# Using 3D Virtual Worlds in the Design of Wellness Applications

**Maaret Posti**
Center for Internet Excellence
University of Oulu
Erkki Koiso-Kanttilan katu
90014 University of Oulu Finland
maaret.posti@cie.fi

**Leena Ventä-Olkkonen**
Center for Internet Excellence
University of Oulu
Erkki Koiso-Kanttilan katu
90014 University of Oulu Finland
leena.venta-olkkonen@cie.fi

**Jonna Häkkilä**
Center for Internet Excellence
University of Oulu
Erkki Koiso-Kanttilan katu
90014 University of Oulu Finland
jonna.hakkila@cie.fi

Designing for Wellness and Behavior Change
workshop
October 14th, 2012at NordiCHI 2012, Copenhagen, Denmark


## Abstract
Wellness applications are no longer designed only for strictly professional looking gadgets or employ user interfaces dominated by numbers or charts. Playful design and game-like user interfaces have emerged also in this area. In this paper, we discuss the role of virtual worlds in wellness applications which aim to motivate people to perform more physical exercise. We describe different ways to utilize virtual worlds in wellness applications, and introduce our work-in-progress in the area – an online survey with 111 participants assessing different concept design.

## Author Keywords
Wellness, user interface design, virtual reality.

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

## Introduction
The use of different types of playful user interface (UI) design elements has become more common in wellness applications during past years. Combining aspects familiar from games and entertainment industry to gestures or whole body interaction has resulted off-the-shelf products such as Wii and Kinect which have brought physical exercising to living rooms of families.

Research has explored versatile concepts for exergames and persuasive user interfaces aiming to increase motivations for physical exercise [1, 2, 3, 4]. These concepts cover different types of systems from, for example mobile phone applications [1] to heart rate controlled games [5] and connecting people over distance during the exercise within a virtual space set with audio design [4].

In this paper, we focus on the use of virtual worlds in the UI design of wellness applications that use spatial or geographical presentations. We provide an overview to different aspects of how virtual worlds and other spatial or geographical elements have been used in wellness UI designs, and present findings of an online survey we conducted to chart perceptions of the aspects applied to concept level scenarios.

## Use of Virtual Worlds for Wellness - Charting the Design Space

Examination of the prior art utilizing virtual world presentations in the interaction design reveals different approaches. Here, we are interested in designs focusing on the use of spatial dimension in the sense of using distances as a central concept either in input or output side. Based on the literature review, we came up with different categories of how virtual worlds have been used in the design of wellness applications or systems. In the UI design, performing a physical exercise can…

1. reveal hidden parts of the virtual world
2. take the user towards a distant goal in the virtual world
3. modify the virtual world
4. map/associate with the real world activities

In category 1, conducting physical exercise reveals parts of the unknown world presented on the UI according to the physical exercise progression. The hidden entities can be e.g. map sections that need to be revealed or virtual treasures that should be found. This category covers both more goal orientated as well as exploratory application designs where the user may select paths more randomly and without competitively orientated rationale (e.g. virtual sightseeing).

Crossing a distance or travelling from one point to another, category 2, contains scenarios where the player progresses towards a goal location set in the virtual world, e.g. as races the competition to the finish line. This kind of wellness game design has been demonstrated e.g. in [1], where the users of Into mobile wellness game progressed on the game map according to their pedometer count, and in [6], where different exercise methods are converted to a virtual rowing competition.

Category 3 refers to the designs, where the exercise effort is converted to actions that change the visual representation or other characteristics of the virtual world. This design approach has been used in Fish 'n' Steps [3], where the fish in a virtual fishtank changes to a happier and more active representation according to a user's step count, and UbiFit, where a flower garden visualized on a mobile phone screen becomes richer with more physical exercise [2]. Although these examples use designs that do not utilize spatial dimensions of the virtual worlds, the same principle is easily applied to geographically orientated virtual world games.

Furthermore, there are additional dimensions in the spatial design space. Mapping the distances between virtual and physical world can be absolute or relative. Moreover, the distance crossed in the physical exercise can be measure in spatial coordinates (e.g. jogging in the streets) or without a change in the actual physical location (treadmill). In addition, virtual mapping can be done to convert a non-spatial exercise (e.g. gym) to virtual world travel, and include different exercise types converted to a common game UI design according to the performance, as in [6].

## Our research

To evaluate the expectations and opinions on how virtual worlds could be utilized in a wellness application design, we drafted five scenarios with alternative designs. People were asked to comment these in an online survey in summer 2012. The aim of the survey was to provide background knowledge for the future research, as we plan to design a wellness application concept further. In the following, we present our findings of our initial study.

*Concept Designs*

Online survey was conducted with five different scenarios combining user exercise and 3D city scene. The recipient was asked to evaluate each scene with three different aspects: fun, motivating for the exercise and whether the recipient would like to use the application. The evaluation scale was 1 to 5 (5=strongly agree, 1=strongly disagree). All scenarios were presented on the same page of the online survey, and participants could scroll the page back and forth as well as change their scores.

