Mind Control

Capstone Spring 2014

Michael Eric Carlson

# **Project Success**

Mind Control empowers users with the ability to control a robot using their mind alone. I plan to develop the interface and software necessary for training users in recognizing and consistently producing the specific brainwave signals necessary to move objects in a virtual environment. This gives users the opportunity to become proficient in the basics of Mind Control use, exercising mental-muscles they’ve not yet had to use, before moving on to the (conceptually) heavy lifting. Upon becoming proficient, users can implement their newfound skills on a real world object, in the form of driving a remote control car. Users gain the ability to control an object with their mind via an electroencephalogram (EEG) headset, which is capable of reading the EEGs of a wearer. Should my project go forward, it stands to be of real benefit to a variety of users.

# **Target Users**

* Person’s with ADD or ADHD/Parents with a child who has ADD or ADHD
  + Because Mind Control requires reading brainwaves, there is abundant promise of using Mind Control to improve concentration. The assurance to ameliorate attention is likely to cause people with ADD or ADHD to take interest in my product. The interest of parents not only comes from the promise Mind Control has to help with ADD or ADHD, but also from the “fun factor” that the product has to engage children.
* Handicapped Individuals
  + Mind Control has incredible potential with handicapped individuals. Use of one’s mind in such a manner requires a plethora of practice. Mind Control would serve as a stepping-stone to future implementations of EEG devices that would control a wheelchair or even prosthetic limbs.
* Users whose minds work differently
  + The difference in the way that these user’s brains work is outside normal variance levels. Any number of external factors could cause the contrast in brain activity (brain trauma, PTSD, weed, etc.).

# **Project Backlog**

------------------------------------------------------------------------------------------------------------------------------------------

1. Title: Settings Change What EEG Readings Generate Commands
   1. Description: As a user whose mind works differently, I need to change settings so that I can decide what readings from the EEG Headset control the directional movement of a virtual or real car.
   2. Acceptance criteria:
      1. Settings menu provides options for each direction that let the user decide what brainwave reading controls the associated direction of the car.
      2. The user will be able to change the settings if desired. Once changed, the settings menu will display the new settings.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Settings Persistence
   1. Description: As user whose mind works differently, I do not want to change settings every time I run the program so that I am not wasting time changing the settings over and over again.
   2. Acceptance criteria:
      1. Control settings are per user. If the User Profile is changed, that particular User Profile’s settings will then take effect. The settings menu will reflect the current User Profile’s settings.
      2. Settings persist outside the application. When restarting the application, all User Profiles’ settings will load. Upon selecting a User Profile at the start of the application, the settings menu will retain the settings from the previous execution of the program.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Accurate & Responsive User Controls
   1. Description: As user whose mind works differently, I want application-commands that I send using the EEG headset to be consistent, accurate and responsive.
      1. The nature of accepting commands from an EEG headset is as unreliable as electronic voice-dictation software. In the same sense that word-recognition is difficult for software when users have different pronunciations and accents, the variance in EEG levels between users is too great for a static analytic process to operate within an acceptable level for both accuracy and responsiveness.
   2. Acceptance criteria:
      1. A calibration function in the software application will match the unique brainwaves of the current user. Running this calibration function will be required for every user before further use of the application.
      2. The application will allow a user to re-calibrate whenever they want; this allows a user to account for possible chemical changes in the way they think down the road.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Create Commands from EEG Readings
   1. Description: As a handicapped individual, I need the application to generate commands calculated from my brainwaves so that I can control a virtual or remote control car.
   2. Acceptance criteria:
      1. The application must generate binary commands for each direction (forward, left, right, backward) based on the current User Profile’s settings. These the virtual and real portions of the application will reflect these commands.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Practice Moving a Car Forward and Backward
   1. Description: As a handicapped individual, I need a way to practice just moving the virtual car forward so that I can focus my practice on what I must do to move the car forward.
   2. Acceptance criteria:
      1. The user will have the option to select a practice mode that allows the user to practice moving a virtual car forward and backward. Once selected, the virtual car will only move based on forward and backward commands.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Practice Turning a Car Left and Right
   1. Description: As a handicapped individual, I need a way to practice just turning the virtual car so that I can focus my practice on what I must do to turn the car.
   2. Acceptance criteria:
      1. The user will have the option to select a practice mode that allows the user to practice turning the virtual car left and right. Once selected, the virtual car will only move based on left and right commands.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Practice All Directions Simultaneously
   1. Description: As a handicapped individual, I need a way to practice all movement of the virtual car at once so that I can combine what I know on how to move the car forward with what I know on how to turn the car.
   2. Acceptance criteria:
      1. The user will have the option to select a practice mode that allows the user to practice moving the car in all directions. Once selected, a virtual car will move based on forward, left, right, and backward commands.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Computer to Car Interface
   1. Description: As a handicapped individual, I want to be able to connect an RC car to a computer so that I can practice moving a real world object with my mind.
   2. Acceptance criteria:
      1. The application will present the user with the option to practice movements with an RC car. Once selected, the application will attempt to connect with an RC car. If the application cannot find a connection, the application will notify the user and pause to wait for a connection.
      2. The remote control of the RC car must accept commands from a computer. These commands move the RC car accordingly (forward, left, right, backward).
      3. EEG data must be the basis to generate the commands sent from the computer to the remote control. The RC car will not be able to move via any method other than the brainwave data, which includes buttons on the remote control and buttons on the keyboard of a computer.

-------------------------------------------------------------------------------------------------------------------------------

1. Title: Track Progress
   1. Description: As person with ADD/ADHD, I need a way to track progress so that I can tell if my concentration has improved
   2. Acceptance criteria:
      1. The tracking of improved concentration is in the form of a graph. The user can look at the graph at any time. The graph will show plot points of average concentration during each practice session.

-------------------------------------------------------------------------------------------------------------------------------

# **2-Week Plan**

Week One

1. Title: Computer to EEG Headset Interface
   1. Description: All users need a way to connect an EEG headset to a computer so the application can read the user’s brainwaves.
   2. Acceptance criteria:
      1. The application will let the user know if the application has connection to an EEG headset. Upon failure of connection, the application will let the user know how to alleviate the issue.
      2. The application will let the user know if the EEG headset is not on a user’s head. If the application detects the headset is not on a user’s head, the application will pause the current session and provide the user with instructions on how to resolve the error. (Maybe the user positioned the headset incorrectly, or the headset is not on the user’s head, etc.)

Week Two

1. Title: User Profiles
   1. Description: As a user whose mind works differently, I need the ability to create my own profile so that my experience with the application is not hindered by the way my mind functions.
   2. Acceptance criteria:
      1. Upon executing the program, the user will be required to select a “User Profile”. The user will have the option to create more “User Profiles” if desired. If no profile exists, the user will be required to create a new “User Profile”.
      2. A collection of user profiles will host new user profiles. The application will display the collection of user profiles upon execution of the program.