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A unified platform for outcome measures and exergames with 3D accelerometry

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Background

Mobile accelerometry is more and more being used in clinical trials as a tool to measure outcomes related to physical activity. However, it is still difficult to integrate exercise therapy in controlled clinical trials. We want to explore the option to use a unified platform to both measure outcome and prescribe and monitor exercise therapy using the actibelt technology platform. We present a prototype based on the actibelt platform that allows to use the wearable device as a mouse controller for a large set of potentially interesting games.
Playing an exergame a person is encouraged to increase its level of daily motion while engaging in an activity that is perceived as interesting and fun, thus, providing an intrinsic motivation. Studies suggest that exergaming can be compared to light or moderate physical activity considering the heart rate, oxygen consumption and energy expenditure. [1]

Methods

Considering the vast amount of video games that have been developed to this day, the use of mobile accelerometry for a multi-purpose game controller becomes increasingly interesting. Using such a device, already existing games can be utilized as exergames. Primarily, fast-paced games that seem suitable to encourage constant movement and skill-based games to set a focus on constantly keeping one's balance. Thus, such an approach can also be individualized to a certain category of people, e.g. obese children and adolescents, elderly people or people with a disturbance of equilibrium, depending on the choice of games.
Based on “actibelt blu”, an 3D accelerometer included in a belt buckle with bluetooth connectivity, such an application has been developed. The accelerometry data send by the “actibelt blu” is used to generate mouse events, enabling the user to control standard computer games.
This concept is a different approach to exergaming compared to the mainstream technology (Kinect, Wii Remote, etc.) where games are actually developed to suit a given technology.

Figure 1: An “actibelt” with full accessories. [5]

Results

We have tested various games (in particular enigma) that include visualization and sound and checked usability and motivational aspects in healthy individuals of various age groups to establish safety and feasibility. The gaming activity can be linked to a more general information and motivational platform to stimulate an active lifestyle, www.your724.com, based on an objective measurement of physical activity during one week (“week-in-a-box”).

Figure 2: Screenshot of “Enigma”, a skill-based video game. [3]

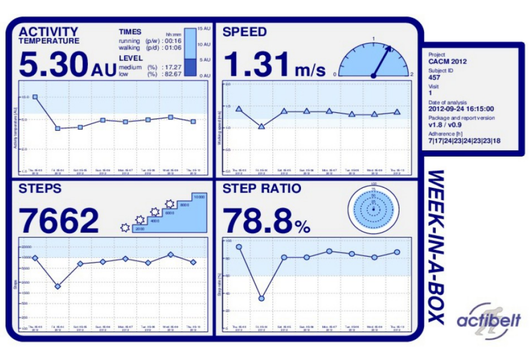

Figure 4: Example data for a “week-in-a-box”. [4]

A short overview of existing technologies

The following figures show different types of technology that allow the user to engage in exergames.

Figure 5: The Nintendo Wii with a Wii Remote, a controller Based on accelerometry. [6]

Figure 6: Example for a commercial exergame platform. Wii Fit for the Nintendo Wii [2]

Figure 7: The Kinect, using motion capturing and gesture control. [7]

Conclusions

Mobile accelerometry is a promising tool to measure physical activity both in its role as outcome and treatment. Technologically it seems to be possible to seamlessly integrate exercise games in large scale clinical trials, but logistics, data management and regulatory topics will need to be clarified.

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