Sprint 2 - Accuracy Design Document

November 20, 2023

Table of Contents

1. Executive Summary

1.1 Project Overview

This project's goal is to make a Bluetooth Sphero robot move in a figure eight.

1.2 Purpose and Scope of this Specification

In scope

- Modification of robot programming
- Measurement of tape on room floor
- Frequent communication via text, virtual, or in person

Out of Scope

- Managing requirements and time
- Fixing colors and distance

2. Product/Service Description

2.1 Product Context

This robot functions similarly to other programs. It's like a normal computer program, it requires a set of instructions to perform a task. When the robot is hooked up to someone's computer, they can use the blocks to code the robot to move in a certain direction. When the code is provided to speak, the voice will come out of the computer rather than the robot.

2.2 User Characteristics

The professor has worked with the robots before. He is proficient in how they work since he's used them before. For us, we only had one previous experience with the robots prior to receiving instructions.

2.3 Assumptions

The room might not be available to us, so we might not get accurate measurements for how far the robot should move. A Mac computer is also required for the sensor data diagram. There will also be lots of trial and error since we don't have lots of experience with the Sphero robots and this kind of technology. Also, we might have trouble connecting the Bluetooth to enable the Sphero robots.

2.4 Constraints

- Windows computers won't work
- One audit trail (test table) and don't know all of computer's functions
- Classes and other activities take up access time, need to manage time
- Don't know how to do professional computer evaluation, only evaluate at a normal level
- Possible limits of storage space
- Computer lag is predictable

2.5 Dependencies

- This product requires a computer to function
- The first distance must be measured correctly before the other distances are embedded in

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Move around top circle	start in middle then start moving to left	1	11/9	Approved
ENDUR_02	Move around bottom circle in opposite direction	start in middle then start moving to left	1	11/9	Approved
ENDUR_03	Move around top circle	REPEATS 5 TIMES	1	11/9	Approved
ENDUR_04	Move around bottom circle in opposite direction		1	11/9	Approved
ENDUR_05	Move around top circle		1	11/9	Approved
ENDUR_06	Move around bottom circle in opposite direction		1	11/9	Approved
ENDUR_07	Move around top circle		1	11/9	Approved
ENDUR_08	Move around bottom circle in opposite direction		1	11/9	Approved
ENDUR_09	Move around top circle		1	11/9	Approved
ENDUR_10	Move around bottom circle in opposite direction		1	11/9	Approved
ENDUR_11	Say “I am the winner”		1	11/9	Approved
ENDUR_XX	Flash multicolored lights for 5 seconds		1	11/9	Approved

3.2 Security

3.2.1 Protection

- Security and privacy on computer protects data from being stolen
- Activity logging helps keep track of what we’ve done up to that point
- Robot isn’t always with computer, restricting intermodule communication
- Data integrity checks when necessary

3.2.2 Authorization and Authentication

For authorization, Sphero has a privacy policy verifying that the users know how to use the product safety and effectively. For authentication, the computers and logging in to the coding software require usernames and passwords to enter, validating user’s identities.

3.3 Portability

- The robot must be connected to the computer the code is being made on;
- A Mac is required for the sensor data diagram

4. Requirements Confirmation/Stakeholder sign-off

Meeting Date	Attendees (name and role)	Comments
11/9/23	Andrew	Requirements Approved

