner is essentially known before the activity begins [5]. To address this, athletes have previously used handicaps to level out athletic abilities, for example in golf. However, this usually involves making a stronger participant weaker. Knowing that one’s abilities are artificially constrained might hinder engagement with the activity. Technology can address this by concealing such a handicap. For example, in a networked game participants might not be aware that their performance is artificially dampened. This might facilitate engagement, however, can raise ethical concerns.

In Jogging over a Distance [8], we have used heart rate data from the participants, but instead of using the beats-per-minute value, we have processed the relative increase to the participants' target heart rates as input to the experience. This meant that an experienced runner had to increase his/her heart rate by 10% if he/she wants to keep up with a beginner who has increased his/her heart rate by 10%, even though their absolute heart rates might be very different. With this design strategy, we enabled a novel experience that allowed very fast runners to jog with beginners, an experience not easily achieved without the technology.

Conclusion

In conclusion, we have argued that the notion of gamification is not new when it comes to exertion activities; however, technology enables new opportunities to facilitate this process. We have detailed a set of design strategies that benefit from digital technology to support novel game experiences. We are looking forward to discussing them as part of the gamification agenda, contributing an exertion perspective to the dialogue.

Acknowledgements

This work was partially supported by a Fulbright Scholarship with support from Telstra. Thanks to Eelke Folmer, BJ Fogg, Frank Vetere, Martin Gibbs, Darren Edge, the London Knowledge Lab, the University of Melbourne and Microsoft Research.

Bibliography

[1] Blanchard, K. The anthropology of sport: An introduction. JF Bergin & Garvey, 1995.

[2] Danc. What activities can be turned into games?, 2008. Retrieved from

<http://www.lostgarden.com/2008/06/what-activities-that-can-be-turned-into.html>.

[3] Deterding, S., Dixon, D., Nacke, L., O'Hara, K. and Sicart, M. Gamification: Using Game Design Elements in Non-Gaming Contexts Proceedings of the SIGCHI conference on Human factors in computing systems, ACM New York, NY, USA, Vancouver, Canada, 2011.

[4] garmin.com. Forerunner 405. Retrieved from <https://buy.garmin.com/shop/shop.do?cID=142&pID=11039>.

[5] Kretchmar, R. Practical philosophy of sport and physical activity. Human Kinetics Publishers, Champaign, IL, USA, 2005.

[6] Mueller, F., Agamanolis, S. and Picard, R. Exertion Interfaces: Sports over a Distance for Social Bonding and Fun SIGCHI conference on Human factors in computing systems, ACM, Ft. Lauderdale, Florida, USA, 2003, 561-568.

[7] Mueller, F., Edge, D., Vetere, F., Gibbs, M.R., Agamanolis, S., Bongers, B. and Sheridan, J.G. Designing Sports: A Framework for Exertion Games CHI '11: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM, Vancouver, Canada, 2011.

[8] Mueller, F., Vetere, F., Gibbs, M.R., Edge, D., Agamanolis, S. and Sheridan, J.G. Jogging over a distance between Europe and Australia UIST '10. Proceedings of the 23rd annual ACM symposium on User interface software and technology, ACM, New York, New York, USA, 2010, 189-198.

[9] Sheridan, J. and Mueller, F. Fostering Kinesthetic Literacy Through Exertion Games Workshop on Whole-Body Interactions at CHI'10: International Conference on Human Factors in Computing Systems, ACM, Atlanta, USA, 2010.

[10] Weinberg, R.S. and Gould, D. Foundations of Sport and Exercise Psychology. Human Kinetics, Champaign, IL, USA, 2006.