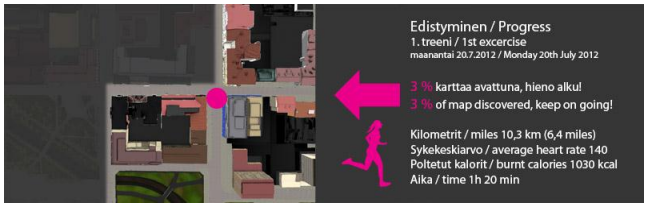


**Figure 1. Screenshot of concept design A.**

Concept design A, Figure 1, shows a virtual world map that is originally hidden. The longer the user runs, the more of the map is revealed. With each exercise, more areas of the map become visible.

**Figure 2. (left) Screenshot of concept design B (the virtual world part).**

**Figure 3. (right) Screenshot of concept design C (the virtual world part).**

Concept design B, Figure 2, shows a 3D map of a virtual world, where the user can explore and go in any direction s/he wishes. The longer distance the user runs, the more s/he can explore the virtual world.

Concept design C, Figure 3, shows a 3D map of a virtual world, where the user has a goal to travel from point A to B. The longer distance the user runs, the

more s/he can progress towards the goal in the virtual world, and explore the landscape on the route.


**Figure 4. Screenshot of concept design D.**

Concept design D, Figure 4, shows a 3D map of a virtual world containing more details and a polished visualization if the user exercises more.

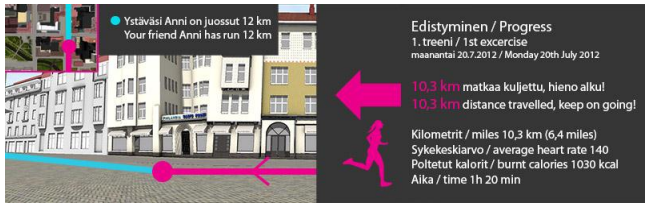


**Figure 5. Screenshot of concept design E.**

Concept design E, Figure 5, shows a 3D map of a virtual world, which shows the location of the user and a friend, who is also jogging. The more they run, the longer they can travel in the virtual world. The users can e.g. agree if they try to race each other to a certain location on the virtual world map.

*Participants*

The wellness questions of the online survey gained 111 responses during the one and a half months it was open. 64/111 respondents were female. 31,5 % of the respondents belonged to the age group of 30–39 years, 27 % to the group of 18–24 and about one fifth to the groups of 25–29 and 40–49 each. All participants had a mobile phone. Mayority (63,1%) used map application in their mobile phones. Google Street View was also commonly used among the survey respondents as 87,4% had used it and 9% had tried it out.

Almost half had experience on 3D virtual world computer games, 34 reported playing them and 22 had at least experimented playing. Most of the participants were somewhat familiar with augmented or mixed reality applications (e.g. Layar, Google Goggles, Wikitude). 36 % had heard about them, 18,9 % had tried and 11,7 % had used them. Most of the survey respondents (57,7 %) used some wellness technologies or applications to track their physical exercise. 32,4 % were using mobile applications (e.g. Sports Tracker, Edmondo) and 27,9 % reported using heart rate monitor. An online Wellness portal was used by 13,5 %, 12,6 % reported playing a fitness game at home (e.g. Wii Fit) and 10,8 % used pedometer.

*Results*

Our concept designs received relatively good feedback from the 111 respondents who assessed them. Application A was the most popular concept design, and was chosen as the favourite one by 38 (of 111) respondents, see Figure 6. Two thirds (67/111) thought it would be fun or quite fun to use the application described in A, and almost the same amount (66/111) of respondents also considered A as motivating or quite motivating for physical exercise. Secondly best liked was application E with social elements. 56/111 thought using this application would be fun or quite fun and nearly as many (57/111) considered the use of application E motivating.

Respondents valued the **game-like aspect** of the concept designs as seen in the following comments: *"I don't like jogging very much, but the app seems exciting. It includes game-like elements which motivate you to exercise"* (male, 25–29, about design A). "*Best idea, motivates you to exercise and even in new foreign environment. Works for people like me with 'collect the whole set' obsession"* (About design A, male, 25–29).

However, revealing the 3D map bit by bit was considered annoying and even dangerous by some respondents and little less people (51/111) were interested on trying to use the application in real life. *"I usually plan my jogging paths beforehand in a foreign place, but when using this, you could run to nasty places by accident if the map is not revealed"* (male, 30–39).

