Low Cost Motion Capture Integrated into Home Based Serious Games

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Abstract

The research presented in this abstract concern the utilization of Serious Games in terms of home-based patient rehabilitation. The main goal here is to attempt to provide motivation and enjoyment during the performance of exercises while using the low-cost Microsoft Kinect integrated into a customized open sourced game engine.

1. Motivation

Serious games can be thought of as any game based interfaces that have been designed for any purpose other than entertainment. Serious games have been researched in the areas of: military, health, government and education. The design of these serious games can offer valuable contributions to develop effective games in the area of rehabilitation. As any other computer game, they are fundamentally intended to capture and keep a person's attention.

2. Problem Statement

Patients that require rehabilitation for balance re-training, rheumatoid arthritis rehabilitation, and rehabilitation following stroke, etc. must perform consistent exercises as a crucial element in their overall physical and mental rehabilitation. However patients at home tend to either only follow their programmes for a short period of time or do not follow them at all. The problem we are aiming to solve is that patients follow their exercise programmes regularly and to view it as a fun activity.

3. Related Work

Lots of research has been conducted in using serious games in terms of rehabilitation. Effective rehabilitation must be early, intensive and repetitive [1]. Serious games provide a means to maintain motivation for people undergoing therapy [2] by means of exercises. Games of virtual reality and imaging of webcam-based games [3] are usually the solution to provide an engaging and motivating tool for physical rehabilitation. Most of the systems presented in the literature are very specialized to a particular condition and most have expensive hardware requirements.

4. Research Question

Can the use of low cost sensors in serious games address the problem of patient adherence to exercise rehabilitation programs in home based scenarios?

5. Hypothesis

This research will provide a first step towards proof-of-concept, that serious games are a crucial cog in a home rehabilitation system by utilizing low cost home based motion capture devices, which may already be present in households, with the Kinect. The use of low cost sensor in serious games can enable the use of those games for rehabilitation by creating both personalized games and also making more widely available than other expensive alternatives.

6. Proposed Solution

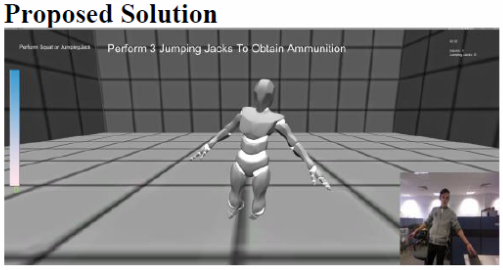

Figure 1: Screenshot from the 'power-up' element of the game.

In this work we have developed an early stage game on the open sourced Unity3D game engine and integrated it with the Microsoft Kinect motion capture device. The objective of Game is to allow the patient to perform their rehabilitation exercises in a fun 'gamified' environment. This is achieved by powering up a turret and shooting targets. However many things must be done to gain ammunition for turret and power up turret. The Game sequence is as follows, once the game starts, a warmup round, where the user must perform basic movements like capturing orbs. After that exercises must be performed, which are automatically detected by the system, to power up the turret and acquire ammunition (Figure 1). Once the exercises are performed the turret can be used. After each round of firing turret and acquiring ammunition for turret, difficulty increases on powering it up and firing at targets.

7. Evaluation

The research presented here reflects an initial three months investigation into this project. In the future patient usability is planned to stress test the technology in order to produce fully working prototype.

8. References

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