



Department of Computer Science

First Semester Project Report 2017/2018

Fun Treatment: use of gaming in physiotherapy

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1. Goals & Objectives:

Our project will be to create a serious game in medical domain and physiotherapy specifically, and our games are developed to help people who have physical injuries to do rehabilitation exercises, especially since there is a large proportion of people who have been injured and they are not able to do their exercise because of boredom during exercise and routine which accompanies the performance of these exercises, and ours is made for decrease this proportion Through performing these exercises by playing in the games that we will develop indirectly.

Physical injuries are those injuries that affect the body and one of the parties, as a result of accidents or falls or other reasons, there are many treatment methods, depending on the injured area and its severity One of the most important ways to treat physical injuries is physical therapy to restore their natural movement, and we select shoulder dislocation as a study case to help the patient in their treatment process because it's one of the most common injuries.

Shoulder dislocation is the removal of the shoulder joint from its cavity it's caused by accidents, hangings or falls, there is a great role for physiotherapy and performing medical exercises in the treatment, to strengthen the shoulder and restore its natural movement after the treatment process. There are many exercises to help treat shoulder injury, some exercises that injured person should do to treat the injury, such as movement of the hand vertically from up and down, there is also movement for the hand horizontally left and right.

2. What we did this semester:

After we select the idea of the project, we have read many researches related to our idea, and then we gained the necessary knowledge to start design our project.

In the next stage, we have two parts to build our project; first part of the project is complete, now we will discuss how it was completed.

2.1 Overview of the technical area:

As we say we will focus on shoulder injuries because it's most common injuries, and decided to choose the unity3d game engine, because of our prior knowledge of it. And for design our 3d objects we will use the blender graphics software, which increases the aesthetics of the game and the ability to use the wondered reality that we have time during the next semester and for game mechanics and player control we will used kinect hardware as a device to read the movement of the player, the kinect is the best for our game, because it easy to connect with the environment of unity3d.

2.2 Games that will be created:

Because of the treatment process, we conclude that we should create two games that will help the player to recover from injury.

- **Fruit game:** This game will cover horizontal hand movement, by move the patient hand to the right and left, the fruit game is about Player mission is cutting all fruit that appears, the goals of the game is to make the player cut all the fruit that appears through playing to increase the score and get a high score before the time end, and the player should avoid the obstacles and get rewards and open all unlocked environment and fruit, this game has many environments that the player can choose from (mountains, deserts... etc.), the selected environment affects the fruits that are appearing on the screen. For instance, the desert provides fruits like banana, dates and cactus ... etc. And so on for the other environments, how to play it first the player choose the game environment, then he enter the game and appear a player hand that holds a sword, after that the fruit will instantiate and the player must cut them off before they fall on the ground. The player should avoid cutting the obstacles like bomb that will appear suddenly, although there will be a supporting tools that will help the player for instance, time freeze and add new life, at the end of every session, appearance three treasures to the player, and then the player should point to one of them to get the prize.

- **Spaceship game:** This game will cover vertical hand movement; the spaceship game is about a space spaceship flying through space, this spaceship moves up and down based on the player's hand movement, the goal of the game is to avoid as many obstacles as possible and collect coins to increase the score and open all unlocked environment and spaceships, this game has many environments that where the spaceship flying in it and there is a lot of obstacles appear such as meteor and stones appears while flying, how to play it first the player choose the game environment, then he enter the game and directly appear a spaceship, after that the player should avoid the obstacles like meteor and stones, and collect coins and supporting tools such as rockets and add new life, at the end of every session, the player is shown three treasure boxes and the player has to point to one of them to get the prize.

2.3 Overall goal and outcome:

The patients will be able to perform his / her medical exercises without being bored, he will be eager for exercise; this will speed up treatment and recovery from injury, which will increase the performance of these exercises.

3. Demo

We have created a prototype, my fruit game, in order to test the possibility of linking sword movement to hand movement, where at the beginning we designed the sword using blender, we tied the sword movement in the movement of the mouse, because we the kinect device not available for us now. After that, we were brought an object, and we did some experiments on it, to study the possibility of cutting when touched by the sword, and how to cut it and divide it, as shown in the (Figure: 1) below.



Figure 1

We have taken this prototype to the doctor, where he studied the possibility of introducing movements to it, because the medical movements must be precise by execution, the doctor showed his admiration for the idea of the game, and he said it will help the injured greatly, it will facilitate his work, especially in dealing with the injured.

4. The work to be done in the second semester

In the next semester, we will start to build our game, first we will design the objects for both games, since there will be a lot of game environment and objects for design, after that we will start to Integrate game objects into the game engine Unity3D, and design the interfaces that fit with each game, and then handle the game mechanics through connecting our game with the Kinect to read the external movement by the player using Kinect SDK and make sure to link the external movement with the game, after we finish developing our games we will go to physiotherapy centers to get the feedback from real patient to make adjustments if necessary.