Sprint 1 – Agility Design Document

April 18, 2022

The problem

1. **Agility**– Your robot will run the obstacle course. The course will start in a square. Then the robot will encounter 3 objects which it must avoid. Next, the robot will go over the ramp. Finally, the robot will knock over as many pins as possible. Points added for each obstacle the robot completes, for each obstacle avoided and, for each pin the robot topples.

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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.

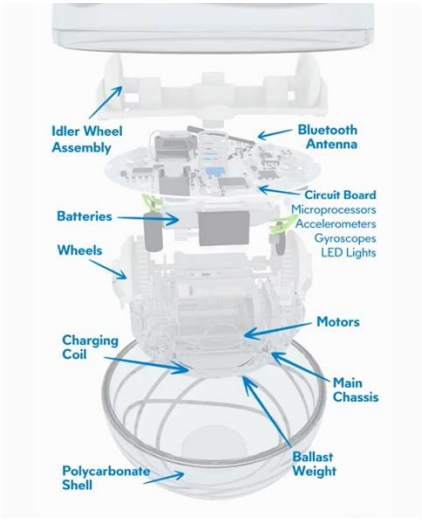
Out of Scope

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 Rvwd**	**SME Reviewed / Approved**
ENDUR_01	Follow the course	Follows the guidelines	Priority 1	4/11	4/11
ENDUR_02	Avoid the 3 objects	Follows the guidelines	Priority 1	4/11	4/11

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_03	Go over the ramp	Follows the guidelines	Priority 1	4/11	4/11
ENDUR_04	Knock down the pins at the end of the course	Follows the guidelines	Priority 1	4/11	4/11

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
04/11/22	Arizona Reynoso, Kelly Gonzalez, and Bijon Wilkins	confirmed all

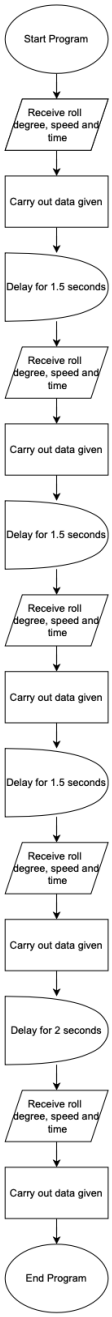
5. System Design

5.1 Algorithm

- Start Program
- Set roll degree to 0 degrees
- Set speed to 58
- Roll for 1.6 seconds with the accepted data
- Delay for 1.5 seconds
- Set roll degree to 90
- Roll for 1.8 seconds with the new roll degree
- Delay for 1.5 seconds
- Set roll to 0
- Roll for 2.1 seconds at the new roll degree

- Delay for 1.5 seconds
- Set roll degree to 90
- Set speed to 140
- Roll for 2.2 seconds with the new accepted data
- Delat for 2 seconds
- Set roll degree to 225
- Set speed to 151
- Roll for 2.6 seconds with the new accepted data
- End Program

5.2 System Flow



5.3 Software

We used blocking coding in the Sphero Edu programming

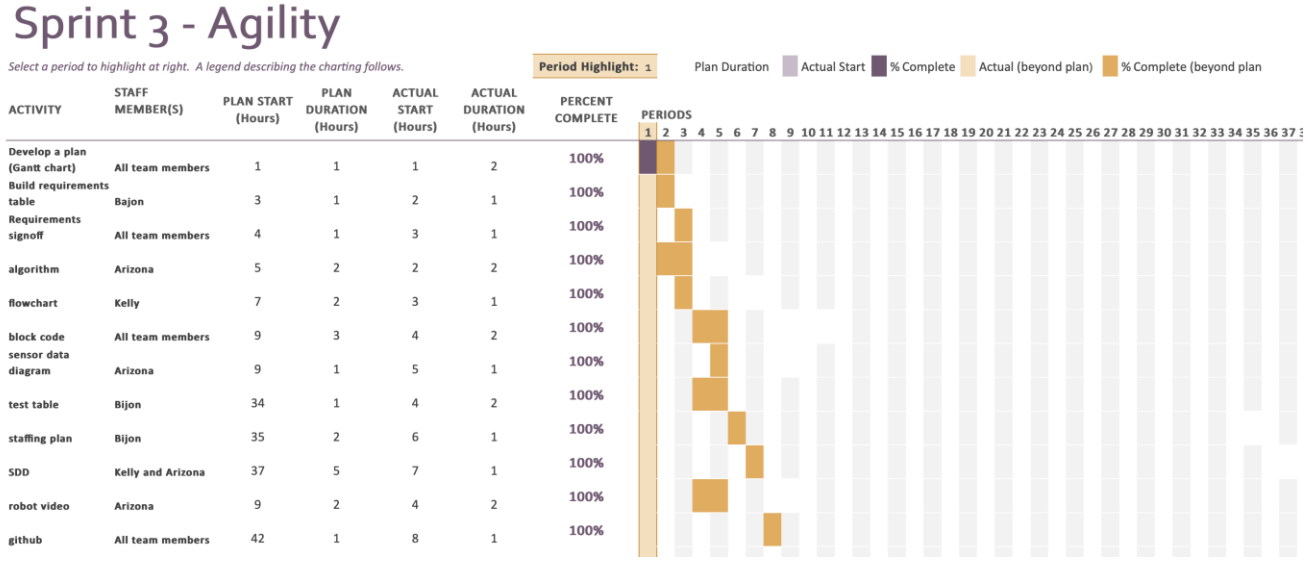
5.4 Hardware

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
Test out our trial code	4/11	The robot would go follow the course	The robot followed the course but the speed and angles were off.	KG/AR	Fail
Fix the speed of each turn	4/11	The robot would follow more closely aligned to the outline's lines	The robot's speed was fixed but the angles were still off	KG/AR	Fail
Fix the angles for each turn	4/11	The robot would follow more closely aligned to the outline's lines	The robot followed the lines much more accurately	KG/AR	Pass
Add the obstacles and test run	4/11	The robot would complete the course	The robot hit the beginning obstacles	KG/AR	Fail
Fix the diagonals a bit and retry the course	4/11	The robot would follow the course correctly	The robot was angled a bit off and missed the binder	KG/AR	Fail
Fix the diagonals a bit and retry the course	4/11	The robot would follow the course	The robot completed the course but did not knock over enough pins	KG/AR	Fail
Add speed for the final turn to try and knock as many pins down as possible	4/11	The robot would complete the course and knock over almost all the pins	The robot completed the course according to the guidelines and knocked over all the pins but 1	KG/AR	Pass

5.6 Task List/Gantt Chart



5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Kelly Gonzalez	Scribe/ Programmer	- Create the flowchart - Develop a Gantt chart - Work on the block code - Work on the System Design Document	Mr. Eckert
Arizona Reynoso	Scribe/ Programmer	- 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	- Build the requirements table - Create the test table - Create the staffing plan - Work on the block code	Mr. Eckert