Sprint 2 - Endurance Design Document
April 11, 2024

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1. Executive Summary

1.1 Project Overview

This project consists of evaluating the accuracy and reliability of a Sphero Bolt Robot's performance while it performs a figure-eight pattern five times. The main goal shared with the class and professor, is to program the robot to move accurately along the figure-eight path while staying on course, using specialized software and block coding techniques.

1.2 Purpose and Scope of this Specification

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

In scope

This document addresses requirements related to phase 2 of the Robot Project:

- Program the robot to successfully perform a figure 8 course 5 times in room HH 208.

Out of Scope

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

- Sprint 1: Program the robot to circumnavigate a rectangular track.
- Sprint 3: Program the robot to run an obstacle course.

2. Product/Service Description

Product Context

Along with the Sphero Sprk and Sphero Sprk+, this robot is a member of the Sphero Bolt Robot series. The Sphero Edu program allows block code control of the Sphero Bolt Robot utilized in this project. In addition to speaking and rolling to certain places at predetermined speeds and directions, the robot can also change colors.
User CharacteristicsUniversity Students
First Year CS/SE Major
Entry Level Programming Knowledge

User Characteristics

- University Students
- Entry level Computer Science 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.

- Requires up to date version of Sphero EDU software

Requirements

2.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Run figure 8 course 5 times	Robot must successfully travel around the figure 8 course 5 times	Priority 1	4/8/24	Trey H, Flavia D, Trey P
ENDUR_02	Stay's on figure 8 path	Robot must stay on the figure 8 path while doing the course	Priority 1	4/8/24	Trey H, Flavia D, Trey P
ENDUR_03	Start in provided square	Robot must be in the provided square before starting the figure 8 course	Priority 1	4/8/24	Trey H, Flavia D, Trey P
ENDUR_04	Finish in provided square	Robot must finish in the provided square after running the figure 8 course	Priority 1	4/8/24	Trey H, Flavia D, Trey P
ENDUR_05	Speak "I'm the winner"	Robot must speak "I'm the winner" at the finish of the course	Priority 1	4/8/24	Trey H, Flavia D, Trey P
ENDUR_06	Flash multicolored lights for 5 seconds	Robot must flash multicolored lights for 5 seconds at the finish	Priority 1	4/8/24	Trey H, Flavia D, Trey P

2.2 Security

2.2.1 Protection

The primary safeguard preventing accidental access to the system is the Bluetooth connection established with a specific device. Access to the robot requires establishing a Bluetooth connection, with only one user able to connect at any given time.

2.2.2 Authorization and Authentication

To grant authorization for robot usage, users are required to authenticate the robot by providing its name through the Sphero Edu Software

2.3 Portability

High environmental independence
Compatible with iOS, Android, Windows, and MacOS.

3. Requirements Confirmation/Stakeholder sign-off

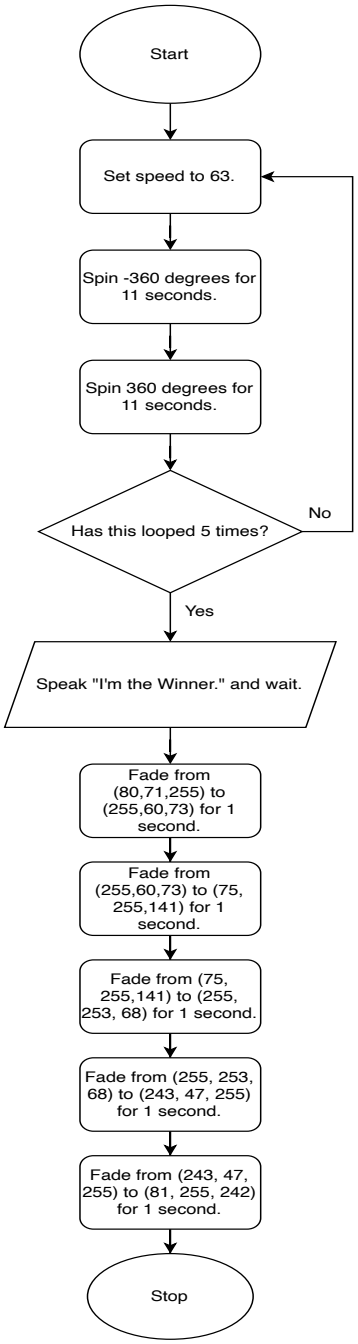
Meeting Date	Attendees (name and role)	Comments
4/8/24	Trey H, Flavia D, and Trey P	Confirmed all requirements

