

# **Sprint 1 - Endurance Design Document**

**March 28, 2024**

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## **Executive Summary**

### ***1.1 Project Overview***

The Endurance task is coordinated by the program by the Sphero robot, which involves navigating a rectangle route around the tapes in the classroom. To show the start of the work, it first sets up the Sphero robot and sets its LED color to green. With an audio cue, which simulates readiness, the robot then sets on its course and starts moving forward. As it moves forward, it mimics the corners of the rectangular path by going forward and making right turns at regular times. The robot uses its color-changing LED to visually indicate its progress during the work, turning red after it is completed. As it ends, the robot emits an audio message saying it must take a break and hydrate. The project's target audience consists of robotics enthusiasts, educators wishing to integrate hands-on robotics projects into their curricula, and other students.

### ***1.2 Purpose and Scope of this Specification***

The purpose of this specification is to have a student program a robot to perform several different sprints efficiently and accurately.

#### ***In Scope***

This document addresses the requirements related to Sprint 1 of the Robot Project:

- Program the robot to successfully circumnavigate a rectangular track in room HH208.

#### ***Out of Scope***

The following items of The Robot Project are out of scope:

- Sprint 2: Program the robot to accurately run a figure 8 course 5 times.
- Sprint 3: Program the robot to run an obstacle course.

## **Product/Service Description**

### ***Product Context***

The Sphero Bolt Robot can be controlled using block code with the Sphero Edu program, just like its siblings the Sphero Sprk and Sphero Sprk+. It has speech recognition, color customization, and accurate navigation to predetermined areas. The Sphero Bolt Robot also has sophisticated features including sensors and a customizable LED matrix display, which allow it to do more than just basic navigation and include users in interactive learning activities.

### ***User Characteristics***

- University Students
- First Year CS/SE Major
- Entry Level Programming Knowledge

### ***Assumptions***

- Assumes the Sphero Edu software is installed on device
- Assumes that the robot has been calibrated to face the initial direction of movement before commencing the program.

### ***Constraints***

- Size of classroom HH208
- Limited time available in HH208

### ***Dependencies***

- This requirement necessitates the use of the latest version of the Sphero EDU software.

# Requirements

## 1.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Start at starting point of the rectangle	Got us our basics	1	3/25/24	Approved
ENDUR_02	Change LED Light to green and say "Ready Set Go"	Really quick and easy	1	3/25/24	Approved
ENDUR_03	Travel to the first corner & turn 90 degrees to the right	Took the longest and was the toughest	1	3/25/24	Approved
ENDUR_04	Travel to the second corner & turn 90 degrees to the right	Took about the same amount of time as 04	1	3/25/24	Approved
ENDUR_05	Travel to the third corner & turn 90 degrees to the right	Moved faster than 03 and 04	1	3/25/24	Approved
ENDUR_06	Go until reaching finish	Hard to figure out how to stop right on the starting point	1	3/25/24	Approved
ENDUR_07	LED light turn red	Quick and easy	1	3/25/24	Approved
ENDIR_08	Robot says "I'm done, and I need water"	Very easy	1	3/25/24	Approved

## 1.2 Security

### Protection

The Bluetooth connection to a particular device serves as the main protection against unintentional access. The robot can only be accessed through a Bluetooth connection, and only one person can connect at once.

### Authorization and Authentication

The user must be aware of the robot's name to authenticate it using the Sphero Edu Software and approve its use.

### Portability

Exceptional environmental independence, guaranteeing that the product functions reliably in a variety of networks, operating systems, and production or development environments.

Deployment across many devices and systems is made easier by compatibility with several platforms, such as Windows, MacOS, Android, iOS, and more.