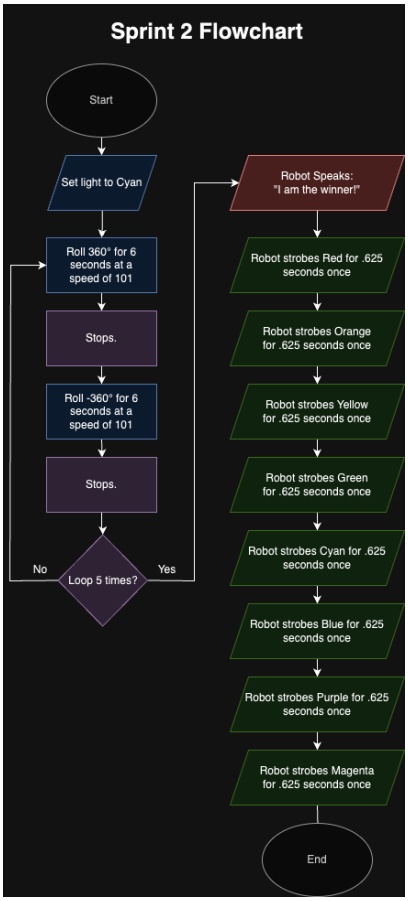
5. System Design

5.1 Algorithm

On start

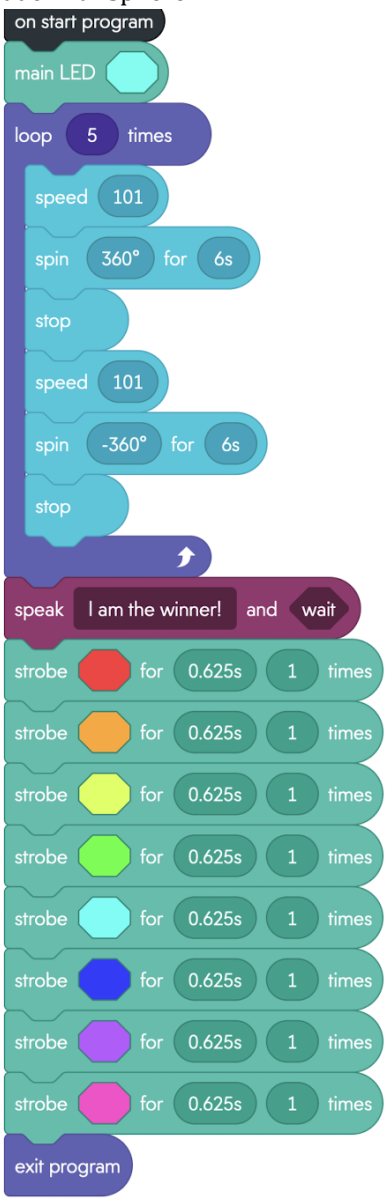
1. Set light to cyan.
2. Roll 360° for 6 seconds at a speed of 101.
3. Stop.
4. Roll -360° for 6 seconds at a speed of 101.
5. Stop.
6. Repeat Steps 1 through 5 for 5 repetitions.
7. Have the robot say “I am the winner!”
8. Strobe a red light for ⅝ second.
9. Strobe a orange light for ⅝ second.
10. Strobe a yellow light for ⅝ second.
11. Strobe a green light for ⅝ second.
12. Strobe a cyan light for ⅝ second.
13. Strobe a blue light for ⅝ second.
14. Strobe a purple light for ⅝ second.
15. Strobe a magenta light for ⅝ second.

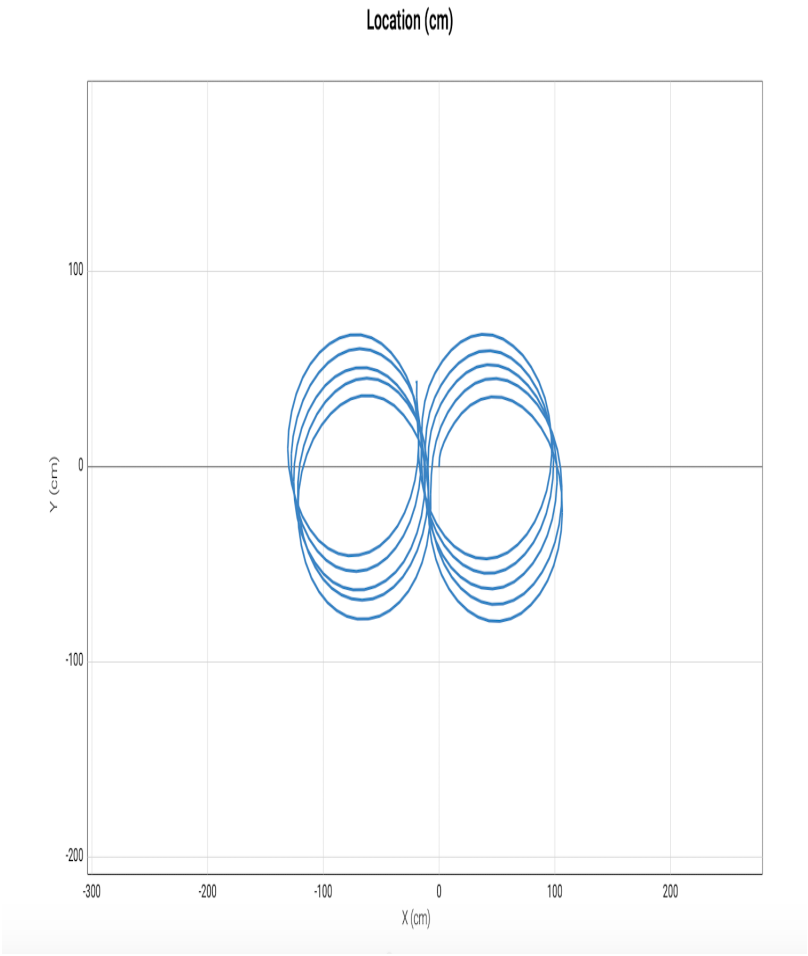
5.2 System Flow



5.3 Software

Made with Sphero.





5.4 Hardware

An Apple Macbook Air was used to code this robot.

5.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
travel in circle	**11/10**	robot follow tape	robot went in circular path that was too short because it wasn't aimed correctly	Alex	Fail
travel in figure 8	**11/10**	robot follow tape	robot's path was in front of top tape and below bottom tape for first circle	Alex	Fail
travel in figure 8	**11/14**	robot follow tape	robot stayed mostly on the course	Alex	Mostly Pass
travel in figure 8 for 5 repetitions	**11/14**	robot follow stape	robot mostly stayed on the tape, but didn't stop for long in between each circle	Alex	Mostly Pass
travel in figure 8 for 5 repetitions	**11/15**	robot follow tape	circles were too small	Alex, Andrew	Fail
" "	**11/15**	robot follow tape	circles were too small	Alex, Andrew	Fail
" "	**11/15**	robot follow tape	robot stayed on for most of the course, but then went too far	Alex, Andrew	Mostly Fail
" "	**11/17**	robot follow tape	robot was pretty much spot on for the first 2 repetitions and then slowly kept getting more off the course for the following 3 repetitions because the robot stopped too far forward on the circumference on the left circle	Alex	Pass* *I'm going to say it stayed enough on the track to be considered acceptable.

5.6 Task List/Gantt Chart

https://docs.google.com/spreadsheets/d/1CpcHduDbsUqz6zqID1UW-WlLSvsmqLS1/edit#gid=1507529980

5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Alex	group manager	SDD, gantt chart developer, code writing and testing, uploading to Github repository	Professor Eckert
Andrew	group technical writer	SDD, Gantt chart, build requirements and signoff table, algorithm, make outline for block code, code testing	Professor Eckert
Kiumbura	group planner	SDD, flowchart	Professor Eckert