4. System Design

4.1 Algorithm

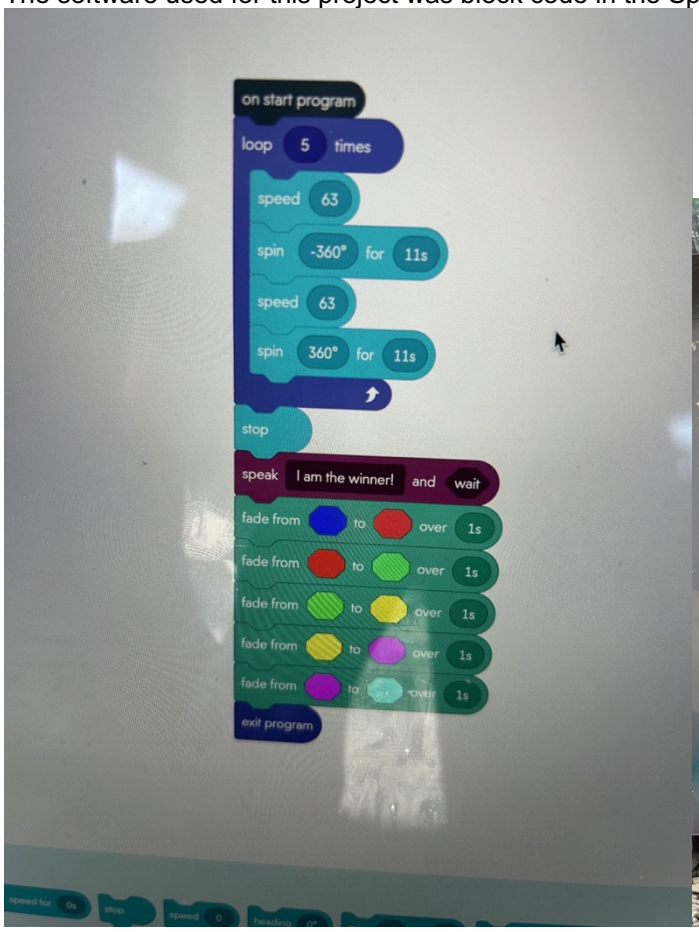
- Start
- Step 1: Set speed to 63.
- Step 2: Spin -360 degrees for 11 seconds.
- Step 3: Set speed to 63.
- Step 4: Spin 360 degrees for 11 seconds.
- Step 5: Loop Steps 1 to 4, 5 times.
- Step 6: Stop.
- Step 7: Speak “I’m the winner!” and wait.
- Step 8: Fade from (80,71,255) to (255,60,73) for 1 second.
- Step 9: Fade from (255,60,73) to (75, 255,141) for 1 second.
- Step 10: Fade from (75, 255,141) to (255, 253, 68) for 1 second
- Step 11: Fade from (255, 253, 68) to (243, 47, 255) for 1 second.
- Step 12: Fade from (243, 47, 255) to (81, 255, 242) for 1 second.
- Done.

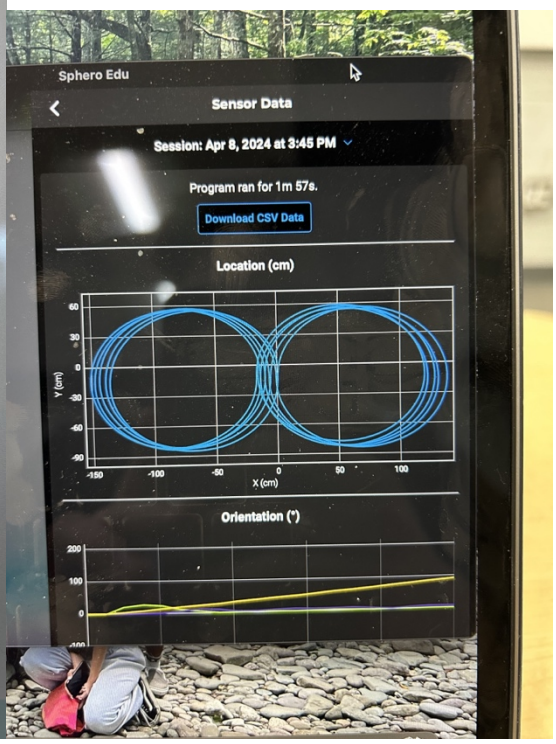
4.2 System Flow



Software

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





4.3 Hardware

Hardware platforms used:

