

# SHARD

## *Structural Health and Rupture Detection*

### **CSE Team Members:**

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### **Aero/Mechanical Team Members:**

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### **CSE Faculty Advisor:**

Dr. Silaghi, [msilaghi@fit.edu](mailto:msilaghi@fit.edu)

### **Advisor Meeting Dates:**

9/20/2022

10/4/2022

### **Client:**

Dr. Willard, Aeronautics Professor and NASA Engineer

### **Client Meeting Dates:**

9/9/2022

9/16/2022

9/23/2022

1. Progress of current Milestone (progress matrix)

Task	Completion %	Julian	Matthew	To do
1. Investigate tools	100%	50%	50%	none
2. Hello World demos	100%	100%	0%	none
3. Requirement Document	100%	70%	30%	none
4. Design Document	75%	50%	50%	make other diagrams and diagram descriptions
5. Test Plan	100%	30%	70%	none

2. Discussion (at least a few sentences, ie a paragraph) of each accomplished task (and obstacles) for the current Milestone:

- Task 1 - GUI API Choice: The purpose of this task was to find a suitable GUI API that we will use throughout the project to design our software. We decided to go with the OpenGL API, which self-identifies as “The Industry Standard for High-Performance Graphics.” The ability to achieve high-performance graphics is important to us because we will be creating a GUI with three-dimensional objects, and high performance is necessary if we want the application to have this functionality.
- Task 2 - Microcontroller/Hardware design: The purpose of this task was to determine which microcontroller and hardware configuration of sensors would best suit our software requirements. Talking with our advisor, each tile in the physical structure will have 2 sensors. Each of these sensors is connected to a multiplexer. The multiplexer is connected to 7 other tiles (14 sensors) including the one mentioned before, and the multiplexer’s output is to one raspberry pi. We chose to use raspberry pi over Arduino because raspberry pi has good support for software to microcontroller interface through the laptop.
- Task 3 - “Hello world” demos for microcontroller and GUI API: The purpose of this task was to create various introductory demos for the microcontroller and GUI API we would use in order to better understand the tools we use for the project. A demo when testing for GUI APIs was creating a window with 2D objects with OpenGL. For the microcontroller, we didn’t have access to one during the time period of the first milestone, so we did online emulations from sites like Tinkercad and Wokwi. These sites only had emulations for Arduino.
- Task 4 - Create Requirements Document: The purpose of this task was to outline the main functionalities of the software and the requirements for the computer interface system. The product scope, product functions, user functions, and the various product modes were also expanded upon in this document.

- Task 5 - Create Design Document: The purpose of this task was to outline how the user will interact with the interface and how the interface will be connected to the microcontroller/sensor system. The document shows how the requirements will be fulfilled and how the application modes will interact with each other. Sketches of the various windows of the GUI and a UML diagram were both created in this document.
  - Task 6 - Create Test Plan: The purpose of this task was to create a document that describes all the test cases. The cases will test the functionality of the application and see if the requirements outlined in the Requirements document are satisfied. For each test case, the document shows the associated requirements, procedure, valid input, invalid input, and expected output for the test.
3. Discussion (at least a few sentences, ie a paragraph) of contribution of each team member to the current Milestone:
- Julian Herrera: Worked mainly on the requirements and the design document. Did research on which GUI API to use and created programs testing different API. Tested microcontroller via online emulation on the websites called Tinkercad and Wokwi.
  - Matthew Manley: Worked mainly on the test plan document and the design document. Discussed with Julian the various components/modes of the user interface and how this interface will be connected to the microcontroller/multiplexer sensor data. Goals were also established for the upcoming milestones.

Plan for the next Milestone (task matrix)

Task	Julian	Matthew
1. Increase understanding of how to draw the tiles from the hardware system (algorithm).	50%	50%
2. Experiment with multiplexer and raspberry pi connection with each other and with the laptop.	50%	50%
3. Create the basic structure of GUI	50%	50%

4. Discussion (at least a few sentences, ie a paragraph) of each planned task for the next Milestone
  - Task 1: The purpose of this task is to determine how the user will correlate the sensors in the real world with the tiles on the screen. We will need to develop an idea/pseudocode of some algorithm for use in the software in conjunction with the hardware configuration that we end up using.
  - Task 2: The purpose of this task is to, when provided with the physical hardware, test the connection interface between a laptop, raspberry pi, and multiplexer (possibly a dummy sensor) in order to get a better understanding of how our software will be programmed in the future. The multiplexer will be connected to the raspberry pi, which will in turn be connected to the laptop. Electrical information will be sent to the multiplexer input lines which will be sent to the raspberry pi via an output line. We will verify that the laptop is then able to read this information from the raspberry pi.
  - Task 3: The basic framework of the user interface will be created. This will include menu items and the ability to open and close the application. File interactions may also be included.
5. Date(s) of meeting(s) with Client during the current milestone:
  - September 9, 2022 - Discussed the overall project (including non-CSE) and its goals and objectives
  - September 16, 2022 - Discussed the overall project's system requirements and the sensors involved.
  - September 23, 2022 - Discussed more about the sensors and hardware capabilities.
6. Client feedback on the current milestone
  - Main concern with how the sensors are going to work and be produced.
  - Wants computer scientists to understand how the hardware and sensors are made and how they interact with everything.
7. Date(s) of meeting(s) with Faculty Advisor during the current milestone:
  - September 20, 2022 - Met with Dr. Silaghi to discuss the necessary components of the project.
  - October 4, 2022 - Met with Dr. Silaghi to discuss our progress.
8. Faculty Advisor feedback on each task for the current Milestone
  - Task 1: Tkinter is a good API for graphical interfaces.
  - Task 2: Have sensors connected to multiplexers and multiplexers connected to microcontroller
  - Task 3: None
  - Task 4: Said it was good
  - Task 5: None
  - Task 6: None