Exertion Interfaces

Florian 'Floyd' Mueller
floyd@exertioninterfaces.com

Stefan Agamanolis
stefan@agamanolis.com

Abstract

Exertion as an interface has gained an increased momentum recently due to the belief that it can address current issues such as obesity, contribute to technology developments such as pervasive computing, and open new markets for entertainment industries. We are proposing a workshop on this topic to bring researchers and industry participants from this area together to further refine the field and promote the area as distinct topic. The workshop will support developing future collaborative efforts and encourage a constructive reflection on the issues of this novel area.

Keywords

Exertion, physical, activity, natural, interaction, pervasive, ubiquitous, sports, videogames, obesity

ACM Classification Keywords

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

Introduction

The human-computer interaction community has come a long way since the first CHI conference 25 years ago. The interfaces that have been invented, evaluated and investigated over this period usually address a specific task, useful in a professional environment where outcomes are goal driven. Empirical findings and rules are grounded on the understanding that the less

physical and cognitive effort is needed by the user to operate an interface, the better the interface is.

Exertion Interfaces turn this traditional approach upside down by utilizing the mental but in particular the physical action that is required to operate the interface in order to create a superior experience. An Exertion Interface is defined as an interface that deliberately requires intense physical effort [10]. Exertion Interfaces can be expected to be physically exhausting when used for an extended period of time. In short, if the interface is hard to use, it can be better in supporting the experience. This experience is often not of task-oriented nature, but touches the realms of fun, human rapport and social experience.

Establishing the conceptual position of Exertion Interfaces in the HCI domain and promoting the theoretical framework for future instances are important elements of a successful workshop on this topic.

Related Work

Telephonic Arm Wrestling [7] was one of the first attempts to combine an Exertion Interface with networking technologies; it allows a player to arm-wrestle an opponent over a phone line. *Virtual Tug-of-War* [13] is a group physical activity in which two teams of high-school students were involved in a tug-of-war 13 miles apart from each other. *Breakout for Two* [11] uses balls to create a social sense of connectedness between players who are geographically distant through a competitive game of soccer. *Push'N'Pull* [12] is a networked exercise machine that focuses on a cooperative game to encourage rapport and a workout at the same time. *Virku* is a *Virtual*

Fitness Center that uses physical movements conducted on exercise bicycles to modify the representation of a 3D virtual environment [9]. *Virtual Arena* [4] is a multi-player arcade game, where the body movements of players are tracked and mapped onto fighting avatars so players are able to hit one another without getting hurt.

Conceptually, research has been investigating the applicability of two different frameworks ([2] and [3]) especially the interaction with the webcam *Eyetoy* gets attention [8]. Other work has emerged that is conceptualizing a more general theoretical framework around the topic, for example Dourish [6] developed foundations of embodied interactions, and, more concretely, theories evolved around interacting through body movements, and special journal issues [12] have started to examine this topic recently.

Application Domains

Interfaces that encourage physical, exhausting activity have found their way into current research and industry developments, often overlapping certain application domains. We hereby describe the main domains where such interfaces can be beneficial:

Promoting physical activity to fight obesity
Currently, over 60% of all American adults are overweight [1]. Encouraging people to adopt a healthy lifestyle which incorporates physical activity can help address this issue. In the last several years, we have seen supportive systems such as [5] that allow participants to compare their daily step-count with mobile phones to encourage each other in order to achieve their daily exercise goals. Another example is the *Dance Dance Revolution* project [16]: The state of

Virginia in the US plans to install computer dance games, in which players step on lighted platforms in time with the music as they try to match the dancing instructions on the screen, in every public school to encourage the pupils to dance as a form of exercise.

Entertainment industry
The majority of games in modern arcades have become physical games that are distinctly different to traditional joystick games. The physical activities required to operate them seem to attract players, and now players can recreate these experiences in their homes: Commercial input devices for personal use exist for consoles that allow players to exert themselves through dancing (see Dance Dance Revolution), karate-kicking (tracked with a webcam) and playing guitar (with a plastic guitar). The latest console from Nintendo, Wii, strays away from the traditional gamepad by using a controller with accelerometers to allow for games with more excessive body movements.

Supporting an enhanced sport experience
Commercially available products such as personal training watches that incorporate a heart rate monitor were initially designed as mere analysis tools for professional athletes. Recently however, they have made it into commodity items that are used by hobby athletes not only to track their progress, but also as motivational tool. They track their progress over the Internet with pervasive technology, such as the symbiosis of fashion item, entertainment media and analysis tool, the Nike/Apple sport kit [14], and share their exercise experience with friends and strangers: Running tips are discussed on blogs and routes are shared using Google Maps. Such tools can be elements of a pervasive and ubiquitous computing environment,

while creating a challenge for designers of such systems: they need to be very robust, contextually aware, and very mobile due to the exertion they have to support.

