**SOFTENG 702 Assignment 1 Final Report**

**Review on User Interaction and Physical Activity Monitors**

|  |  |  |
| --- | --- | --- |
|  | **Weiyang Wang**  UPI: wwan256  University of Auckland  [wwan256@aucklanduni.ac.nz](mailto:wwan256@aucklanduni.ac.nz) |  |

## Abstract

The way how the user interacts with the hardware is one of the keys to a successful hardware product. This paper is a literature review on the topic of user interaction and physical activity monitors. It focuses on how well-designed and efficient user interaction can promote the physical activity persuasion effect of a physical activity monitoring system, most commonly, a smartphone application and what the most significant aspects of interaction are in the designing of such systems. The three papers selected all discussed the effect of user interaction design on physical activity monitoring systems. However they did it from a relatively different perspective. The first paper mainly focused on introducing one specific design of theirs; the third one mainly analyzed the features from current available applications for physical activity promotion while the second one provided some suggestion on the designing and also gave a concrete demonstrate of their design prototype.

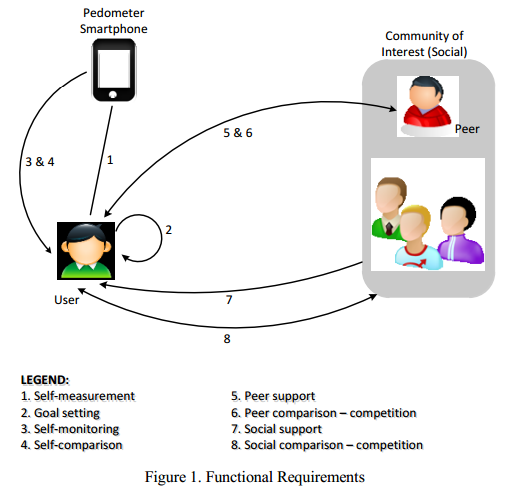
# Introduction

As we know, the world we lived in was reshaped by several times of industrial revolution, which happened and spread around the world in the last centuries. As the consequence the productive forces of the human society has been multiplied exponentially since then. One of the most significant changes of our society is distribution of labor force. Huge amount of physical labor is taken by highly developed tools as machines. By the help of the developing education level, more people engage in mental labor and the proportion of mental labor has overtaken that of physical labor. Fortunately, most people suffering from diseases and disorder caused by physically overwork are saved. On the other side, diseases and disorder caused by lack of physical activity has become a new problem of the whole modern society. During 2002-2004, despite the numerous benefits of PA and well-publicized exercise guidelines, only 38% of US adults engaged in regular leisure-time PA and at least 25% were completely inactive[4]. Therefore it is urged to develop systems to persuade people to do more physical exercise or, as many may complain that they even do not have particular time for exercise, more physical activity just in everyday life. To achieve this goal, an efficient way to measure and quantify the amount of physical activity taken by the object is needed before analyzing and illustrating those data to the object to persuade them to have more physical activity. One of the solutions proved to be efficient is to utilize physical activity monitors with inertial sensors such as accelerometer and gyroscope[5]. On the other hand, as the rapid development and popularity of smart devices, represented by smart phones, they are equipped with all kinds of accurate sensors and powerful processors needed in building a proper physical activity monitor for every individual[6]. Nevertheless, the critical part of designing an excellent system that is indeed persuasive for the users to have more physical activity lies on the way how the system interact with the user. Considering all above, this paper presents a review focusing on user interaction design in building a persuasive system with physical activity monitors, especially smart phones.

## Related work

In general, the idea is prevailing these years to utilize cutting edge technology to monitor physical activity of an individual and building a persuasive system to encourage more physical activity thus to help cultivate a healthy lifestyle with sufficient physical activity. Even the implemented products are volcanically erupting recently[7,8,9]. Here, three of the most relative papers focusing on the design of user interfaces in a persuasive system utilizing physical activity monitors will be mainly reviewed and several other papers related work will be introduced briefly.

In the paper PersonA: Persuasive social network for physical Activity[1] the authors introduced a project they were conducting, which was to combine a common kind of physical activity monitoring devices, i.e. a smartphone, with a social network system (SNS), Facebook, to build a real-time physical activity data recording, publishing and social feedback system to persuade and encourage people to promote a healthy lifestyle and also for some health professionals collect physical activity related data. The fundamental idea of this project is to fully utilize the advantage of two popular and rising technology to create a well user interacted application of physical activity monitors.



