Sprint 1 - Endurance Design Document

November 7th, 2022

Table of Contents

1. Executive Summary

1.1 Project Overview

This project is focused on how well the Sphero can move around HH208. Endurance is to see whether or not the robot is capable of enduring moving in long distances between the four corners of the room. The accuracy portion is to see how well it can mimic figure eight on the guiding tape. Lastly, the agility portion is to depict how well the Sphero can be programmed to find ways around obstacles and how well it can move. Sphero is a robot that can be controlled remotely and can be given an algorithm to move in certain directions, speak, and even change colors.

1.2 Purpose and Scope of this Specification

In Scope

- The Main point of endurance is to see if it is capable of hitting the 4 corners of the room. The focus is on how well it can travel in a straight line 4 times and how well it can accurately stop on the corners and turn to go to the next corner.
- Aside from hitting the four corners, other goals that are a part of this specification are the robot speaking at the start at the end, along with the L.E.D color changes at the start and the end as well.

Out of Scope

- Two parts of this 3 part project that are out of scope are the agility and accuracy portions.
- Additional code will be added for accuracy which involves moving in figure 8 as well as moving around to knock some pins over.

2. Product/Service Description

Some factor that may affect the outcome of the product is how the floor is not completely smooth, causing the Sphero to somewhat go off track but as a whole, the product will come out to the end result that is desired.

2.1 Product Context

Sphero is related to other products which involve robotics. It is a programmable robot in a ball that also can be remotely controlled. It is self-contained, having all of the processors and boards inside the ball itself while also having a motor to allow the ball to move around.

2.2 User Characteristics

Professor Eckert who works at Monmouth University, has a bachelor of science at Stockton State College and a Master of Science from Kean University. He has plenty of years of experience when it comes to technology and is technologically savvy when it comes to programming and using the Sphero robot.

2.3 Assumptions

Even though as a group we have all used and programmed a Sphero once does not make us experts. There is still some practice that needs to be had before we are fully capable of using all of its distinct features to effectively go through the course(s).

2.4 Constraints

There are not really any design options when it comes to a fully-built robot. Not really any hardware limitations, but one constraint that exists would be the use of block code.

2.5 Dependencies

The dependent required for the robot to work is the block code that will be programmed with the appropriate website. The block code and algorithm must be completed before the robot is capable of completing the endurance task.

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Robot must travel around the indicated 4 four corners of the track.	Points will be taken off if we don't meet this requirement	1	11/2/22	Approved
ENDUR_02	Robot will start at the yellow square indicated by the blue tape.	Points will be taken off if we don't meet this requirement	1	11/2/22	Approved
ENDUR_03	Robot must start with a green light and state “ready set go” and must state “I’m done I need water” and turn red when finished.	Points will be taking off if we don’t meet this requirement	1	11/2/22	Approved
ENDUR_04	Robot must turn right at the center of each yellow tile.	Points will be taking off if we don’t meet this requirement	1	11/2/22	Approved
ENDUR_05	Robot will return to its original starting location.	Points will be taking off if we don’t meet this requirement	1	11/2/22	Approved
ENDUR_06	Robot cannot collide with any obstacles on the track.	Points will be taking off if we don’t meet this requirement	2	11/2/22	Approved

3.2 Security

3.2.1 Protection

Specify the factors that will protect the system from malicious or accidental access, modification, disclosure, destruction, or misuse. For example:

1. Activity logging, historical data sets
2. Data integrity checks
3. Keep the robot away from others to decrease the chance of destroying the robot
4. Do not tell others your login information to Sphero EDU or github
5. Keep the robot away from dangerous environments

6. If your going to use the robot let the other group members know

3.2.2 Authorization and Authentication

Specify the Authorization and Authentication factors. Consider using standard tools such as PubCookie.