## Requirements Confirmation/Stakeholder sign-off

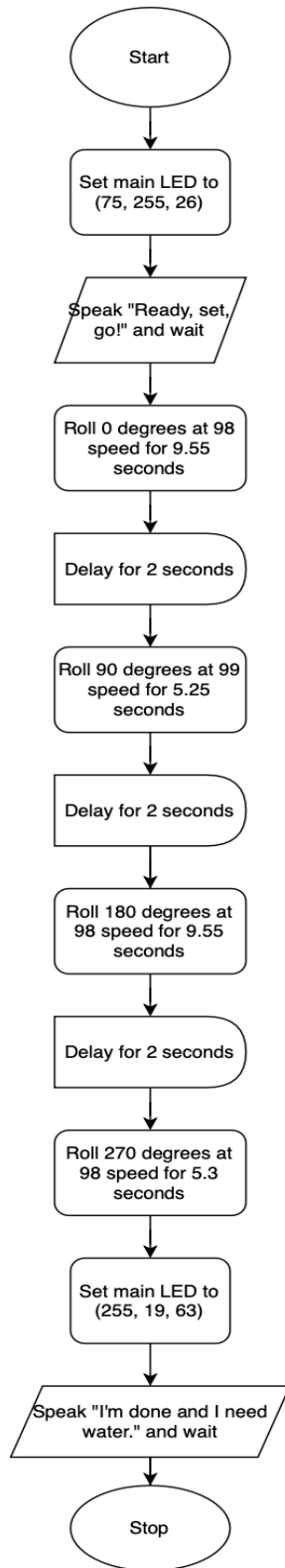
Meeting Date	Attendees (name and role)	Comments
03/19/2024	Trey H (Robot), Trey P (Algorithm), Flavia D (Flowchart)	confirmed all except ENDUR_04
03/25/2024	Trey H (Robot), Trey P (Algorithm), Flavia D (Flowchart)	confirmed.....

## System Design

### ***Algorithm***

- Start
- Step 1: Set Main LED to (75, 255, 26).
- Step 2: Speak "Ready, set, go!" and wait.
- Step 3: Roll 0 degrees at 98 speed for 9.55 seconds.
- Step 4: Stop
- Step 5: Delay for 2 seconds.
- Step 6: Roll 90 degrees at 99 speed for 5.25 seconds.
- Step 7: Stop
- Step 8: Delay for 2 seconds.
- Step 9: Roll 180 degrees at 98 speed for 9.55 seconds.
- Step 10: Stop
- Step 11: Delay for 2 seconds.
- Step 12: Roll 270 degrees at 98 speed for 5.3 seconds.
- Step 13: Stop.
- Step 14: Set Main LED to (255, 19, 63).
- Step 15: Speak "I'm done, and I need water."
- Done.

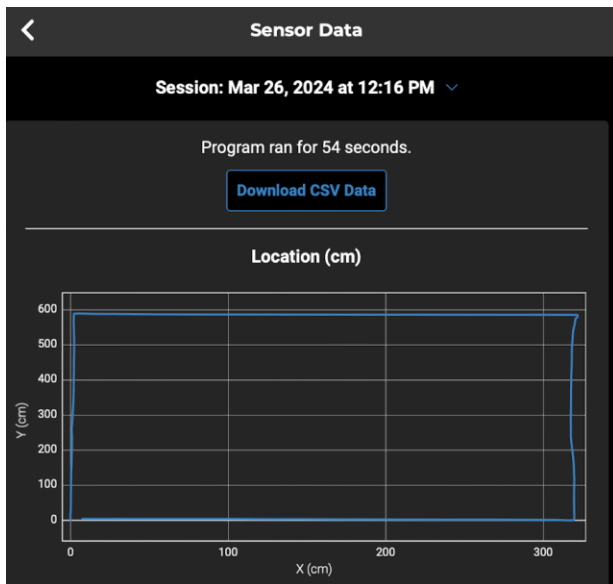
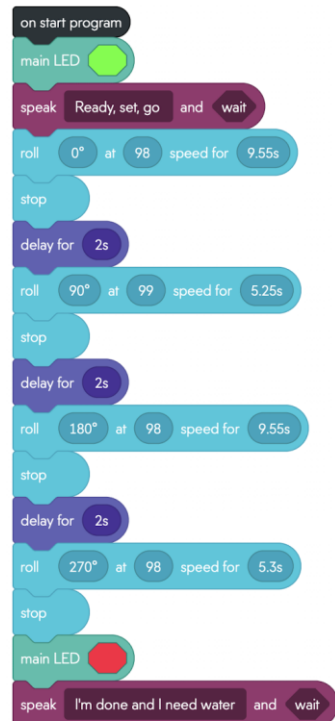
## System Flow



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### 1.3 Software

The Software used for this Robot project was block code in the Sphero Edu application.