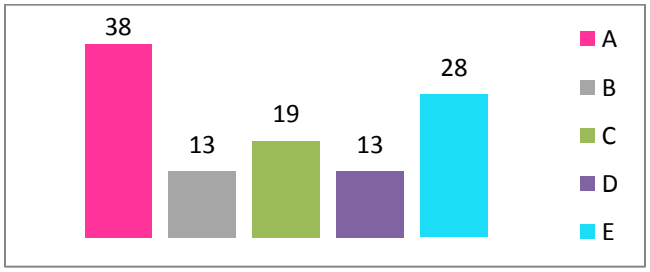


**Figure 6. Participants answers when they were asked which concept design was their favourite one (n= 111).**

The **sociality** of the application E was considered motivating as in following citations*: "Jogging with a friend is always more fun although just virtually"* (female, 18–24). Application E was seen as a device for increasing sociality in modern society. *"This could be a platform to socialize in the big cities where people are sort of alienating from each other more"* (male, 25–29). Also game-like aspect would increase interest: *"This could be pleasant with a good friend. If this were a game, it would be interesting, but if this is just 'this much kate and mary have jogged' –application it couldn't interest less how much someone has burnt calories"* (female, 18–24).

On the other hand social dealing would enable **competition**. Competitive aspect awoke strong reactions against and for. *"Horrible thought to compete against a friend like this*" (female, 18–24). "*This would just increase the competition culture which I don't think is appropriate for human being's selfesteem"* (female, 25–29).

The **virtuality** itself raised negative reactions among the survey respondents and it was argued that real world physical jogging friend would motivate to exercise more*. "I would rather jog concretely together with a friend"* (female, 18–24).

All of the concept designs (A–E) were considered fairly similar with each ther and it was suggested that they would be features of one and the same application. Comparing these options was considered hard because of the similarity between concepts.

## Discussion

In this paper, we have presented an overview to different cases how virtual worlds can be used in the wellness application design. We drafted five alternative concept designs that illustrated different approaches how a virtual world representing a city landscape could be utilized in a wellness application. We organized an online survey, which was answered by 111 people. In

our study, we were interested in evaluating how different wellness applications utilizing a virtual world presentation would be received by the audience.

The results did not reveal any strong preferences, although desing A (revealing hidden parts of a virtual world) was the most popular. However, a design (E) which included information also of another person, was perceived competitive, and received quite strong opinions both for and against. The unpopularity of concept E was somewhat a surprise, as knowing the peer performance has been found motivating in other applications [1, 4], and social support as an important factor for persevering physically active lifestyle [7]. It may be that our scenario did not appeal to users who do not have a competitive nature. However, this result may not reflect the reality, as the users did not use any of the introduced application hands-on, but the answers were based on first impressions.

Interestingly, when the participants were asked their opnions of how fun and motivating they found the concept designs, and if they would like to use the application, the distribution of answers did not alter much. However, the results based on our concept prototypes only show participants' opinions, not their actual experiences of using these designs.

We acknowledge that our research has limitations, especially as the findings are based on an online survey, not real use of an application. However, we were interested in getting some preliminary results before getting into actual application design, which we plan to do in the later phase of the project. As a future work, we also wish to develop further the taxonomy of wellness applications using virtual worlds.

## References


[1] Ahtinen, A., Huuskonen, P., Häkkilä, J. (2010). Let's All Get Up and Walk to the North Pole: Design and Evaluation of a Mobile Wellness Application. In *Proc. NordiCHI 2010*.

[2] Consolvo, S., Klasnja, P., McDonald, D. W., Avrahami, D., Froehlich, J., LeGrand, L., Libby, R., Mosher, K., Landay, J. A. Flowers or a Robot Army? Encouraging Awareness & Activity with Personal, Mobile Displays. In *Proc. Ubicomp 2010*.

[3] Lin, J., Mamykina, L., Lindtner, S., Delajoux, G., Strub, H. Fish'n'Steps: Encouraging Physical Activity with an Interactive Computer Game. In *Proc, UbiComp 2006*, 261-278.

[4] Mueller, F., Vetere, F., Gibbs, M.R., Edge, D., Agamanolis, S., Sheridan, J. G. Jogging over a distance between Europe and Australia. *Proceedings of the 23nd annual ACM symposium on User interface software and technology*, October 03-06, 2010, New York, New York, USA

[5] Nenonen, V., Lindblad, A., Häkkinen, V., Laitinen, T., Jouhtio, M., Hämäläinen, P. Using heart rate to control an interactive game. April 2007, In *Proc. CHI 2007*.

[6] Park, T., Inseok H., Uichin L., Sunghoon I. L., Chungkuk Y., Youngki L., Hyukjae J., Sungwon P. C., Souneil P., Junehwa S. ExerLink - Enabling Pervasive Social Exergames with Heterogeneous Exercise Devices. In *Proc. MobiSys 2012*.

[7] Ståhl, T., Rütten, A., Nutbeam, D., Bauman, A., Kannas, L., Abel, T., Lüschen, G., Rodriquez, D., Vinck, J. and van der Zee, J. The importance of the social environment for physically active lifestyle – results from an international study. *Social Science and Medicine* 52 (2001).