Include documentation of the approval or confirmation of the requirements here. For example:

Meeting Date	Attendees (name and role)	Comments
11/02/22	Aidan M(Documenter), Raul(Programmer), Olivia(Data Collector)	Ran the program multiple times and later had a successful run

4. System Design

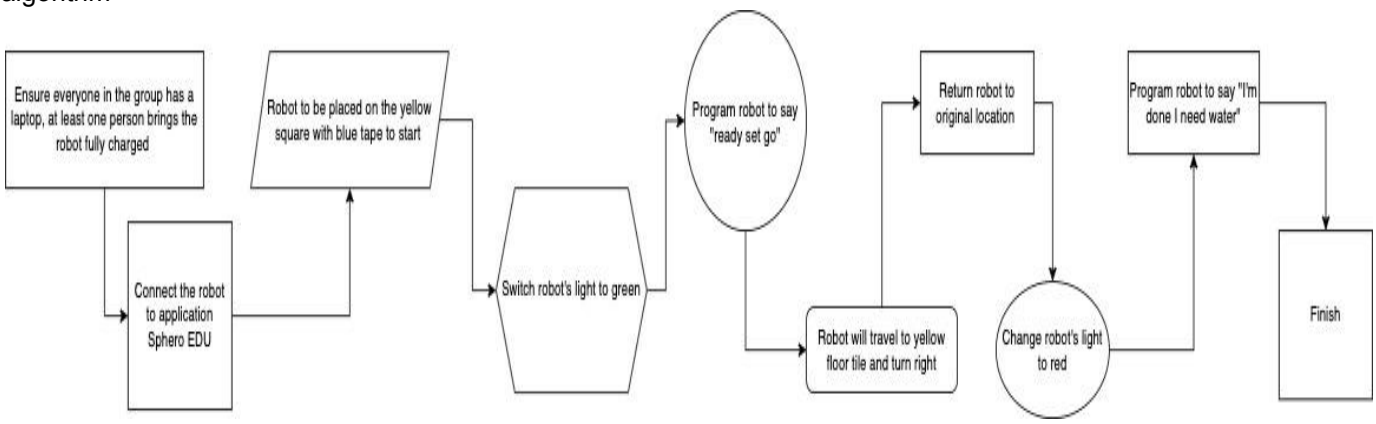
4.1 Algorithm

Develop and describe here the algorithm that will be used to provide the required performance of your software

- 1. Ensure everyone in the group has a laptop, at least one person brings the robot fully charged
- 2. Connect the robot to application Sphero EDU
- 3. Robot to be placed on the yellow square with blue tape to start
- 4. Switch robot's light to green
- 5. Program robot to say "ready set go"
- 6. Robot will travel to yellow floor tile and turn right
- 7. Repeat Step 6 until finished
- 8. Return robot to original location
- 9. Change robot's light to red
- 10. Program robot to say "I'm done I need water"
- 11. Finish

4.2 System Flow

Develop a flowchart (and show here) that accurately depicts how your software application will act to fulfill the algorithm



4.3 Software

Describe software languages/platforms/api's used to develop and deploy this application

- Sphero EDU application to connect and program our robot
- Google Docs used to organize plans on SDD
- Microsoft Excel to create a chart for testing.

4.4 Hardware

Describe hardware platforms that were used to develop, test and demonstrate this application

