

Sprint 1 - Endurance Design Document

April 11, 2022

The problem

1. **Accuracy** – Your robot must successfully run the figure eight course 5 times. A path will be laid out on the floor. Your robot must stay within the path provided. Your robot will start and finish in the square provided. Upon finishing, robot will speak 'I am the winner' and flash multicolored lights for 5 seconds. Points will be deducted if your robot strays from the path, if it does not go around 5 times, or if it does not finish in the same place it started.

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1. Executive Summary

1.1 Project Overview

The project targets class CS 104-01 which intends to participate in a robotic triathlon. This second event focuses on Agility through an obstacle course located in room 208. The programming software that will be used is Sphero Edu along with the Sphero robot plus.

1.2 Purpose and Scope of this Specification

The purpose of this audience is to make sure the students in the class learn problem solving as a group using block coding and are able to use everything they have learned so far this year such as creating algorithms and flowcharts to help them complete all the requirements given in the specifications of this project.

In scope

This document addresses the requirements related to the Endurance section of this robot triathlon project.

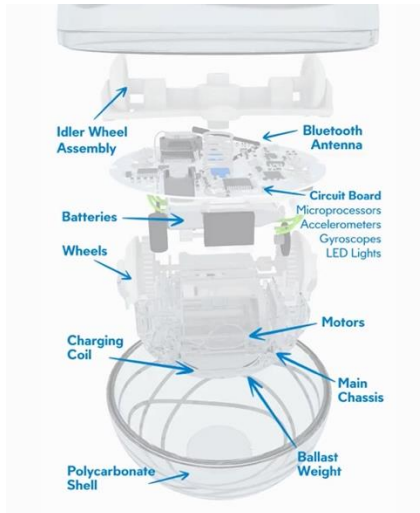
Out of Scope

Nothing addressed in this project is out of scope.

2. Product/Service Description

2.1 Product Context

Sphero is a robot that connects through Bluetooth to an app where the user can use block coding to program the robot to do what is coded. It is not independent moving and relies on the input of the user to run.



2.2 User Characteristics

	Student	Faculty	Parents
Top Priority	To use in class as instructed by the teacher.	To teach their students block coding and problem solving with programming.	May use to help their child in their classes or just to learn on their own.
Experience	Beginner level	Expert level	Beginner or Intermediate
Technical Expertise	You don't need to have any background knowledge to be able to program the Sphero.		

2.3 Assumptions

- You own a Sphero
- You have had a little practice with block coding
- You have the path the robot must follow available to you
- You own some sort of device to hook the robot up to: whether it be a phone, a computer, etc.

2.4 Constraints

- We are new to programming/difficulty reading the language
- Availability to work on the robot in the room
- Room availability
- Space limits

2.5 Dependencies

- In order for the programming to work, we must use Sphero edu
- Sphero must be connected by Bluetooth to follow commands
- Wi-Fi must be readily available
- Programs need to be completed before it can run
- This new product will require a daily download of data from X,
- Module X needs to be completed before this module can be built.

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvw'd	SME Reviewed / Approved
ENDUR_01	The robot must run a figure out course 5 times	Follows the guidelines.	Priority 1	3/28	3/28
ENDUR_02	Return to its starting location	This lets the user know that the machine had completed the program correctly.	Priority 1	3/28	3/28

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Req#	Requirement	Comments	Priority	Date Rvw'd	SME Reviewed / Approved
ENDUR_03	Say "I am the winner"	Allows the user to know the machine is ending the program.	Priority 1	3/28	3/28
ENDUR_04	Flash multicolored lights for 5 seconds.	Follows the guidelines.	Priority 2	3/28	3/28
ENDUR_05	Not collide with anything	This will help to make sure the machine will complete requirement number 4.	Priority 1	3/28	3/28

3.2 Security

3.2.1 Protection

The factors that will protect the system from malicious or accidental access, modification, disclosure, destruction, or misuse:

- Making sure the area is clean and free of clutter before using
- Activity logging
- Only bringing the robot out when taking it to the test room to run the program.
- Having one person responsible for the robot rather than passing it around daily.

3.2.2 Authorization and Authentication

Everything was saved with one password onto one account for us to access.

3.3 Portability

- The robot is small enough to be able to transfer from location to location when having to work on testing the new programs we have created to practice on the test-runs.
- With Sphero, we can each use our own devices and just connect one of us to the robot at a time to run our own code, making it easy for all of us to use our own device with one robot.

