Sprint 1 - Endurance Design Document

March 28, 2022

The problem

Endurance – Your robot must successfully travel around the periphery of HH208 (circumnavigate). A clear path will be provided from each outside wall. Robot will start from the yellow square with blue tape. Robot should start with a green light and speak 'ready set go' and stop with a red light and speak 'I'm done and I need water'. Robot must travel to each of the yellow floor tiles and turn right at the center of each tile. <u>Robot must return to it's starting location</u>. Robot should not collide with any objects as it goes around the room. Points deducted if robot does not light and speak at start and finish, if it collides with anything, or if it does not finish in the square where 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 first event Focuses on Endurance 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.
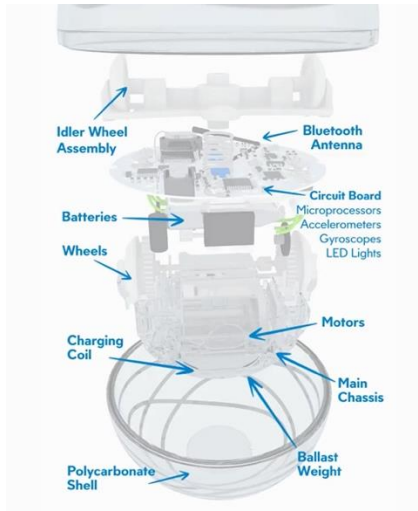
Out of Scope

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 Rvwd	SME Reviewed / Approved
ENDUR_01	Start with the main LED light being green	Shows the user the machine is ready to begin.	Priority 1	3/23	3/23
ENDUR_02	Say "ready set go"	Lets the user know that the program is about to start	Priority 1	3/23	3/23
ENDUR_03	Stop with the main LED light being red	Shows the user the machine has finished traveling the path coded.	Priority 1	3/23	3/23

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_04	Successfully travel the periphery of the lines laid out on the floor	Follows the guidelines	Priority 1	3/23	3/23
ENDUR_05	Return to its starting location	This lets the user know that the machine had completed the program correctly.	Priority 1	3/23	3/23
ENDUR_06	Say "I'm done and I need water"	Allows the user to know the machine is ending the program.	Priority 1	3/23	3/23
ENDUR_07	Not collide with anything	This will help to make sure the machine will complete requirement number 4.	Priority 1	3/23	3/23

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
03/23/22	Arizona Reynoso, Kelly Gonzalez, and Bijon Wilkins	confirmed all

5. System Design

5.1 Algorithm

5.2   System Flow
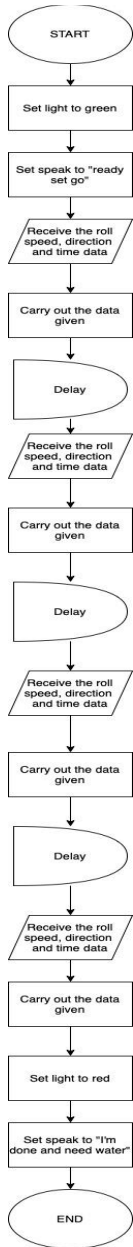
5.3   Software

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
First run to test aim	3/23	The Sphero would go straight down the path	The robot did not go the direction we had expected	KG/AR	Fail

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Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Go straight down first line	3/23	The Sphero would go straight down the first line	The robot had followed the path we had programmed it to	KG/AR	Pass
Extended time and fix speed for first line	3/23	The Sphero would reach the end of the first line on the path.	The robot did what we had programmed it to.	KG/AR	Pass
Added first turn	3/23	The Sphero would continue as it had done before but now add a turn and continue down the next line	The robot had turned correctly, however it then did not reach the end of the next path correctly.	KG/AR	Fail
Fixed the speed and aim of the next turn	3/23	The Sphero would be able to turn and continue down the second path with a good aim and speed.	The robot was able to correctly roll down the first two paths.	KG/AR	Pass
Added the third turn	3/23	The Sphero would be able to continue as it has and add a third turn to its path.	The robot was able to correctly aim itself down the first three paths without adjustment to timing.	KG/AR	Pass
Added the fourth turn	3/23	The Sphero would be able to add a fourth and final turn to its course.	The robot was able to correctly finish the course and end up in the same spot as it had started.	KG/AR	Pass
Added colors and voice over	3/23	The Sphero would turn green in the beginning and say "ready, set, go" and turn red once completing the course and say "I'm done and I need water".	The robot was able to correctly speak and change colors upon command while still running the path we had programmed it to.	KG/AR	Pass
Practice ran it	3/23	The Sphero would be able to complete its entire course and meet all the requirements	The Sphero had completed the course however the aim was a bit off.	KG/AR	Fail
Practice ran it	3/23	The Sphero would be able to complete its entire course and meet all the requirements	The Sphero had completed the course and the aim was correct, only veering off by a minimal amount and easily fixing itself as it ran down the line.	KG/AR	Pass

5.6   Task List/Gantt Chart
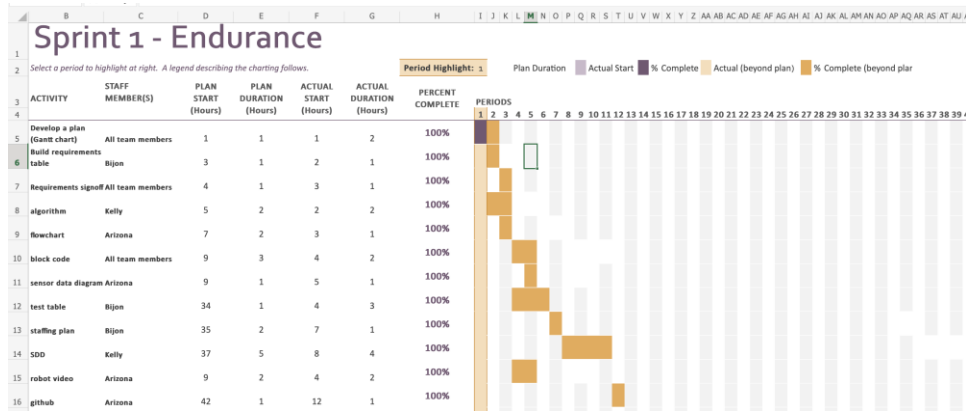
5.7   Staffing Plan

Name	Role	Responsibility	Reports To
Kelly Gonzalez	Scribe/ Programmer	- Write the algorithm - Develop a Gantt chart - Work on the block code - Work on the System Design Document	Mr. Eckert
Arizona Reynoso	Scribe/ Programmer	- Create the flowchart - Work on the block code - Get the sensor data diagram - Videotape the robot - Create the shared GitHub	Mr. Eckert
Bajon Wilkins	Scribe/ Programmer	- Build the requirements table - Create the test table - Create the staffing plan - Work on the block code	Mr. Eckert