SHARD

Structural Health and Rupture Detection

CSE Team Members:

Julian Herrera, jherrera2020@my.fit.edu

Matthew Manley, mmanley2018@my.fit.edu

Aero/Mechanical Team Members:

Matthew Meesit, mmeesit2019@my.fit.edu

John Bruce, jbruce2020@my.fit.edu

Paul Awad, pawad2021@my.fit.edu

CSE Faculty Advisor:

Dr. Silaghi, msilaghi@fit.edu

Advisor Meeting Dates:

2/9/2023

Client:

Dr. Willard, FIT Aeronautics Professor and NASA Engineer

Client Meeting Dates:

1/27/2023

2/3/2023

Table of Contents

1 Current Milestone Progress

Task	Completion %	Julian	Matthew	To do
Implement Applicable GUI Functionalities for the toolbar	50%	0%	100%	Connect the toolbar's icons to its corresponding action
Create Welcome Page	90%	0%	100%	Connect the webpage with the sensor interface via an executable file
Continue Sensor Experimentation	100%	50%	50%	N/A
Allow for ability to rotate newly added tiles (hexagons)	50%	100%	0%	Added the framework to rotate (programmable but not interactable during run time)
Implement sensor to application interface	50%	100%	0%	Connect to main application and correlate the sensor data to color of hexagons

2   Discussion - Tasks

2.1 Task 1: Implement Applicable GUI Functionality for the toolbar

The purpose of this task was to implement the functionalities of the toolbar. Actions such as go forward, go backward, zoom in, zoom out, add tile, remove tile, save as, exit application, etc are to be added to the corresponding icon on the toolbar.

2.2 Task 2: Create Welcome Page

The purpose of this task was to create a user-friendly page upon starting the application. The welcome page has a brief overview of the SHARD project and the team members. The welcome page is a website that runs the exe file upon user input.

2.3 Task 3: Continue Sensor Experimentation

The purpose of this task was to work with our team to test the sensor equipment. We are doing these tests so as to better understand and prepare ourselves for when we finally implement a single tile. Sensors were tested by attaching two sensors (one with super glue, one with scotch tape) to a thin aluminum metal. Hooked up these sensors to an arduino and used the Arduino IDE to display a graph of the data. Outcome of the test was that we figured out that super gluing led to better results and less sensitivity to interference. In the future we will be using something called nano gel tape (which is a very strong adhesive) so as to make the sensor be integrated almost entirely as one unit into the piece of aluminum.

2.4 Task 4: Allow for ability to rotate newly added tiles (hexagons)

The purpose of this task was to give the application the capability to rotate tiles. The application has the programming capability now to allow for rotations. However, this feature can only be hard coded as of now and is not implemented in the user interface for the user to rotate the hexagons at runtime.

2.5 Task 5: Implement sensor to application interface

The purpose of this task was to "start implementing the connection interface between the sensors and the application." What was done is that we generated an external program that serially communicates with the arduino and retrieves data from certain pins specified in the arduino code. Work still needs to be done such as implementing this interface into the main GUI application. Another task that still needs to be accomplished because of this is the correlation between color of the hexagons in the software and the sensor data obtained.

2.6 Other miscellaneous tasks accomplished:

- There is a way for hexagons to be different colors through programmatically changing the color (a stepping stone for the changing of colors to be implemented with the sensor to software interface)
- Highlighting of specific faces based on mouse click
- Transitioned from multiple draw calls to a singular draw call for increased performance (batch rendering)

3 Discussion - Contributions

3.1 Julian Herrera

Completely reworked the OpenGL layer of our application. I did this in order to allow for batch rendering (which improves performance significantly), as well as for simplicity of code.

Worked with non-CS engineer (John Bruce) to solder some wires together for use in testing the sensors. Helped with the testing of sensors by providing the service of connecting the sensors to my laptop and the Arduino IDE.

Worked on the rotation implementation of the hexagons. Implementing highlighting of the hexagon faces.