4. 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
03/28/22	Arizona Reynoso, Kelly Gonzalez, and Bijon Wilkins	confirmed all

5. System Design

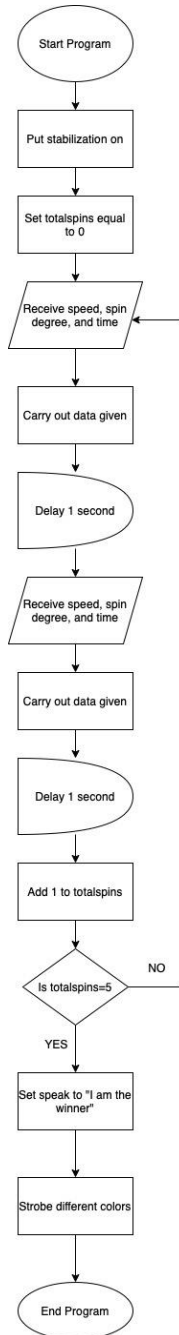
5.1 Algorithm

- Start program
- Put stabilization on
- Set speed to 60
- Set spin to 360 for 8 seconds
- Stop spin
- Delay for 1 second

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- Set speed to 60
- Set spin to -360 for 8 seconds
- Stop spin
- Delay for 2 seconds
- Set loop to 5 times
- Set speak "I am the winner"
- Strobe different colors
- End Program

5.2 System Flow



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5.3 Software

We used blocking coding in the Sphero Edu programming

5.4 Hardware

We used the Sphero robot alongside our laptop and iPad when working on this project.

5.5 Test Plan

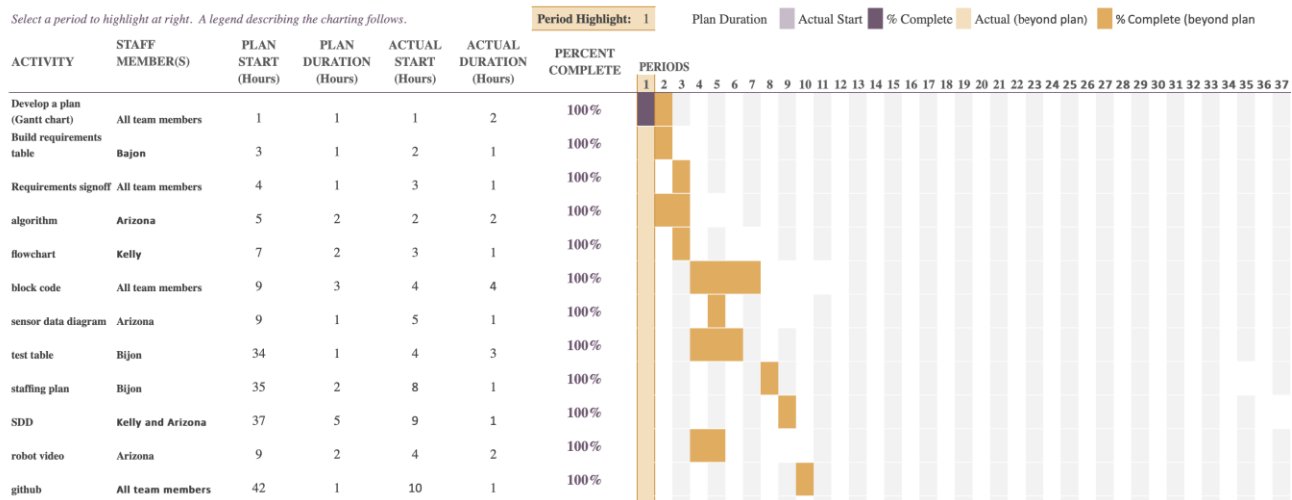
Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Tried to get the ball to curve	3/28	The Sphero would curve when expected	The robot did not curve the way we had hoped	KG/AR/BW	Fail
Tried a pre-coded figure eight	3/28	The Sphero would do a figure 8.	The robot did a circle correctly but then didn't go the aspired way after that.	KG/AR/BW	Fail
Tried another pre-coded figure eight	3/28	Th Sphero would complete a figure 8	The robot went very off of course	KG/AR/BW	Fail
Tried a new way of slowly adding each couple degrees to the code as a roll to see if the robot would complete a circle	3/30	The Sphero would complete a circle.	The Sphero went in a circle	AR/BW	Pass
We wanted to test add another circle to see if the robot would complete a figure 8.	3/30	The Sphero would complete a figure eight.	The Sphero completed a figure eight.	KG/AR/BW	Pass
We fixed up some angles to try and keep the ball on course	3/30	The ball would be closer to the outlined course.	The ball was closer to the course.	KG/AR/BW	Pass
We fixed the speed of the ball in certain sections of the course.	4/4	The ball would stay completely on course.	The ball stayed decently near course	KG/AR	Fail
We fixed up some more speed and timing to keep the ball on course	4/4	The ball would stay on course	The ball stayed mostly on course	KG/AR	Pass
We added the loop and text to speech along with the colors to let the ball run through the course fully.	4/6	The ball would stay mostly on course only straying a bit and complete all 5 loops with the spoken words and colors added.	The ball mostly stayed near course	KG/AR/BW	Pass

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5.6 Task List/Gantt Chart

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5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Kelly Gonzalez	Scribe/ Programmer	<ul style="list-style-type: none"> Create the flowchart Develop a Gantt chart Work on the block code Work on the System Design Document 	Mr. Eckert
Arizona Reynoso	Scribe/ Programmer	<ul style="list-style-type: none"> Write the algorithm Work on the block code Get the sensor data diagram Videotape the robot Create the shared GitHub 	Mr. Eckert
Bajon Wilkins	Scribe/ Programmer	<ul style="list-style-type: none"> Build the requirements table Create the test table Create the staffing plan Work on the block code 	Mr. Eckert