

REINFORCEMENT OF REHABILITATION FOR COCHLEAR IMPLANTED CHILDREN THROUGH A MOBILE-BASED VR AND AR SERIOUS GAME

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Aim: The purpose of this project is to introduce a pilot mobile-based rehabilitation VR and AR serious game to help Cochlear Implanted Children improve their auditory skills. It is known that the development of auditory skills requires much practice and repetition. Virtual reality gaming - an innovative and most promising technology, particularly popular among children – could serve as a tool of substantial help to this cause.

Method: The serious game was developed using Unity's Game Engine 2017 in combination with Google's platform and C#. We chose the Virtual headset Durovis Dive 5 and the mobile phone SONY Z3 (Fig.1), as target devices, because they are considered cheap.



Figure 1

The game consists of five stages, four of which have currently been completed. In Stage Learn (Fig.2) the user gets to know the environment and becomes acquainted with the use of the device and “eye tracking” operation.

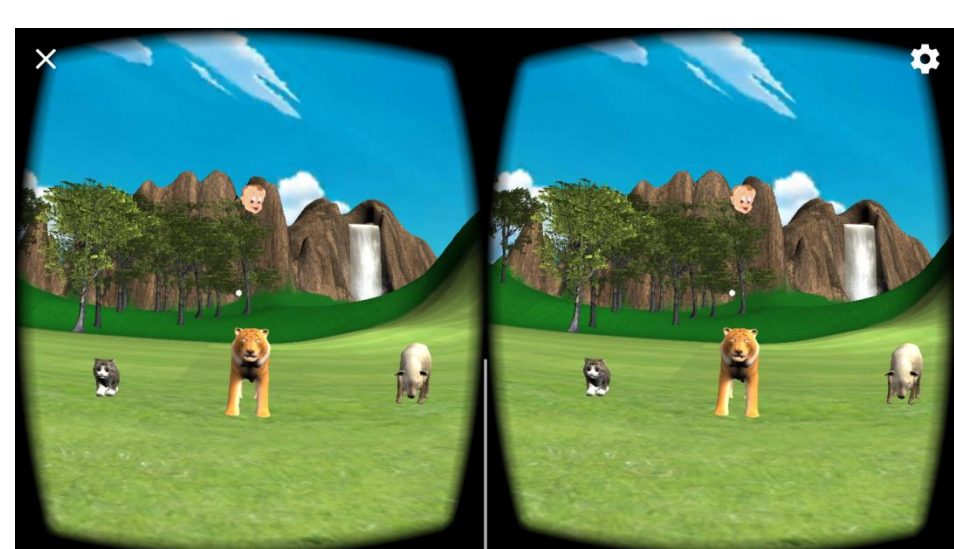


Figure 2



Figure 3

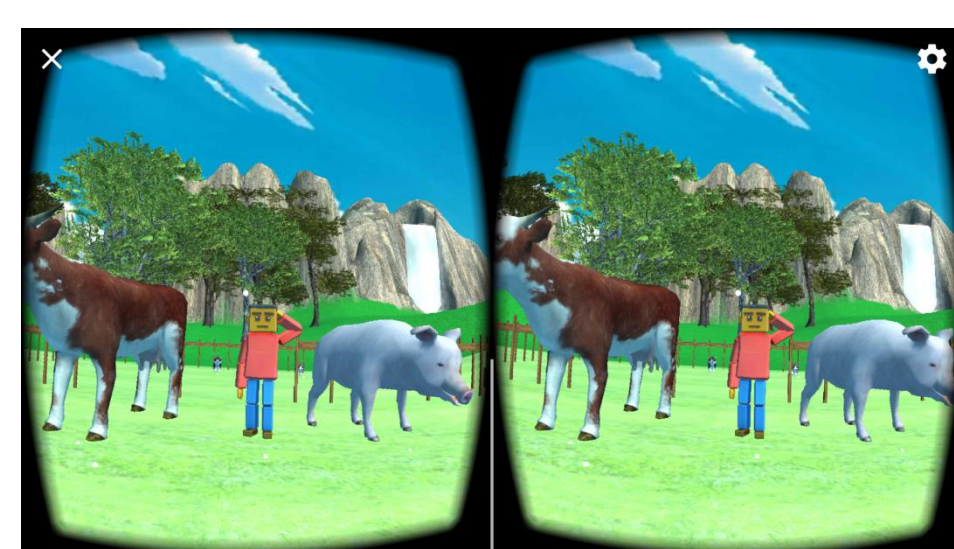


Figure 4

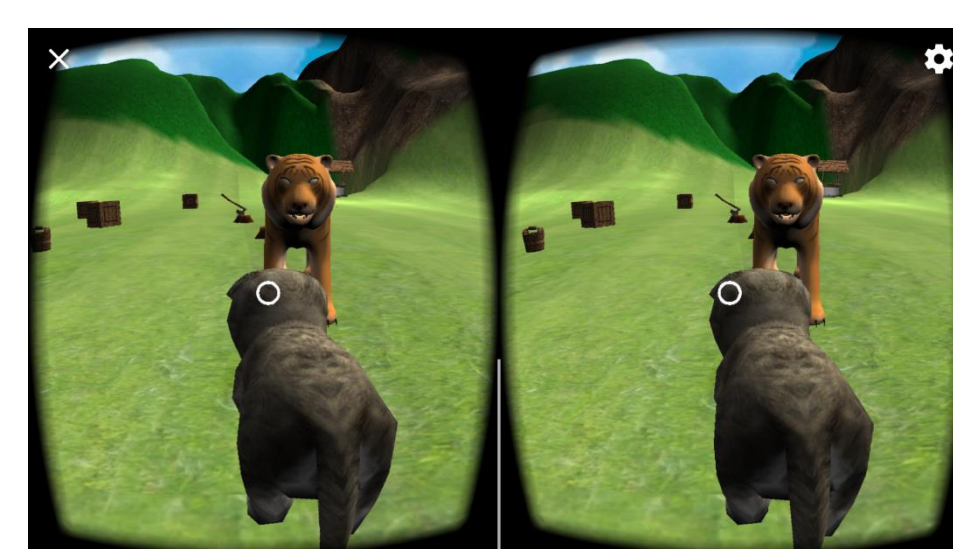


Figure 5

In Stage Detection (Fig.3) a sound corresponding to one of the animal species involved is produced at random and the user has to touch the related animal on the screen within a reasonable time.

In Stage Discrimination (Fig.4) the user watches different animals walk in pairs and he has to match the sound he hears with the related animal.

In Stage Identification (Fig.5) the user watches different animals walk in pairs. When he hears the phrase “Eat the apples, X!”, where X is the animal name, he has to choose the related animal.

In the last two stages, the selection of the animal by the user is made through eye tracking.

In the “Startup” Stage (Fig.6), apart from the four stages regarding the end user, there are also two stages developed for the Speech Pathologist.

The “Setup” Stage (Fig.7) enables the speech therapist to set the volume of sound and noise, adjust the output valid delay time and also specify whether animal sounds or animal names will be reproduced. Furthermore, he can define the time range (Set Random time range) with an accuracy of 1 second, out of which random time of sound reproduction will be played.

In the “Data View” Stage (Fig.8) the speech therapist can see the data produced by the use of the software application. The registered data are the date and time of use of the various stages, the volume of animal sounds and their respective names. In addition, the SP can select the volume of noise (we used the sound of a waterfall as noise). The choices (right or wrong) are also being registered, as well as the time response of the user to the auditory stimuli. Data entries can either appear on the screen of the mobile phone itself or be sent via e-mail or Bluetooth to any other device.

