

Sprint 1 - Endurance Design Document

October 30th, 2020


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1. Executive Summary

1.1 Project Overview

This project is the Endurance leg of the triathlon. The goal of this leg is to get our Sphero robot to follow the desired path to the end, as close as possible to the blue line on the floor. The intended audience is our classmates in CS-104 and Professor Eckert. The path that our robot will be going through is close

to this shape: 

1.2 Purpose and Scope of this Specification

In scope

This document addresses requirements related to phase 2 of Project A:

- The program we create is designed to follow the path in Howard Hall
- The software is designed to run on smooth surfaces

Out of Scope

The following items in phase 3 of Project A are out of scope:

- The program will not work on leg 2 or leg 3 of the triathlon
- The robot will not run on sand

2. Product/Service Description

2.1 Product Context

The product (our program) relies on the Sphero Edu app to run its code. The program also relies on a connected Sphero robot in order for the program to run. The program relies on the app and the robot in order to exist. The app and robot can run other code, but our code can not run on other apps or different brands of robot. This is the first of three sprints we will be doing.

2.2 User Characteristics

1. Computer Science Professor: Has experience using the robot in the past, has expertise in the field
2. Student: Limited experience in the field, has an interest in learning the field, has a background of using technology throughout their life
3. Child: No experience in the field, has an interest in technology, has a background using technology almost their whole life

2.3 Assumptions

- Test room in Howard Hall availability
- Sphero Edu app is available to run create our code on
- Robot is available and in possession of the group
- Assume that we have enough expertise to get the program running well

2.4 Constraints

- Restricted to remote work instead of collaborating in person
- Restricted to certain times to test in Howard Hall

2.5 Dependencies

- Algorithm needs to be complete before creating a flowchart
- Flowchart needs to be complete before programming the robot
- Program needs to have at least one line of code before the robot can move

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Robot must start		1	11/08	Approved
ENDUR_02	Robot must turn green before moving		1	11/08	Approved
ENDUR_03	Robot must say "ready, set, go" before moving		1	11/08	Approved
ENDUR_04	Robot must traverse the first length before stopping		1	11/08	Approved
ENDUR_05	Robot must stop after completing the first length		1	11/08	Approved
ENDUR_06	Robot turn 90 degrees to the right after first stop is complete		2	11/08	Approved
ENDUR_07	Robot must traverse the first width before stopping		1	11/08	Approved
ENDUR_08	Robot must stop after completing the first width		1	11/08	Approved
ENDUR_09	Robot must turn 90 degrees to the right after first width is complete		1	11/08	Approved
ENDUR_10	Robot must traverse the second length before stopping		1	11/08	Approved
ENDUR_11	Robot must stop after completing the second length		1	11/11	Approved
ENDUR_12	Robot turn 90 degrees to the right after completing the stop after finishing second length		1	11/11	Approved
ENDUR_13	Robot must traverse the second width before stopping		1	11/11	Approved
ENDUR_14	Robot must stop after completing the second width		1		Approved
ENDUR_15	Robot must change color to red		1	11/11	Approved

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ENDUR_1	Robot must say "I'm done and I need water"		1	11/11	Approved
ENDUR_17	Change numbers in the program to follow the path more accurately	Numbers will change based on multiple factors including the floor, distance, imperfections in the course.	2	11/11	Approved
ENDUR_18	Inspect the floor of Howard Hall to check for anything that would disrupt the path	The Tape on the floor of Howard Hall causes bumps in the track, important to take it into consideration.	2	11/11	Approved

3.2 Security

3.2.1 Protection

- Locked Zoom meetings to discuss project
- Password protected computers
- Github editing locked to the members of our group
- Files sent through locked Zoom meetings

3.2.2 Authorization and Authentication

No Authorization or Authentication was used for this project

3.3 Portability

- We used Sphero Edu for the code which is using javascript. Javascript is a very portable language per internet research.
- The program is easily uploadable to Github

4. Requirements Confirmation/Stakeholder sign-off

Meeting Date	Attendees (name and role)	Comments
11/11/20	Jordan, Chelsea, Emily	confirmed all

