



CENG491 Project Proposal

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1. Group Description

1.1. Group Members

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1.2. Sponsor

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1.3. Project Title

Brain Waves Based Psychological Rehabilitation and Decision Support System by Using Brain Computer Interface Devices.

2. Project Description

2.1. Project Description

For many years people have speculated electroencephalographic activity or other electrophysiological measures of brain function might provide a new non-muscular channel for sending messages and commands to the external world -brain computer interface (BCI)-. Over the past 15 years, productive BCI research program have arisen.[1] Our goal with this project is to develop a software product which takes neuro-feedbacks also provided from Brain Computer Interface Devices(BCID). The purpose of this software is to determine and rehabilitation of attention deficiency, performance disorders using science of psychology. One of the major aspects impressing our team members of this project is using the information from two sciences - psychology and computer science.

2.2. The Problem

The first problem that we attend to fix is rehabilitation of attention deficiency, performance disorders using science of psychology. If we achieve to finish this project, It will help to students, sportsmen and businessmen. Secondly, we intend to diagnose some diseases like depression, epilepsy, stress, behavior disorder, panic attack by using neuro-feedbacks provided from Brain Computer Interface Devices (BCID). Since the psychologists do not have certain and sufficient measurable data to diagnose that kind of diseases, we help them with providing such kind of data.





2.3. Our Solution

An EEG(Electroencephalographic)-based BCI(Brain Computer Interface) system measures particular features of EEG activity and uses the result as a control signal.[2] An intelligent agent uses this resultant control signals to identify psychological state of the user. By using these states, we are going to develop a game which uses these phenomenons in its substructure and scenario.

2.4. Characteristics of Our Project

Most popular and many scientific speculations about BCIs start from the 'mind-reading' or 'wire-trapping' analogy, the assumption that the goal is simply to listen in on brain activity as reflected in electrophysiological signals and thereby determine a person's wishes.[3] The graphical interface of the game consists of two main frames. In the first frame, there will be an interface which includes these electrophysiological signals in order to display a real-time map of user's mental activity in brainwave frequency bands. In the second frame, the part of the game controlled by the user will proceed.

The projects aim is not to cure the diseases exactly. Its significant aim is to diagnose these diseases. In order to do that we need lots of data that can be collected from large number of patients. This is the main limitation of our project.

3. Market Search

According to our market research, there are three major companies working on this area.

Brain Master Technologies

Their mission is to develop and provide state-of-the-art neurofeedback devices and neurofeedback systems for the improvement of mental functioning and the awareness of brain states, and to make these neurofeedback products available for widespread use. They develop and/or provide EEG-based neurofeedback equipment, neurofeedback software, neurofeedback systems, publications and training directed toward the emerging fields of neurofeedback, mental fitness, and personal biofeedback.[4]

The difference between this company's approach and ours is that they do not include artificial intelligence support.

MindRoom Sports Science Inc.

The "MindRoom" is a method, based on Neurological and Physiological training (non-clinical and non-therapeutic use of bio- and neurofeedback). Through this training, the person learns how to control his intrusive thoughts and worries, aiming towards a condition of improved presence, attention, concentration and vigilance. This allows an increase in his



awareness and understanding of how his thoughts influence his physiology and how his physiology influences his thoughts. [5]

The difference between this company's approach and ours is that their target market is sportsmen while ours is psychologists.

Thought Technologies Ltd.

Their equipment is used as an essential part of many therapeutic treatments and clinical assessment protocols to treat stress related disorders as well as provide treatment for incontinence and muscle rehabilitation, including sEMG-triggered stimulation. On the non-medical side, it is also used in ergonomics, sports and educational applications – wherever accurate and sensitive psychophysiological monitoring and biofeedback are needed. [6]

The difference between this company's approach and ours is that they only measure brain waves and show that measurement in a graphical monitor. They do not include any artificial intelligence support. Moreover, their target market is sportsmen while ours is psychologists.

4. References

- 1. & 3.** Wolpaw, J.R. & Birbaumer, N. & McForland, D.J. & Pfurtscheller, G. & Vaughan, T.M. (2002, March). Brain-Computer Interfaces for Communication and Control.
- 2.** McForland, D.J. & Miner, L.A. & Vaughan, T.M. & Wolpaw, J.R. (2000, January). Mu and Beta Rhythm Topographies During Motor Imagery and Actual Movements.
- 4.** Brain Master Technologies, Welcome to BrainMaster - Neurofeedback Systems [WWW page]. URL <http://www.brainmaster.com/>
- 5.** MindRoom Sports Science Inc., Company Profile [WWW page]. URL <http://mindroomsportsscience.com/azienda.php>
- 6.** Thought Technologies Ltd., Company: about us [WWW page]. URL <http://www.thoughttechnology.com/overview.htm>