Sprint 1 - Endurance Design Document

October 10, 2021

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1. Executive Summary

1.1 Project Overview

This project is software for the Sphero SPRK+ which is used to circumnavigate the course and the intended audience is our fellow students and professor

1.2 Purpose and Scope of this Specification

The purpose of the specification for the project is to have the code for the navigation of the course and to fulfil some other requirements like the robot changing colors and 2 lines

1. Product/Service Description

Our group needs to create software or to be specific block code that will allow our robot to complete the required course and have it completed the other requirements.

1.3 Product Context

This product is software for the Sphero SPRK+ and so it may work with other Sphero devices which can run off the block code

1.4 User Characteristics

- Students have little to no experience but have developed the block code the robot is using to complete the course
- Professor has more experience but will be evaluating the students' performance on the sprint

1.5 Assumptions

Assuming that the difference in elevation of the ground and when placing the robot down to test it that the differences don't make to much differences when testing and navigating the course

1.6 Constraints

- We can only use the robot that we are assigned
- The robot must be programmed through the Sphero Edu application with its block code
- Must fulfill the requirements for the sprint

1.7 Dependencies

There aren't many dependencies that could affect the project requirements though whether the robot is charged, or the balance of the floor could lead to small changes in the trajectory

2. Requirements

2.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Changes color to green	The robot must be able to turn green	1	11/1	
ENDUR_02	Speaks "Ready set go"	It is required for this line to be spoken before the robot departs	1	11/1	
ENDUR_03	Navigates the course shown in the endurance course video	Must navigate the course outlined in the video	1	11/1	

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_04	Changes color to red	Must turn red from green when finished the course	1	11/1	
ENDUR_05	Speaks “I’m done, and I need water”	Needs to speak this line when it has finished the course	1	11/1	
ENDUR_06					
ENDUR_07					
ENDUR_08					

2.2 Security

2.2.1 Protection

- The software or block code for our robot is protected behind multi factor authentication
- The other documents are private documents which are not available to the public

2.2.2 Authorization and Authentication

- The authorization and authentication processes we have are that in order to access our documents and GitHub you need to have them shared with you

2.3 Portability

- Portability is not a requirement but the software was done in block code so it can be used on any Sphero device which uses block code

3. Requirements Confirmation/Stakeholder sign-off

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

Meeting Date	Attendees (name and role)	Comments
11/01/21	Thomas Schulz-recorder/ Robot tester, Damien Pugh- Robot tester, Chrishen Tissera- Robot tester	Discuss project, and responsivities. Brainstormed and started measurements for how the robot will complete the perimeter of the classroom using sphero.
11/09/21	Thomas Schulz-recorder/ Robot tester, Damien Pugh- Robot tester , Chrishen Tissera- Robot tester	Robot completed perimeter of the classroom

4. System Design

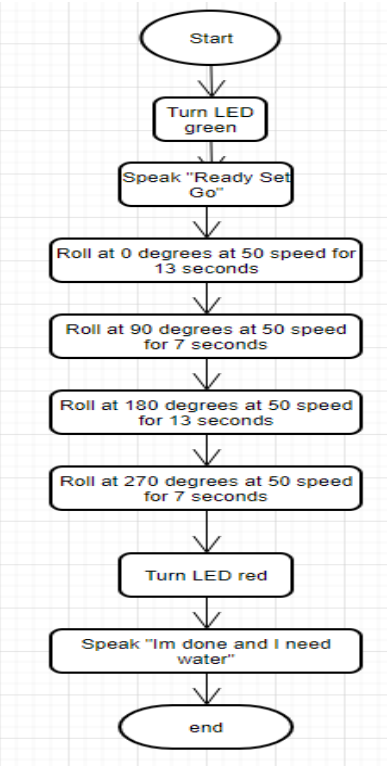
This section will provide all details concerning the technical design, staffing, coding, and testing the system

4.1 Algorithm

- 1 Turn the LED green
- 2 Speak “Ready set go”

- 3 Robot rolls at 0 degrees at 50 speed for 13 seconds from the starting yellow square position
- 4 When the time runs out the robot then rolls at 90 degrees at speed 50 for 7 seconds
- 5 Then when the time runs out the robot rolls at 180 degrees at speed 50 for 13 seconds
- 6 Next when the time runs out the robot rolls at 270 degrees at speed 50 for 7 seconds
- 7 The LED turns red
- 8 Speak “I'm done, and I need water”

