

# A SERIOUS GAME FOR MULTIMODAL TRAINING OF PHYSICIAN NOVICES

Gonçalo CARRASCO<sup>1</sup>, Yves RYBARCZYK<sup>1</sup>, Tiago CARDOSO<sup>1</sup>, Isabel PAVÃO MARTINS<sup>2</sup>

gbcarrasco@gmail.com, y.rybarczyk@fct.unl.pt

1. Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa (PORTUGAL)

2. Faculdade de Medicina de Lisboa, Universidade de Lisboa (PORTUGAL)

## 1. Introduction

The objective of this project is the development of a serious game to support learning and training of the neurological examination, for medical students.

The implemented tool uses Natural User Interfaces (NUI) to ensure realistic and intuitive execution of the tasks by the player.

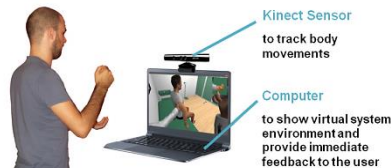
## 2. Background

Simulation based games for training is an original approach to enhance knowledge, psychomotor skills and decision making of physician novices.

In this context, the immersiveness of the game is a key feature for the training efficiency. Since NUIs allow a full transparency to control the avatar's movements, the player can easily experiment a feeling of telepresence into the virtual environment.

## 3. System Overview

A Kinect NUI is used as the main interface of the game, but the player can also use the mouse and keyboard to interact with the system.



System Overview

The Kinect sensor provides a natural and intuitive control of the doctor's avatar, since both the joint positions of the player and avatar are linked together. This optical system (IR) enables quite an accurate tracking of the player's movements and, consequently, and assessment of the quality of the medical gestures.

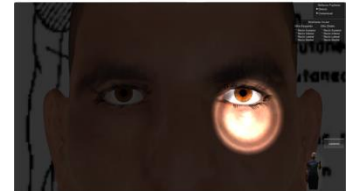
## 5. Prototype Solution

The multimodal training is based on two types of exercises.

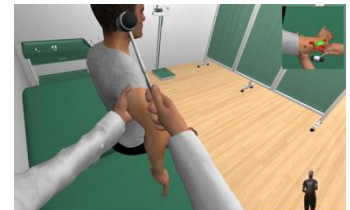
The first one enables the assessment of the student's capacities to establish a diagnostic. An example is the Pupillary Reflex and the Ocular Motility examination.



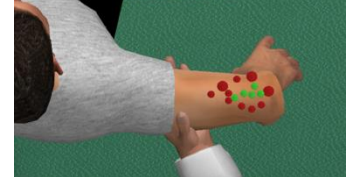
First prototype level (a) Ocular Motility; (b) Pupillary reflex



The second one aims at assessing the student's gesture executions, such as triggering Deep Tendon Reflexes.



SCORE: 5/15



Deep Tendon Reflex level (a) Overview; (b) Hit Chart

## 4. Game Design

The game takes place in a 3D virtual medical office where a doctor, who represents the player, performs the various tasks of the neurological exam. Once a task is completed, the student receives feedback that indicates whether the gesture was correctly applied or not.



Doctor's office overview (in-game)

Diverse mechanics are available in the game, such as an adaptive perspective, a difference in the player gestures, and a different goal for each kind of examination. These mechanics are designed in order to improve the system ergonomics and, ultimately, the training efficiency, given that some tests are quite different from each other in terms of purpose and execution.

## 6. Conclusion and Future Work

The developed game is still a prototype, which consists in two kinds of exercise (cognitive and motor) that clearly demonstrate the potential of this pedagogic tool. The main limitations of the current system are related to the Kinect accuracy and are expected to be corrected with the next generation of the sensor, which is about to be released.

The next stages of the game development will be:

- To test the game on medical students, to collect data from the already implemented project and feedback to use in future work;
- To implement other tasks with different mechanics;
- To create of a central linear narrative using clinical cases connecting all the levels.

## References

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