

Structural Health And Rupture Detection (SHARD)

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Client: Dr. Willard/AEE Senior Design GSAs

Goal and Motivation

- The project goal is to create a shielding system that protects against high impact velocities of micrometer objects. This is especially useful for rockets/shuttles protecting against micrometer debris in low earth orbit
- Our goal is to create an application that displays status of the tile shielding system by interfacing with sensor-connected microcontrollers
- Our goal also is to alert the user if a rupture takes place as well as program a microcontroller to activate a system that autonomously repairs a specific tile if it is ruptured (assuming we are supplied with the repair mechanism)



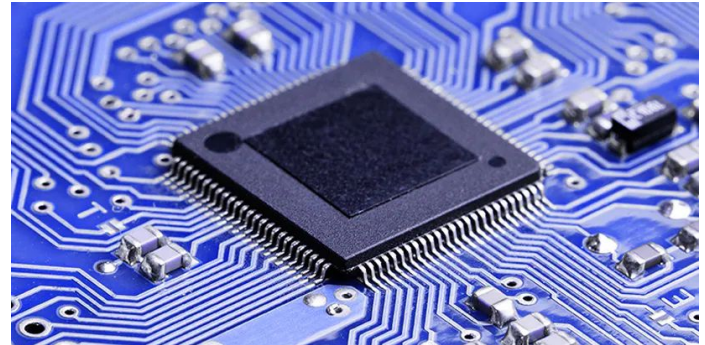
Approach/Key Features

1. Visualize the physical model of the structure
 - a. Create, load, and save models
 - b. Choose which tile in the model corresponds to which microcontroller (in order to view sensor data)
2. Interact with real time data that is fed into the application from outside sensors
 - a. User can select any tile and it will show data for that tile
 - b. The status of the tiles will be color coded
3. Choose what to do when sensor data reveals a breach in the structure
 - a. Application will alert the user if a rupture occurs



Technical Challenges

1. Collecting data from the sensors and turning it into understandable information
2. Knowing which tile in the physical model corresponds to which tile in the virtual model
3. Learning more about microcontrollers (or other electronics that interface with sensors) and how they interact with computers
 - a. Might determine which programming language we use



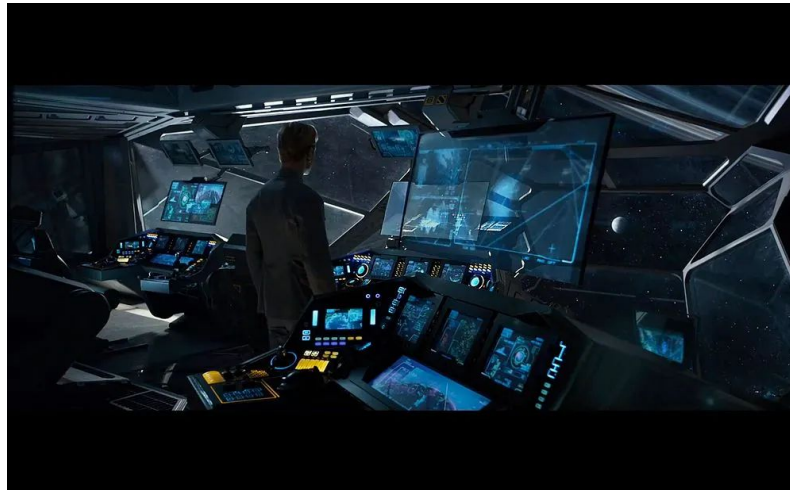
Milestone 1

- Compare and select technical tools
 - a. Programming language for the GUI
 - b. Microcontroller to be used (Arduino, PIC, Raspberry PI)
- Provide small ("hello world") demo(s) to evaluate the tools
 - a. Create basic GUI in programming language that we will use
 - b. Create a basic microcontroller system to test how they work
- Resolve technical challenges
 - a. Learn how the microcontroller interfaces with computer
 - b. Learn how the sensor data is interpreted by the computer
- Requirements document
- Design document
- Test document



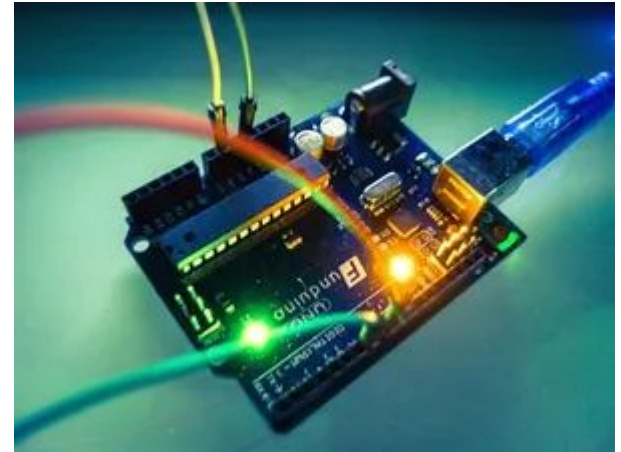
Milestone 2

- Implement, test, and demo the user interface
 - a. Should be able to create a model by adding and removing tiles
- Implement, test, and demo the microcontroller connecting to the application and the tiles in the model
 - a. User should be able to connect a microcontroller to a specific tile in the application



Milestone 3

- Implement, test, and demo the application and the microcontroller with the sensors
 - a. Application should show the sensor data for each tile in the model
- Implement, test, and demo that the application should at the very least tell the user if a rupture happens
 - a. If the rest of the team has a system that can repair the rupture, we will make a program in the microcontrollers that activates this repair system



Questions?