4.2 System Flow



4.3 Software

The software that we used was the block code that is integrated in the Sphero Edu application

4.4 Hardware

The hardware that we used was the Sphero SPRK+

4.5 Test Plan

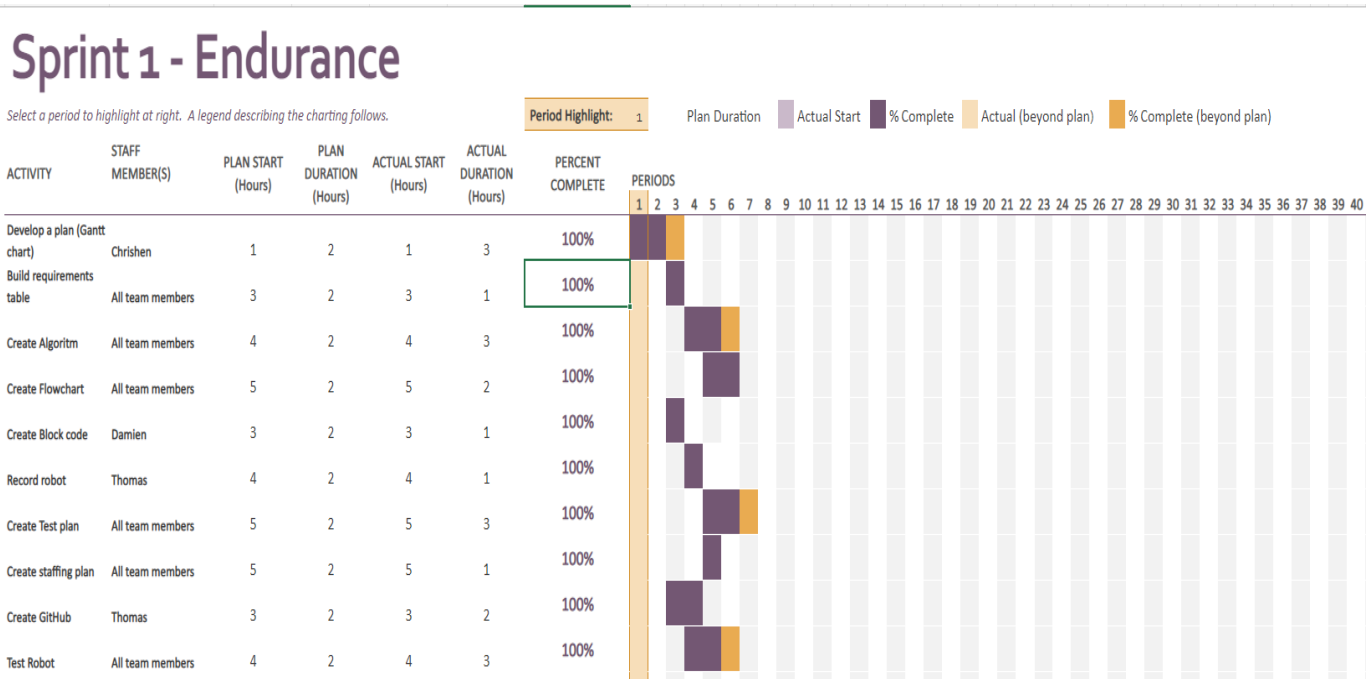
Include a test plan showing all unit tests performed for this application, Include test rational, test date, staff member, pass/fail status

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Trying to find the right speed, degrees, and seconds to reach the first corner of the perimeter.	11/9	Expected the Sphero to travel to the first corner of the perimeter.	The Sphero traveled too far and did not stop at the corner of the perimeter.	Damien Thomas Chrishen	Fail

