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SE -101 - Lab Project - Proposal

Project Overview:

Archimedes is an Arduino based project composed of mini-games/puzzles, designed with the intent to behave as a testing hub for cognitive thinking. The preliminary appeal of *Archimedes* is its focus on applying cognitive tests to components of the brain, which are underused on a daily basis.

Software Components:

- *Archimedes* Application (user-interface and mini-games)
  - Language: C
  - IDE: Eclipse C/C++ Developer Package (Mars 2)
- Arduino Controller (Controller for main *Archimedes* Application)
  - Language: C
  - IDE: Arduino IDE 1.8.5

Materials for *Archimedes*:

Major Hardware Components:

- Arduino UNO R3
- UNO R3 Case
- Wooden Encasement for Controller

Major Input Components:

- Arcade Joystick
- Arcade Buttons
- Radial Input Dials

Intermediate Components:

- Various Resistors and Wires
- Universal Breadboard

Major Status Indicators:

- 32 Character LCD Screen Module
- Multicoloured LEDs

Scope of Prototype:

The prototype model intended for *Archimedes* is evolutionary; as the initial plan is to design hardware/software for four base cognitive testing mini-games. These base games will be synchronized with a central platform and scoring scheme. Once this base prototype is completed, the plan is to continuously develop new games, enhance functionality, and improve the overall design of the project. Some of the ideas we have to enhance on the base prototype are to amplify the amount and quality of the games, alongside developing the functionality of the controller. To improve user experience we can introduce various difficulty levels, where the interface adapts to the user's current level. Furthermore, to create aesthetically pleasing physical aspects, the controller casing can be adapted to be ergonomic, and seamless with the multitude of input and status indicator components.

Challenges We Expect to Face:

The main challenge that we will face will be the synchronization of all games with the central interface and controller. To further elaborate, we will have to set up the controller to receive user inputs, display outputs, and we will have to display the game itself on a separate screen simultaneously to minimize input lag. Furthermore, one of our more advanced challenges throughout this project will be to develop games which target specific cognitive functions and provide factual evidence of the benefits *Archimedes* will provide. To do this, we will need to research the type of cognitive tests which target specific areas of the brain; then design games that effectively invoke use of these components of the brain.