- Laptop
- Robot

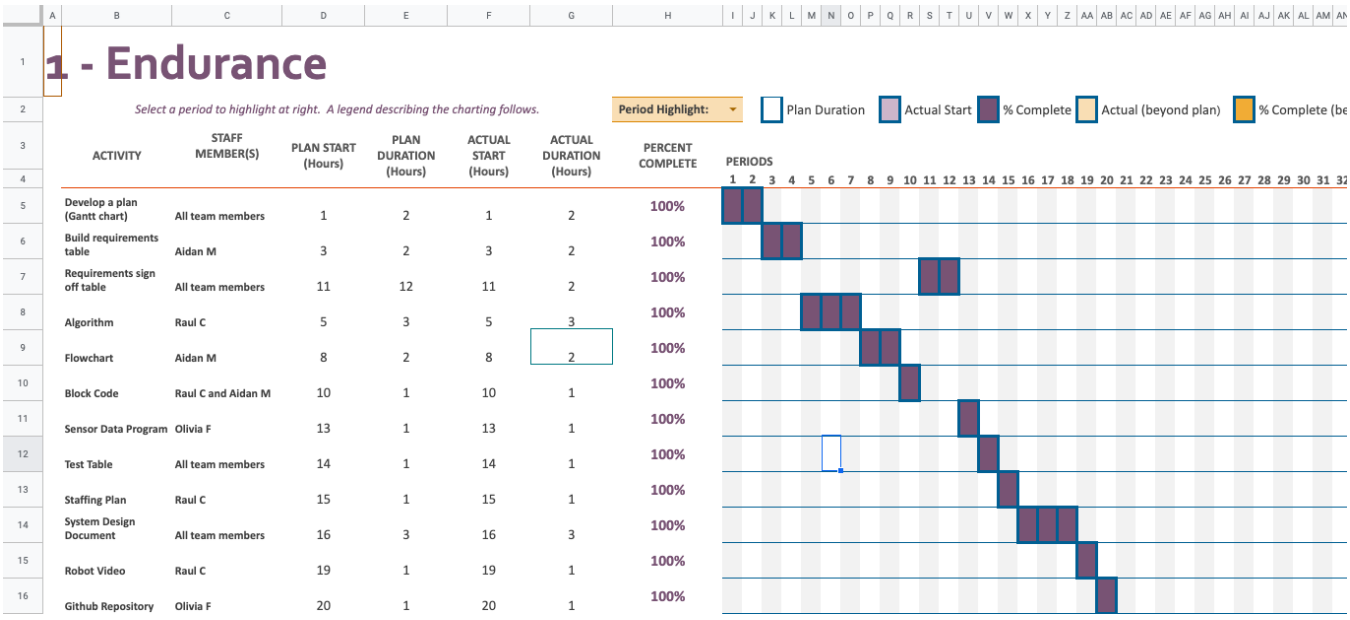
4.5 Test Plan

Include a test plan showing all unit tests performed for this application, Include test rational, test date, staff member, pass/fail status

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
See whether or not It will reach first corner	11/2/22	Expected to reach first corner	Didn't reach	Raul, Olivia, Aidan	Fail
See whether or not It will reach first corner	11/2/22	Expected to reach corner	Went too far	Raul, Olivia, Aidan	Fail
See whether or not It will reach first corner	11/2/22	Expected to reach first corner	Reached first corner	Raul, Olivia, Aidan	Pass
See whether or not it will reach second corner	11/2/22	Expected to reach second corner	Went too far	Raul, Olivia, Aidan	Fail
See whether or not it will reach second corner	11/2/22	Expected to reach second corner	Reached second corner	Raul, Olivia, Aidan	Pass
See whether or not it will reach third corner	11/2/22	Expected to reach third corner	Didn't reach	Raul, Olivia, Aidan	Fail
See whether or not it will reach third corner	11/2/22	Expected to reach third corner	Reached third corner	Raul, Olivia, Aidan	Pass
See whether or not it will reach the last corner of the course	11/2/22	Expected to reach the last corner of course	Went too far	Raul, Olivia, Aidan	Fail
See whether or not it will reach the last corner of the course	11/2/22	Expected to reach the last corner of course	Did not reach	Raul, Olivia, Aidan	Fail
See whether or not it will reach the last corner of the course	11/2/22	Expected to reach the last corner of course	Reached last corner	Raul, Olivia, Aidan	Pass

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
See whether or not it will complete entire course	11/2/22	Expected to complete course	Completed course	Raul, Olivia, Aidan	Pass
See whether or not it will reach entire course with decent accuracy	11/2/22	Expected to complete course with decent accuracy	Did not have the best outcome	Raul, Olivia, Aidan	Fail
See whether or not it will reach entire course with decent accuracy	11/2/22	Expected to complete course with decent accuracy	Did not have the best outcome, hit obstruction	Raul, Olivia, Aidan	Fail
See whether or not it will reach entire course with decent accuracy	11/2/22	Expected to complete course with decent accuracy	Hit obstruction	Raul, Olivia, Aidan	Fail
See whether or not it wil reach entire course with decent accuracy	11/2/22	Expected to complete course with decent accuracy	Did not have the best outcome, hit obstruction	Raul, Olivia, Aidan	Fail
See whether or not it wil reach entire course with decent accuracy	11/2/22	Expected to complete course with decent accuracy	Hit obstruction	Raul, Olivia, Aidan	Fail
See whether or not it will reach entire course with decent accuracy	11/2/22	Expected to complete course with decent accuracy	Completed course with decent accuracy	Raul, Olivia, Aidan	Pass