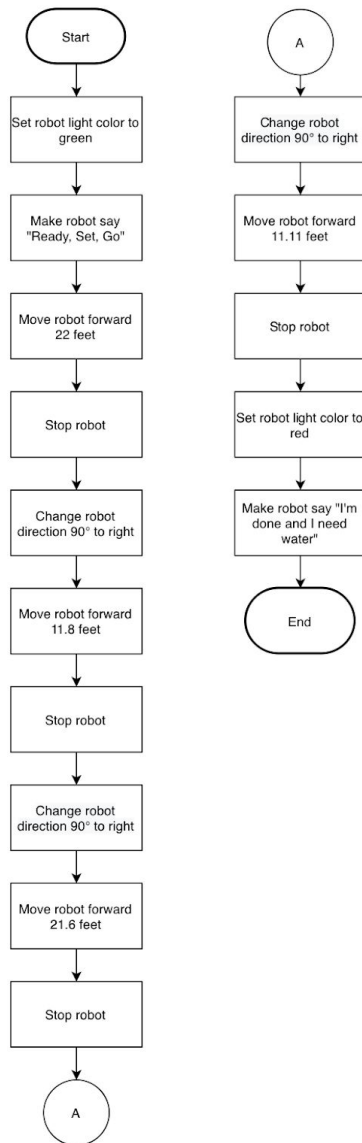
5. System Design

5.1 Algorithm

Algorithm for the Endurance Sprint

1. Start program
2. Set robot light color to green
3. Make robot say "ready set go"
4. Set robot to move forward for 22 feet
5. Stop robot
6. Change robot direction 90 degrees to the right
7. Set robot to move forward for 11.8 feet
8. Stop robot
9. Change robot direction 90 degrees to the right
10. Set robot to move forward for 21.6 feet
11. Stop robot
12. Change robot direction 90 degrees to the right
13. Set robot to move forward for 11.11 feet
14. Stop robot
15. Change robot light color to red
16. Make robot say "I'm done and I need water"
17. End program

5.2 System Flow



5.3 Software

- Zoom: We used Zoom to communicate during the project
- Sphero Edu: We used Sphero Edu to program the robot
- Google Docs: We used Google Docs for this document and to create the algorithm, it allowed for collaboration
- Microsoft Excel: Used for the Gantt Chart
- Draw.io: Used to create the flowchart
- Github: Used to upload important files to our repository
- Text Messages: We used text to communicate during the project as well

5.4 Hardware

- Sphero Robot
- Jordan's Macbook Pro
- Chelsea's Macbook Air

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- Emily's Macbook Air
- Emily's iPhone 11

5.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Robot will turn green	11/10/2020	Robot turns green	Robot turned green	Emily	Pass
Robot will speak "Ready, set, go"	11/10/2020	Robot speaks	Robot spoke	Emily	Pass
Testing distance of first length	11/10/2020	Robot will come up short	Robot came up shorter than expected	Emily	Fail
Testing distance of first length	11/10/2020	Robot will go the exact distance	Robot went the exact distance	Emily	Pass
Testing straight line in first length	11/10/2020	Robot will go the exact distance in a straight line	Good enough but not perfect	Emily	Pass
Robot will stop at the end of the first length	11/10/2020	Robot will stop	Robot stopped	Emily	Pass
Robot will turn 90 degrees after the first checkpoint is reached	11/10/2020	Robot will stop and turn 90 degrees at the checkpoint	Robot turned then turned back	Emily	Fail
Robot will turn 90 degrees after the first checkpoint is reached	11/11/2020	Robot will stop and turn 90 degrees at the checkpoint	Robot turns perfectly at the end	Emily and Chelsea	Pass
Robot will travel the distance of the first width	11/11/2020	Robot will travel the exact distance of the width	Robot came up a little short	Emily and Chelsea	Fail
Robot will travel the distance of the first width	11/11/2020	Robot will travel the exact distance of the first width	Robot goes the perfect amount	Emily and Chelsea	Pass
Robot will stop after travel the width	11/11/2020	Robot will stop at the end of the first width	Robot stopped	Emily and Chelsea	Pass
Robot will turn another 90 degrees to the right after first width	11/11/2020	Robot will turn 90 degrees	Robot went the wrong direction	Emily and Chelsea	Fail
Robot will turn another 90 degrees to the right after first width	11/11/2020	Robot will turn 90 degrees	Robot went in the correct direction. Changed rotation numbers.	Emily and Chelsea	Pass
Robot will travel the second length	11/11/2020	Robot will go the exact distance required	Robot comes up short	Emily and Chelsea	Fail
Robot will travel the second length	11/11/2020	Robot will go the exact distance in a straight line	Robot goes the exact distance in a straight line	Emily and Chelsea	Pass