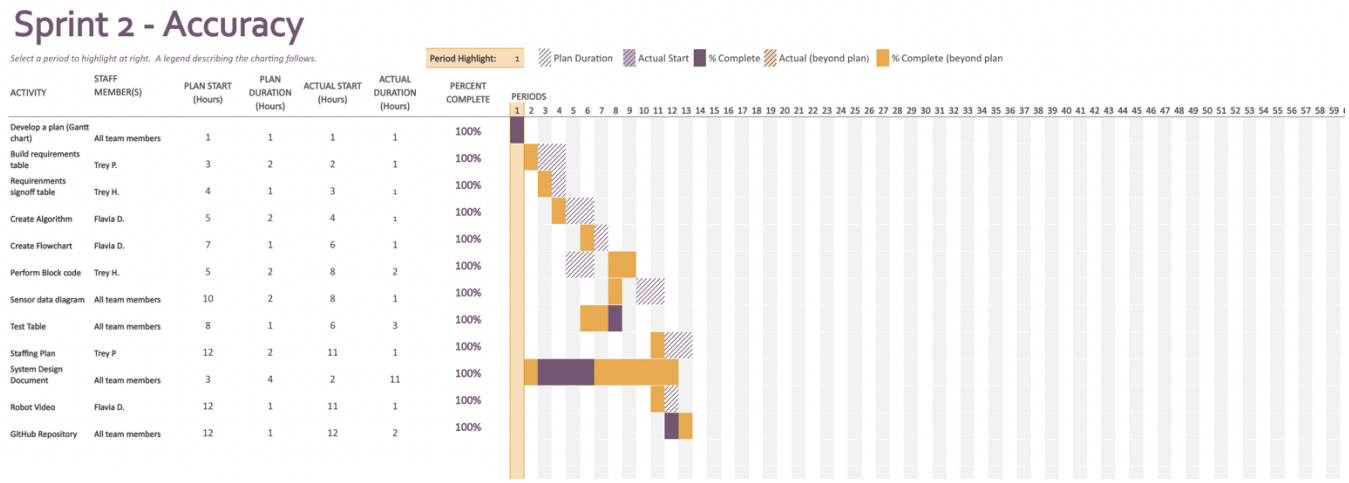
- Apple MacBook Air
- Samsung.
- Sphero Bolt

4.4 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Test if the robot successfully spins around in a full circle	4/8/24	The robot goes around in the complete circle	Robot completed the full circle	Trey, Flavia, Trey	Pass
Test if the robot successfully spins around the full first circle and the full second circle	4/8/24	The robot goes around in the first and second circle completely	Robot completed both full circles	Trey, Flavia, Trey	Pass
Test if the robot completes both full circles 5 times in a row	4/8/24	The robot makes both full circles 5 times in a row without stopping	The robot did not make it around the circles 5 times in a row	Trey, Flavia, Trey	Fail

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Test if the completes both full circles 5 times in a row	4/8/24	The robot makes both full circles 5 times in a row without stopping	The robot made it around the circles 5 times in a row without stopping	Trey, Flavia, Trey	Pass
Test if robot speaks “I’m the winner” when reaches the end of making the circles 5 times	4/8/24	The robot will speak “I’m the winner” after the 5 circles being made	Robot successfully spoke “I’m the winner” at the end of the circles	Trey, Flavia, Trey	Pass
Test if the robot flashes multicolored lights for 5 seconds	4/8/24	The robot flashes multicolored lights for 5 seconds	Robot successfully flashed multicolored lights for 5 seconds	Trey, Flavia, Trey	Pass

Task List/Gantt Chart



4.5 Staffing Plan

Name	Role	Responsibility	Reports To
Trey H	Group Member	Algorithm, robot video, system design doc	Flavia D and Trey P
Flavia D	Group Member	Fow chart, System design doc	Trey H and Trey P
Trey P	Group Member	GitHub Repository owner, System design doc	Trey H and Flavia D