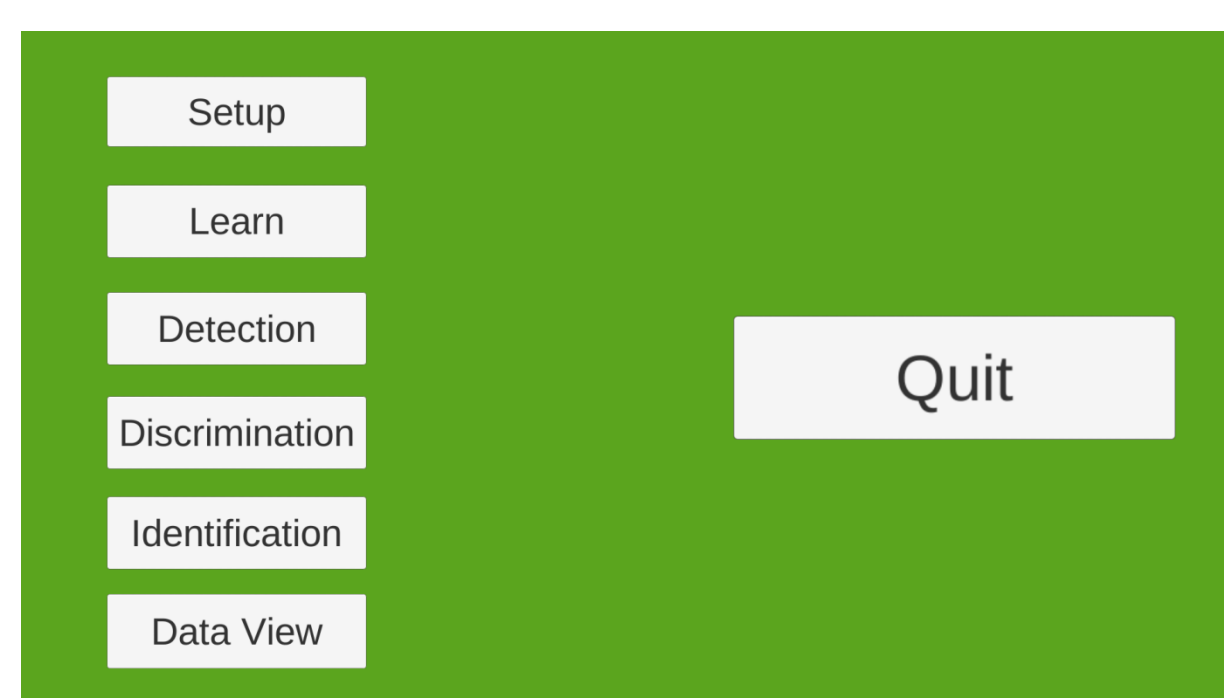


Figure 6

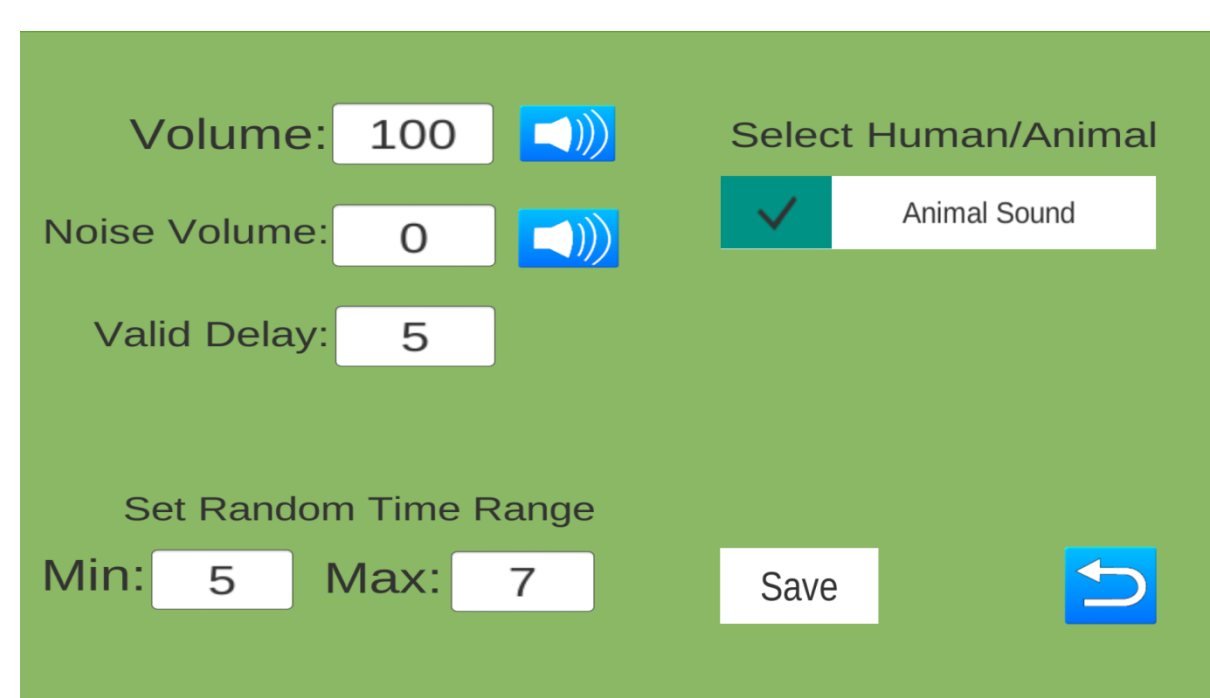


Figure 7

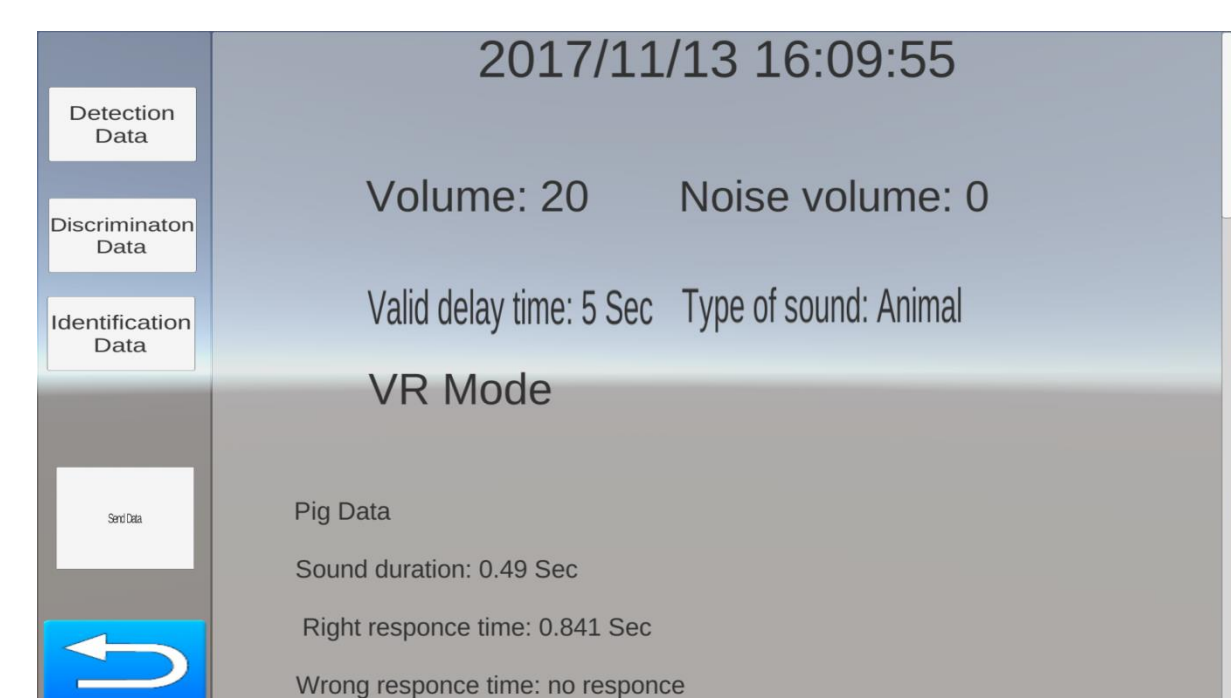


Figure 8

Practical Implications: The innovativeness of this software is the four VR stages training that offers. The recorded information proves to be useful for the speech therapist in evaluating the user.

References

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