

CMU Portugal Undergraduate Internship Program

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This report summarizes the work and activities developed at Carnegie Mellon University under the Undergraduate Internship Program. The internship took place between July and October, 2015 and was sponsored by the CMU Portugal program.

My hosts at CMU were Dan Siewiorek and Asim Smailagic from the School of Computer Science and the main goal of my work was to develop and test a virtual environment (game) which responds to the user's mind state, such as attention, frustration, excitement, boredom, etc. in order to keep the user engaged in the task at hand. This work fell under the research specifications of the Quality of Life Technology Center.

The user's mind state was accessed using an ECG (Electroencephalogram) device such as the NeuroSky MindWave and streamed to the virtual environment with the use of the RehabNet CP.

The environment also had an input error rate similar to a standard BCI controlled system in order to simulate the emotions and frustration which a user would feel while using such system.

After developing the environment we proceeded to the user testing phase, where over the course of three weeks we collected data from eight users.

With all the data analyzed and processed in Matlab, we got some preliminary results which show the relation between frustration and the different brain waves' power bands, such as Alpha, Beta, Gamma, Delta and Theta. However, the system requires more research and testing before it can become robust enough for a broad range of users.

In addition to the planned work, I also attended multiple talks and seminars on a weekly basis. The topics ranged from robotics to interaction design for wearables to data analysis, amongst others.

I met some of the Dual PHD students from the CMU Portugal program and other students from the Undergraduate Internship Program as well. We would all meet for lunch almost every day and discuss each other's work.

The three months in Pittsburgh became a very enriching experience both academically and personally, in terms of organizing, planning and executing the planned work, presenting it in the different stages of development and incorporating the feedback received during the group meetings. All in all, this was an amazing experience and I would highly recommend it to anyone who's looking to increase their research and prototyping skills.

Finally I would like to thank Professor Sergi Bermudez for supporting me with the application for the program and for all of the help he provided during the internship. I would also like to thank Professors Dan Siewiorek and Asim Smailagic for hosting me at CMU and in their research group. Finally I would like to thank CMU, CMU Portugal and the FCT for making the program possible.