IM3080 Design and Innovation Project (AY2022/23 Semester 1)
Individual Report

Name: Wang Yaoxuan

Group No: 3

Project Title: Cloud Tubes

Contributions to the Project (1 page)

Arduino – Ripple effect

1. Designed Ripple Effect:
   - Drew graph and number the tubes
   - Determined the interaction with sensors
2. Implemented Ripple Effect:
   - Implemented TurnOn & TurnOff function: get colour, brightness and tube number, then apply to corresponding LED strip
   - Implemented setup and main(loop) function: make use of elapsedTime variable to achieve multithreading, detect the interaction between sensors and call respective ripple function
   - Implemented SensorIsTriggered function: return Boolean based on the distance between hand and sensor
   - Implemented CenterRipple function: make use of elapsedTime variable to achieve multithreading, turn on and off circles of tubes as time passes
3. Tested Ripple Effect:
   - Modified code based on actual performance
   - Worked with hardware team and helped with the testing on sensors

Group work

4. Helped with group report and poster
5. Helped with the decorations for the tubes and sensors
6. Participated in group discussions and contributed some design ideas

Reflection on Learning Outcome Attainment

Reflect on your experience during your project and the achievements you have relating to at least two of the points below:

(a) Engineering knowledge
(b) Problem Analysis
(c) Investigation
(d) Design/development of Solutions
(e) Modern Tool Usage
(f) The Engineer and Society
(g) Environment and Sustainability
(h) Ethics
(i) Individual and Team Work
(j) Communication
(k) Project Management and Finance
(l) Lifelong Learning

Point 1: Engineering knowledge
In this project, I have learned and mastered skills about Arduino, including coding and usage of Arduino board. I have also learned how to achieve multithreading using elapsed time variable, which will be useful in other coding project. For me, it is also a new way of thinking. Besides, I also had chances to work on hardware and tried soldering.

Point 2: Investigation
Arduino was a new topic to me. To start with, I watched the online course on NTULearn. Then I referred to documentation site of Adafruit Neo library for most of my code controlling LED strips. Also, as mentioned above, I learned multithreading through some video tutorials. In short, I have learned several ways of investigation and had a good experience.

Point 3: Design/ development of Solutions
To create ripple effect, we first drew a graph containing the hardware tubes and ripple flows. Then we labelled each tube with numbers and referred to that when coding (passing respective pin numbers to TurnOn/TurnOff). To make the effect look nicer, I have modified some parts of the code during testing. For example, I decreased the time interval between each “wave” and made the color and brightness change slightly for each “wave”. I realized that the design of solutions might have some minor changes during actual development, so it was important to always test when developing and optimize the solutions/codes according to the feedback.

Point 5: Modern tool Usage
On hardware side, we used Arduino board (Uno for trials, Mega for actual one). It was my first time coding and connecting circuit at the same time. It was quite fun. On software side, we used GitHub to gather all the codes and other files. I practiced how to pull and push on GitHub, which could be very useful in the future too.

Point 6: Individual and Team Work

This is a big project with 9 students in one team, so it was an unusual group project to me. At first, we were a bit confused about the theme of the project and how to assign tasks to achieve highest efficiency. Fortunately, we have come to the right track. I have learned how to effectively work and communicate in a big group: have a clear outline, assign tasks wisely, work hard on own tasks, actively communicate with other teammates, help each other. Over all, it was great working with the team.

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