3.2 Matthew Manley

Researched methods to implement the toolbar functionalities to connect user actions with the corresponding icons. Helped John and Julian test the new piezoelectric sensors and determine their sensitivity. Created a website/welcome page that the user can easily interact with and eventually run the exe file from a button.
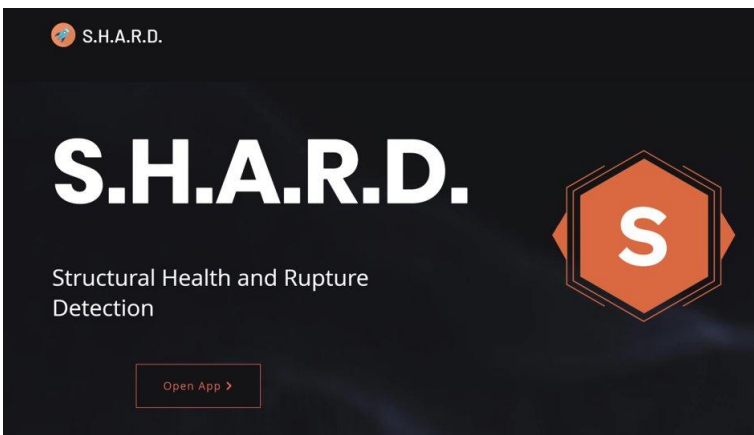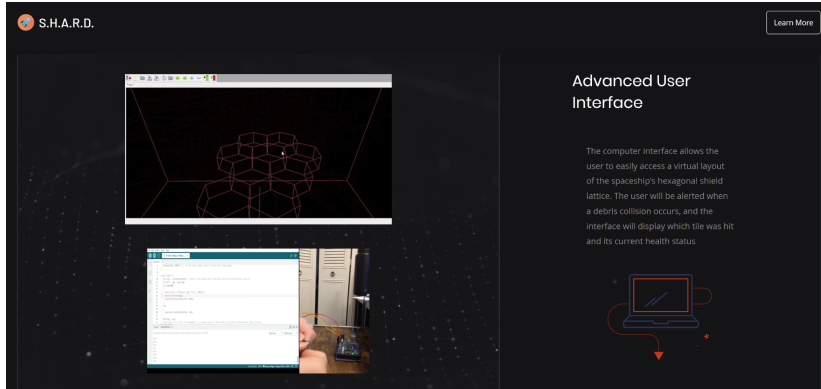
```
<script type="text/javascript" language="javascript">
    function RunFile() {
    WshShell = new ActiveXObject("WScript.Shell");
    WshShell.Run("c:/windows/system32/shard.exe", 1, false);
    }
</script>
```

4   Next Milestone Plan

Task	Julian	Matthew
Create and finish poster and e-book page	10%	90%
Complete webpage and toolbar implementation	10%	90%
Incorporate sensor interface into the main software	90%	10%
Allow for user to rotate hexagon	90%	10%
Start simulation mode (at least the framework)	50%	50%

5   Discussion - Planned Tasks

5.1 Task 1: Create and finish poster and e-book page

The poster and e-book page for the SHARD project will be completed during milestone 5.

5.2 Task 2: Complete webpage and toolbar implementation

The webpage will be able to connect the user to sensor/tile interface via an exe file. Small improvements will be made on the webpage's design and functional features. The functionalities for the toolbar's icons will also be completed during milestone 5.

5.3 Task 3: Incorporate sensor interface into the main software

Need to incorporate the sensor interface discussed previously into the main program for use in the software. This will involve correlating the sensor data to the color of a hexagon.

5.4 Task 4: Allow for user to rotate hexagon

As discussed previously, the rotation of hexagons needs to be implemented into the user interface. This is what this task is for. When the user selects a face of a particular hexagon, a temporary hexagon will appear corresponding to the normal of the face that was clicked on. While the temporary hexagon is visible, scrolling through the mouse wheel will rotate the hexagon accordingly.

5.5 Task 5: Start simulation mode

Need to start the simulation mode of the application. This will involve implementing a separate mode for the user. Simulation should consist of projectile events that occur at specific times, and these projectiles should hit the hexagonal shield that the user made in such a way that simulates what should happen theoretically.

6   Client Meetings

- January 27, 2023 - discussed with the GSA our current progress and any updates
- February 3, 2023 - discussed with the GSA our current progress and any updates

7   Client Feedback

- N/A

8   Faculty Meetings

- February 29, 2023 - gave Dr. Silaghi a status update and discussed tile rotation methods

9   Faculty Feedback

- 3D interaction methods