Basically the paper Design requirements for technologies that encourage physical activity[2] provided four requirements for designing physical activity monitoring and motivating systems and also introduced an example of one of this kind of systems, a prototype mobile phone application named Houston, with which user’s step count data can be shared with user’s friends and thus the physical activity can be encouraged. The most valuable an appreciating content in this paper is the four design requirements it provided for technologies that promote physical activity, respectively creating a credit system for activities; providing user with indication of activity level; associating the collected and processed data with social network systems; taking practical constraints of users lifestyles into consideration.

The paper Desired features of smartphone applications promoting physical activity[3] mainly discussed the value of the commonly adopted features of contemporary smartphone applications used to promote the user’s physical activity and life-style. The evaluation is done by carrying out a well-designed experiment, in which 15 sedentary adults tested three PA (physical activity) smartphone apps available at that time and provided both qualitative and quantitative feedback. This feedback is then analyzed and illustrated in the paper. Generally the paper has provided an evidence-based evaluation on the features and components of a smartphone application designed for promoting user’s physical activity. The features discussed in this paper are most related to user interaction with the system and the systems use smartphone as the physical activity monitoring device.

## Gaps and future work suggestions

All the papers in this area have covered a majority of aspects but there may be some detailed areas missed. Firstly, the Interdisciplinary research with the help of kinematics can be very useful for individual suggestions but it seem no sufficient attention in this area has been drawn. Secondly, full use of specialized social network for the interaction among users maybe brilliant idea for peer persuading like workout route recommendation, workout schedule discussing can be good ideas.

## Conclusion

Researching on the interface design between user and the system which utilizing physical activity monitors to quantize users everyday physical activity amount and use the analyzed data back to persuade user to have a better healthier lifestyle can be a very promising area in the discipline of human computer interface. Many useful yet interesting ideas of projects can be proposed in this area.

**REFERENCES**

1. Ayubi SU, Parmanto B. PersonA: Persuasive social network for physical Activity. Conf Proc IEEE Eng Med Biol Soc. 2012 Aug;2012:2153-7. doi: 10.1109/EMBC.2012.6346387.
2. Sunny Consolvo, Katherine Everitt, Ian Smith, and James A. Landay. 2006. Design requirements for technologies that encourage physical activity. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '06), Rebecca Grinter, Thomas Rodden, Paul Aoki, Ed Cutrell, Robin Jeffries, and Gary Olson (Eds.). ACM, New York, NY, USA, 457-466. DOI=10.1145/1124772.1124840 http://doi.acm.org/10.1145/1124772.1124840
3. Rabin, C., & Bock, B. (2011). Desired features of smartphone applications promoting physical activity. Telemed J E Health, 17(10), 801-803.
4. Adams, P. F., & Schoenborn, C. A. (2006). Health behaviors of adults: United States, 2002-04. Vital Health Stat 10(230), 1-140.
5. Yang, C. C., & Hsu, Y. L. (2010). A review of accelerometry-based wearable motion detectors for physical activity monitoring. Sensors, 10(8), 7772-7788.
6. Freedson, P., Bowles, H. R., Troiano, R., & Haskell, W. (2012). Assessment of physical activity using wearable monitors: recommendations for monitor calibration and use in the field. Medicine and science in sports and exercise, 44(1 Suppl 1), S1.
7. Taj Campbell, Brian Ngo, and James Fogarty. 2008. Game design principles in everyday fitness applications. In Proceedings of the 2008 ACM conference on Computer supported cooperative work (CSCW '08). ACM, New York, NY, USA, 249-252. DOI=10.1145/1460563.1460603 <http://doi.acm.org/10.1145/1460563.1460603>
8. Shlomo Berkovsky, Mac Coombe, Jill Freyne, Dipak Bhandari, and Nilufar Baghaei. 2010. Physical activity motivating games: virtual rewards for real activity. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10). ACM, New York, NY, USA, 243-252. DOI=10.1145/1753326.1753362 <http://doi.acm.org/10.1145/1753326.1753362>
9. Heil, D. P., Brage, S. O. R. E. N., & Rothney, M. P. (2012). Modeling physical activity outcomes from wearable monitors. Med Sci Sports Exerc, 44(1 suppl), S50-60.
10. Ward, D. S., Evenson, K. R., Vaughn, A., Rodgers, A. B., & Troiano, R. P. (2005). Accelerometer use in physical activity: best practices and research recommendations. Medicine and science in sports and exercise, 37(11), S582.
11. Chen, K. Y., & Bassett, D. R. (2005). The technology of accelerometry-based activity monitors: current and future. Medicine and science in sports and exercise, 37(11), S490.
12. Butte, N. F., Ekelund, U., & Westerterp, K. R. (2012). Assessing physical activity using wearable monitors: measures of physical activity. Med Sci Sports Exerc, 44(1 suppl), S5-12.