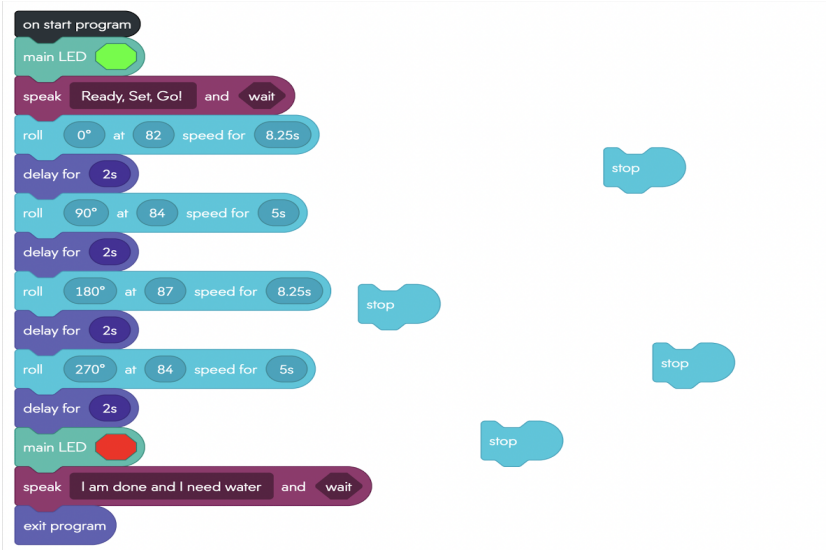
4.6 Task List/Gantt Chart

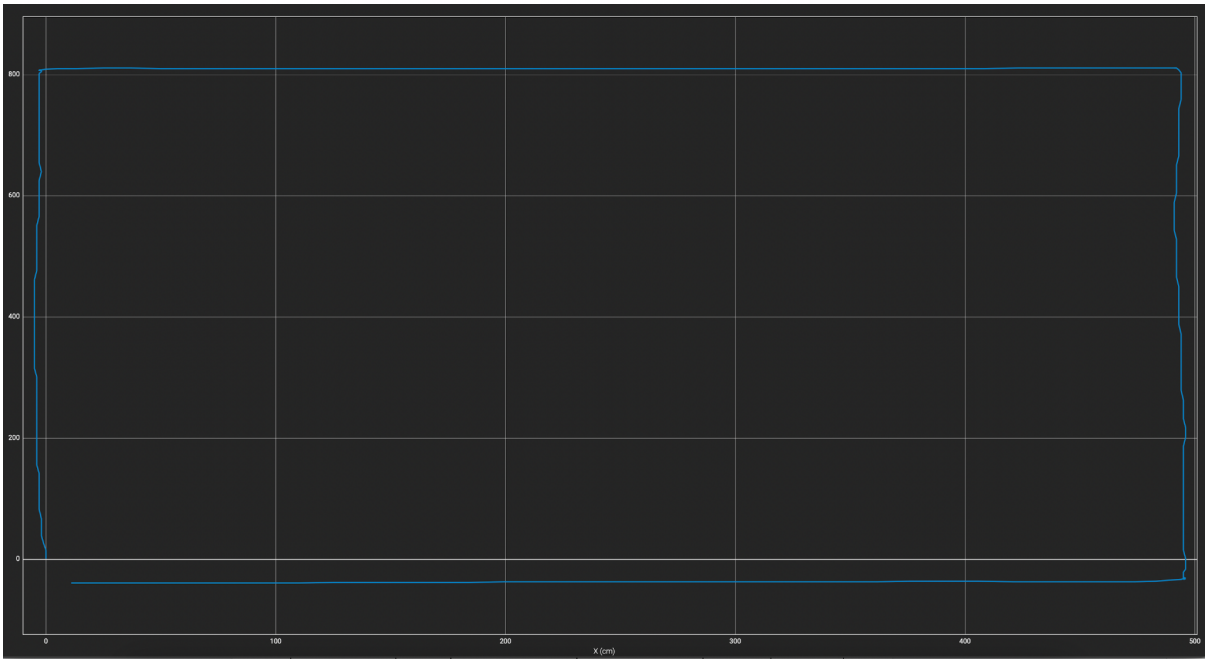


4.7 Staffing Plan

Insert a chart/table that depicts the roles and responsibilities of each team member that worked on this project

Name	Role	Responsibility	Reports To
Raul C	Programmer / Management	Executive Summary page / Algorithm / Block Code / Robot Video	
Aidan M	Documenter / Programmer	Requirements table / Flowchart / Block Code	
Olivia F	Documenter / Data collector	Github Repositories / Sensor Data Program	


on start program
main LED
speak Ready, Set, Go! and wait
roll 0° at 82 speed for 8.25s
delay for 2s
roll 90° at 84 speed for 5s
delay for 2s
roll 180° at 87 speed for 8.25s
delay for 2s
roll 270° at 84 speed for 5s
delay for 2s
main LED
speak I am done and I need water and wait
exit program
stop
stop
stop
stop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