

Proceeding Paper

Development of Dual Activities with Micro:Bit for Interventions in People with Cerebral Palsy [†]

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Abstract: Several studies have shown that video games help to motivate users in different kinds of therapies. Therefore, in this work we developed a tool that includes dual activities for therapy, as well as a data system for the specialist to follow the evolution of the user. The aim of dual activities is to train cognitive and aerobic capacities at the same time. The interaction between the user and the game is made through two Micro:Bits. Once the user finishes the game, the therapist can follow the evolution of the user through some parameters included in the activities.

Keywords: cerebral palsy; Micro:Bit; gamification; dual therapies



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1. Introduction

Cerebral palsy (CP) is a group of disorders that affect a person's ability to move and maintain balance and posture [1]. CP is caused by damage to the brain or abnormal development. Since symptoms vary from person to person, there is not a specific treatment for all children with cerebral palsy.

Nowadays, the search for low-cost and more effective treatments has resulted in the incorporation of new information and telecommunication technologies (ICT) in the field of rehabilitation, for instance telerehabilitation [2]. In this context of telerehabilitation, systems that incorporate video games play an important role. Several studies have shown that playing video games can improve attention, memory and overall performance [3,4].

The aim of this project is to develop a tool that includes dual activities for rehabilitation, as well as a data-system for the specialists to track the evolution of the user. These activities are controlled by the Micro:Bit board, which includes sensors that collect environmental information such as acceleration, temperature or light. These games have the same purpose: to train motor activity and cognitive skills simultaneously. To complete the game, the user must pedal a stationary bike, whilst solving matching, mathematical and memory challenges.

2. Materials and Methods

The Micro:Bit is a board [5] developed by the BBC, designed to encourage children to get involved with computing and programming. This type of device can be programmed using simple graphical interfaces. Programs can be created with Microsoft MakeCode, its own programming environment, but environments such as Scratch, Tynker or Code.org are used to develop projects with this type of device.

This project was developed in Kittenblock, based in Scratch. This platform supports the programming of two Micro:bits. We used two Micro:bit boards, one version 1.5 and the

other v.2. The communications with the Micro:bit v2 are through Bluetooth and with the v1.5 board are through a USB.

We created three games, shown in Figure 1, which have the same purpose: to train aerobic and cognitive skills.

- Maths. The aim is to solve addition and subtraction problems.
- Memory. The user must memorize a pattern of objects.
- Shape matching. Different objects are shown and the user must match them with their shape.

Some variables were defined in order to represent the user's progress. Kittenblock saves these variables and after each session with the user, the therapist can save the progress and store it in a csv file. The structure and an example of the CSV file are shown below: [Username], [date], [time], [score], [speed of game], [level of difficult].

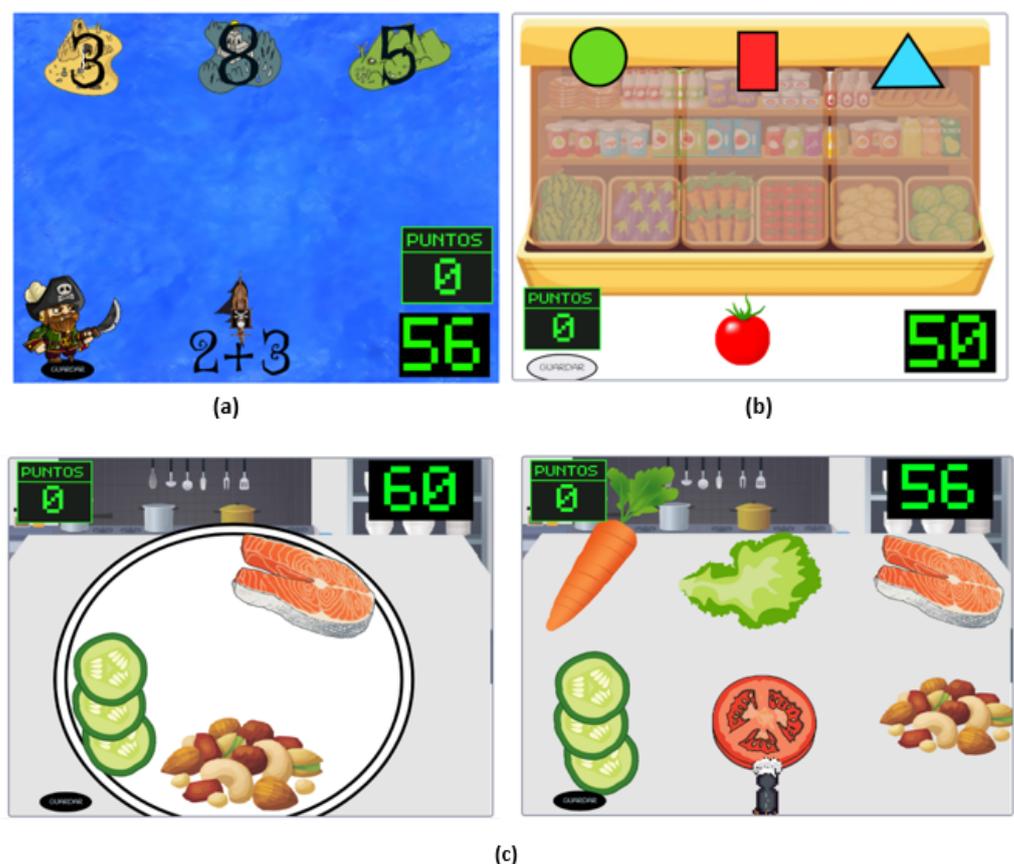


Figure 1. Developed games: (a) Math, (b) shape matching and (c) memory games.

3. Future Work

Some tasks and tests have been left for the future due to time constraints and pandemic-derived problems, restricting access to the Aspace facility and its users. In the future, the tool will be tested with real users in order to measure its effectiveness. Moreover, a platform is being developed using Django, a Python Web framework. Through this app the therapist can graphically analyze the results collected by the tool, track each user's progress and facilitate data recollection.

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