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Adjusts the numbers, changing the degrees, speed, and seconds to reach the first corner of the perimeter	11/9	Expects the Sphero to travel to the first corner of the perimeter.	The Sphero reaches the first corner and stops on the corner. Speed: 50 Degrees: 0 Seconds: 13	Damien Thomas Chrishen	Pass
Adjusts the numbers, changing the degrees, speed, and seconds to reach the second corner of the perimeter	11/9	Expects the Sphero to travel to the second corner of the perimeter.	The Sphero traveled too far and did not stop at the corner of the perimeter.	Damien Thomas Chrishen	Fail
Adjusts the numbers, changing the degrees, speed, and seconds to reach the second corner of the perimeter	11/9	Expects the Sphero to travel to the second corner of the perimeter.	The Sphero reaches the Second corner and stops on the corner. Speed: 50 Degrees: 90 Seconds:7	Damien Thomas Chrishen	Pass
Knowing that the first and second long straightaways are the same distance, we took the speed and seconds from the first long straightaway and applied it for the second long straightaway but only changing the degree to account for the change of direction.	11/9	Expects the Sphero to reach the corner of the second long straightaway with the same seconds and speed from the first long straightaway	The Sphero reaches the second long straightaway corner and stops on the corner Speed: 50 Degrees: 180 Seconds: 13	Damien Thomas Chrishen	pass
Knowing that the first and second short straightaways are the same distance, we took the speed and seconds from the first short straightaway and applied it for the second short straightaway but only changing the degree to account for the change of direction.	11/9	Expects the Sphero to reach the corner of the second short straightaway with the same seconds and speed from the first short straightaway	The Sphero reaches the second short straightaway corner and stops on the corner Speed: 50 Degrees: 270 Seconds: 7	Damien Thomas Chrishen	pass

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Correct proposal for robot to travel around perimeter of the lines in the classroom	11/9	For the Robot to travel around perimeter of the lines in the classroom	Robot successfully completed the perimeter. The speed of the robot the whole time was 50. On the long straightaways it was for 13 seconds. On the shorter straightaways it was 7 seconds/	Damien Thomas Chrishen	Pass

4.6 Task List/Gantt Chart



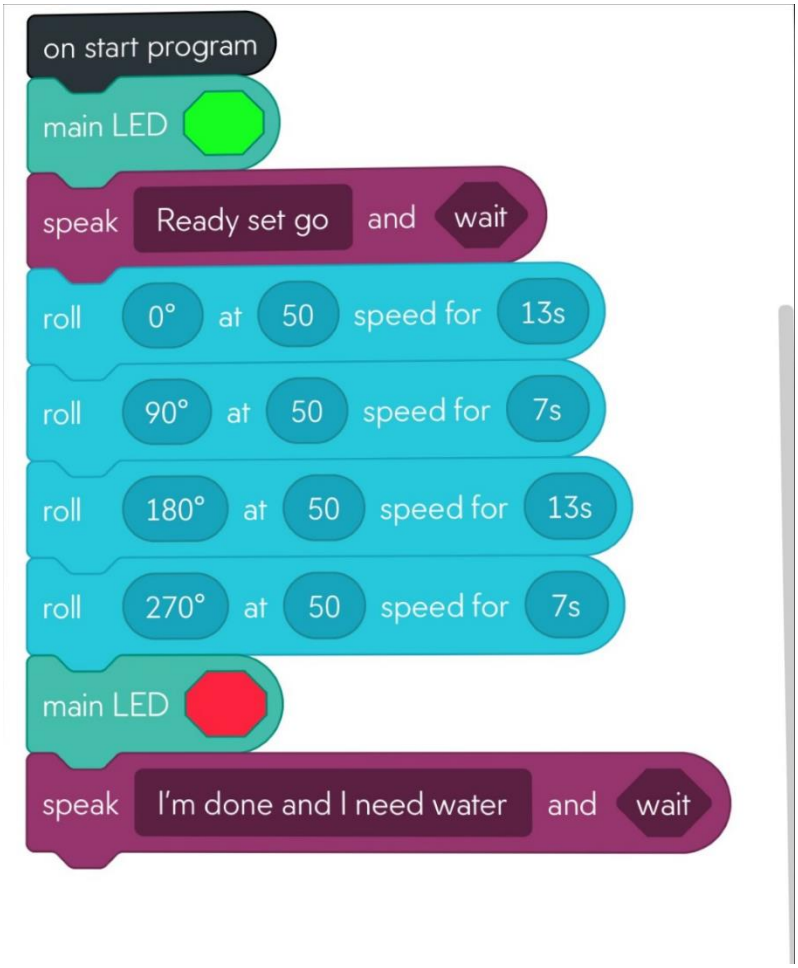
ACTIVITY	STAFF MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATION (Hours)	PERCENT COMPLETE
Develop a plan (Gantt chart)	Chrishen	1	2	1	3	100%
Build requirements table	All team members	3	2	3	1	100%
Create Algoritm	All team members	4	2	4	3	100%
Create Flowchart	All team members	5	2	5	2	100%
Create Block code	Damien	3	2	3	1	100%
Record robot	Thomas	4	2	4	1	100%
Create Test plan	All team members	5	2	5	3	100%
Create staffing plan	All team members	5	2	5	1	100%
Create GitHub	Thomas	3	2	3	2	100%
Test Robot	All team members	4	2	4	3	100%