### Hardware

Hardware platforms used:

- Apple MacBook Air
- Windows Surface
- Shepro Bolt

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### **1.4 Test Plan**

<b>Reason for Test Case</b>	<b>Test Date</b>	<b>Expected Output</b>	<b>Observed Output</b>	<b>Staff Name</b>	<b>Pass/Fail</b>
Test if Main LED light on robot, successfully lights up green.	03/25/24	Main LED light turns green.	Main LED light turns green.	Trey, Flavia, Trey	Pass
Test if robot speaks "Ready Set Go" successfully.	03/25/24	Robot will speak "Ready, Set, Go".	Robot spoke "Ready Set Go".	Trey, Flavia, Trey	Pass
Test if robot successfully rolls to corner of the track.	03/25/24	Robot will travel to the first corner of the rectangle.	Robot traveled to the first corner of the rectangle.	Trey, Flavia, Trey	Pass
Test if the robot successfully rolls to the second corner of the track.	03/25/24	Robots will turn and travel to the second corner of the rectangle.	Robot turned and traveled to the second corner of the rectangle.	Trey, Flavia, Trey	Pass
Test if robot successfully rolls to the third corner of the track.	03/25/24	Robots will turn and travel to the third corner of the rectangle.	Robot turned and traveled to the third corner of the rectangle.	Trey, Flavia, Trey	Pass
Test if the robot successfully rolls back to the start position.	03/25/24	Robot will turn and travel back to the starting position.	Robot turned and traveled back to the starting position.	Trey, Flavia, Trey	Pass
Test if Main LED light on robot, successfully lights up red.	03/25/24	Main LED light turns red.	Main LED light turns red.	Trey, Flavia, Trey	Pass
Test if robot successfully speaks "I'm Done, and I need water."	03/25/24	Robot will speak "I'm done, and I need water"	Robot spoke "I'm done, and I need water"	Trey, Flavia, Trey	Pass

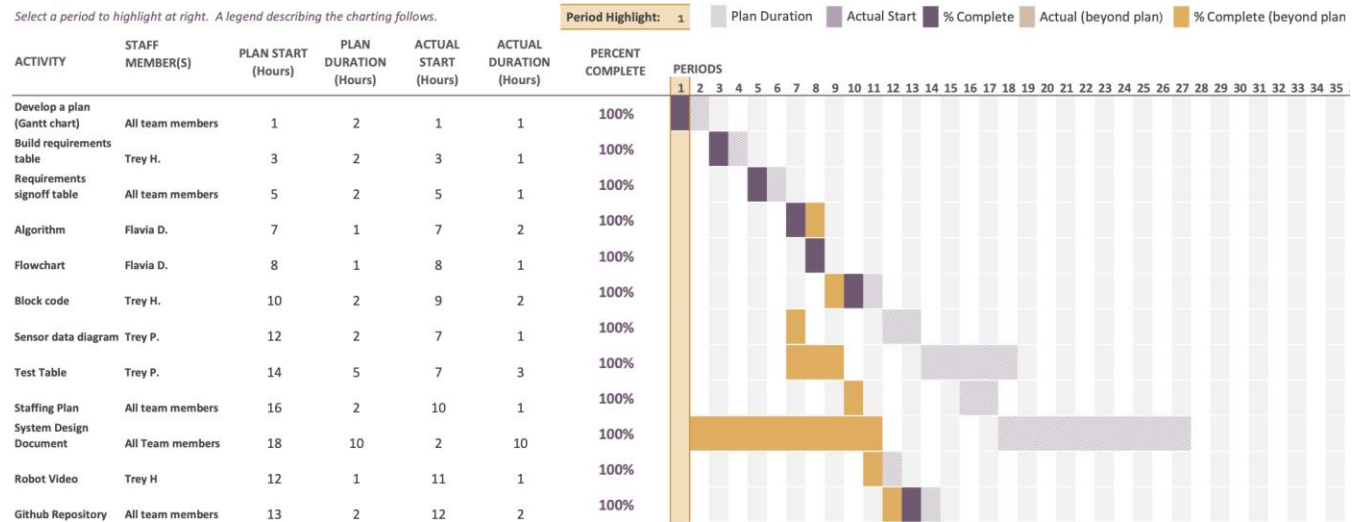


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### 1.5 Task List/Gantt Chart

## Sprint 1 - Endurance

Select a period to highlight at right. A legend describing the charting follows.



### 1.6 Staffing Plan

Name	Role	Responsibility	Reports To
Trey Harpootlian	Group Member	Algorithm, Robot Video, Planning, Communication with group	Flavia D. and Trey P.
Flavia Daniels	Group Member	Flowchart, System Design Paper, Planning, Communication with group	Trey H. and Trey P.
Trey Porter	Group Member	GitbHub Repository, System Design Paper, Planning, Communication with group	Trey H. and Flavia D.