Workshop Goals
The workshop's goals are:

- To share information and experiences among researchers in the area of exertion interfaces and related areas such as ubiquitous computing, context-aware computing, user-experience design and pervasive computing. Researchers in these areas have probably encountered cases where mouse-keyboard interactions do not give justice to real world experiences, but a physical interaction would support them better. Industry participants that are interested in current and future developments can exchange ideas in regards to their requirements of supporting physical activities for professional and casual sportspeople.

- To find consensus among the participants in refining the definition of the field and marking the boundaries of a comprehensive understanding of the area. The area of Exertion Interfaces is relatively young and can benefit from a conceptual refinement by the most influential people in the field.

- To raise awareness in related areas and to promote the field as distinct entity. This can be achieved through organizing a conference with the topic, further workshops at related conferences, editing books or book chapters on the topic etc.

- To find matches in interests that lead to future collaborations and to cooperative research proposals to

extend the network and promote a more connected research approach.

Conclusion

Exertion Interfaces are interfaces that deliberately require intense physical effort. Recent application domains for such interfaces have been encouraging a healthy lifestyle, supporting social interactions between geographically separate participants and allowing for new gaming experiences. A workshop with this topic will provide a first forum that exclusively focuses on this topic and will allow for an excellent networking opportunity which will result in new collaborative projects and a promotion of the field through conceptual papers and book chapters on this topic.

References

[1]   American Obesity Association. Obesity in the US. http://www.obesity.org/subs/fastfacts/obesity_US.shtml

[2]   Bellotti V., Back M., Edwards W., Grinter R., Henderson A., Lopes C. Making Sense of Sensing Systems: Five Questions for Designers and Researchers, CHI '02, ACM Press, Minneapolis, USA, pp. 415-422

[3]   Benford S., Schnadelbach H., Koleva B., Gaver B., Schmidt A., Boucher A., Steed A., Anastasi R., Greenhalgh C., Rodden T. and Gellersen H. Sensible, Sensable and Desirable: a Framework for Designing Physical Interfaces, Technical Report Equator-03-003, Equator, February 2003.

[4]   Children and Hyperreality, http://culturalpolicy.uchicago.edu/conf2001/papers/provenzo.html

[5]   Consolvo, S., Everitt, K., Smith, I., and Landay, J. A. Design requirements for technologies that encourage physical activity. In CHI '06, ACM Press, New York, 457-466.

[6]   Dourish, P. Where the Action is: the Foundations of Embodied Interaction. MIT Press, Cambridge, Mass., 2001.

[7]   http://www.normill.com/artpage.html

[8]   Larssen A., Loke L., Robertson T., Edwards, J. Understanding Movement as Input for Interaction – A Study of Two Eyetoy™ Games. Proc. of OzCHI 2004, Wollongong, Australia.

[9]   Mokka S., Väätänen A., Välkkynen P. Fitness Computer Games with a Bodily User Interface. In Proc. of the Second International Conference on Entertainment Computing. Pittsburgh, USA, 2003. ACM International, pp 1-3.

[10] Mueller F., Agamanolis S., Picard R. Exertion Interfaces for Sports over a Distance. Proc. User Interface Software and Technology, UIST 2002, ACM Press, USA.

[11] Mueller F., Agamanolis S., Picard R. Exertion Interfaces: Sports over a Distance for Social Bonding and Fun, Proc. Conference on Human Factors in Computing Systems, CHI '03, ACM Press.

[12] Mueller, F., Stevens, G., Thorogood, A., O'Brien, S., Wulf, V. Sports over a Distance. Journal of Personal and Ubiquitous Computing, Special Issue on Movement Based Interaction, 2006.

[13] New York Hall of Science - Press Room. http://nyhallsci.org/nyhs-pressroom/nyhs-pressreleases/pr-tug_of_war.html

[14] Nike + iPod Sport Kit. http://www.nike.com/nikeplus/

[15] Special Issue of Personal and Ubiquitous Computing on Movement-Based Interaction. http://research.it.uts.edu.au/idwop/aarhus/special_issues.html

[16] US pupils to dance themselves fit. BBC news. http://news.bbc.co.uk/2/hi/technology/4653434.stm