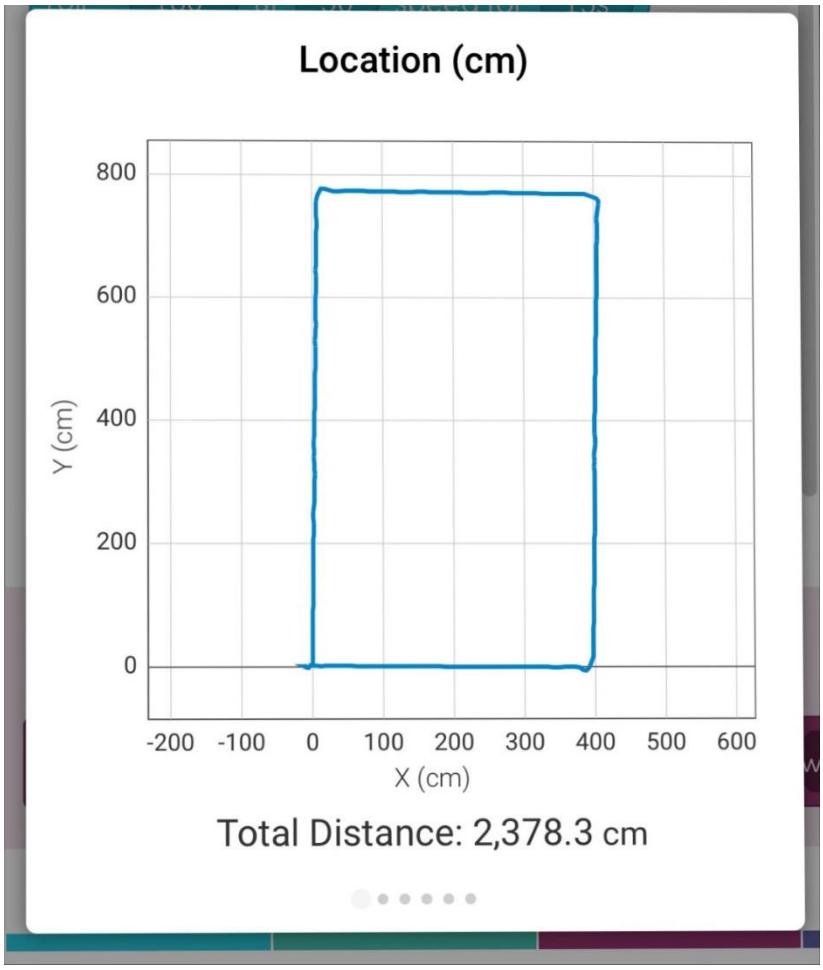
4.7 Staffing Plan

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

Name	Role	Responsibility	Reports To
Damien	Tester, Coder	Helped brainstorm ideas Created the block code worked on the SDD	
Thomas	Tester, Recorder	Brainstormed and helped implement ideas Recorded the test runs Worked on the SDD	

Name	Role	Responsibility	Reports To
		Created the GitHub repository	
Chrishen	Tester, Documenter	Brainstormed and discussed ideas, suggestions and strategies Worked on the SDD and Gantt Chart	


on start program
main LED
speak Ready set go and wait
roll 0° at 50 speed for 13s
roll 90° at 50 speed for 7s
roll 180° at 50 speed for 13s
roll 270° at 50 speed for 7s
main LED
speak I'm done and I need water and wait


Location (cm)
800
600
400
200
0
Y (cm)
-200
-100
0
100
200
300
400
500
600
X (cm)
Total Distance: 2,378.3 cm