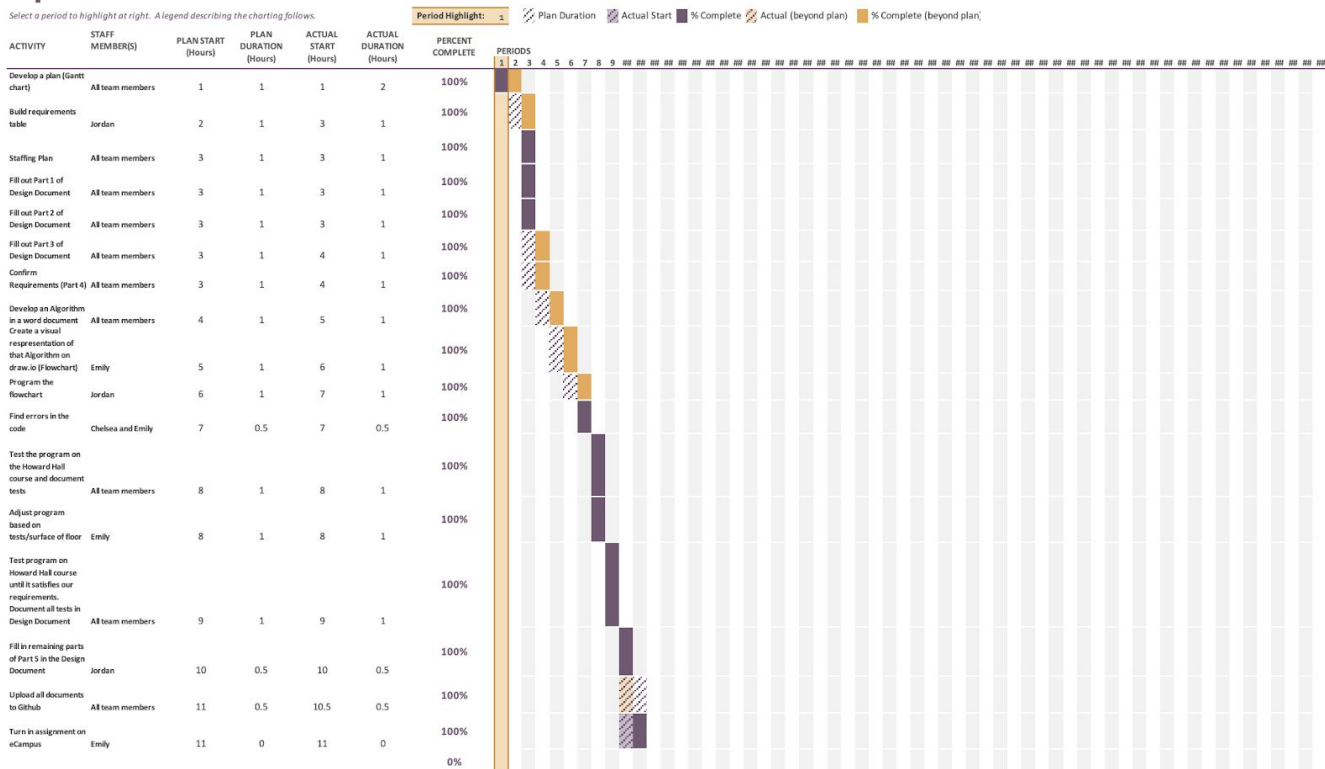
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Robot will stop after traveling the second length	11/11/2020	Robot will stop	Robot stopped after completing second length	Emily and Chelsea	Pass
Robot will turn 90 degrees to the right after stopping	11/11/2020	Robot will turn 90 degrees	Robot turned perfectly	Emily and Chelsea	Pass
Robot will travel the second width	11/11/2020	Robot will travel the width perfectly	Robot stops before the checkpoint	Emily and Chelsea	Fail
Robot will travel the second width	11/11/2020	Robot will travel the width perfectly	Robot stops at the checkpoint! Completing the course	Emily and Chelsea	Pass
Robot will stop after traveling second width	11/11/2020	Robot will stop	Robot stops	Emily and Chelsea	Pass
Robot will change it's color to red	11/11/2020	Robot turns red	Robot turns red	Emily and Chelsea	Pass
Robot will speak "I'm done and I need water"	11/11/2020	Robot speaks	Robot spoke!	Emily and Chelsea	Pass

5.6 Task List/Gantt Chart

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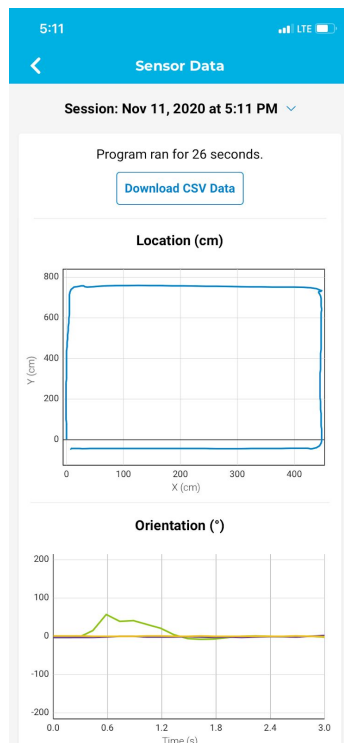
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5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Jordan	Team Leader, Staff Manager, Gantt Chart Manager, Programmer, Algorithm and software Developer	To lead and oversee overall projects, to work with team members to develop programs, algorithms, and software, contribute ideas to overall project and sprint 1 document. Create Gantt chart.	Professor Eckert
Emily	Team member, Software Tester, flowchart developer, Idea Contributor, Repository owner	To work with team members to develop software/algorithms, to test robots on site (HH208), to create flowchart, contribute ideas to the overall project.	Jordan
Chelsea	Team Member, Develop algorithm, Idea Contributor, Software Developer, Software tester	To work with team members to develop algorithms, develop software, and contribute ideas to the overall project and sprint 1 document. To test the robot on site (HH-208)	Jordan

5.8 Sensor Data



5.9 Block Code

