Sprint 3 - Agility Design Document

December 4, 2023

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1. Executive Summary

1.1 Project Overview

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.

1.2 Purpose and Scope of this Specification

The goal is for the Sphero robot to follow its path correctly.

In Scope

- This document addresses the processes and requirements to carry out the agility project:
    - Modifications in the process so that the robot complies with its trajectory.

Out of Scope

- Having the robot follow the blue tape exactly, rather than just being within a inch or two from the tape while traveling around the course. The robot also must fulfill the accurate duty for each obstacle, such as avoid, jump over, or knock over.

2. Product/Service Description

Various factors can influence the performance and requirements of the product. For instance, obstacles like tables, walls, chairs, or people in the robot's path can hinder its ability to move in the intended direction. The obstacles must also be on its exact assigned location. Additionally, a sloping floor may cause the robot to deviate slightly from its course. Furthermore, a smooth floor surface can result in increased sliding, though the outcome in this scenario closely aligns with the desired effect.

2.1 Product Context

Sphero is a robot, meaning it relates to other robots. It is controlled remotely like other robots, meaning that this product is like other products. Sphero is self-contained because it contains everything in itself to work. Sphero’s interface works with other related systems.

2.2 User Characteristics

Gil Eckert, M.S. is a Specialist Professor at Monmouth University. Professor Eckert has an extensive background in technology management and consulting, particularly in the fields of education and medicine. He has experience in developing, marketing, and providing support for software applications in these sectors. Additionally, he has created data pathways to facilitate accreditation processes at the university level.

2.3 Assumptions

Some issues that could interfere with the requirements could be issues with Sphero Edu, broken robot, or an obstructed pathway. With what we have learned in class (CS-104, taught by Professor Gil Eckert), we feel confident that we are educated on Sphero Edu enough to complete the coding. We are also well aware of classroom availability to be able to complete the test. All members of the group are experienced with completing Sprint 1 together, which we believe better prepares us to show further improvement with the following projects, Sprint 2 and Sprint 3.

2.4 Constraints

Constrain the design options, including

- Battery life of robot
- Limited availability of the room
- Knowledge of Sphero Edu
- Access, management and security
- System resource constraints: limits on disk space or other hardware limitations

2.5 Dependencies

- The block programming on Sphero must be completed
- The robot Sphero
- The space (room HH208)

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
AGIL_01	Start robot in the square	points will be deducted	1	12/4/23	Approved
AGIL_02	Robot will turn right 90 degrees after first obstacle	points will be deducted	1	12/4/23	Approved
AGIL_03	Robot will turn left 90 degrees after second obstacle	points will be deducted	1	12/4/23	Approved
AGIL_04	Robot will turn right 90 degrees after third obstacle	points will be deducted	1	12/4/23	Approved
AGIL_05	When robot makes it over jump, it will right towards the pins.	points will be deducted	1	12/4/23	Approved
AGIL_06	Robot will run into pins and knock them over.	points will be deducted	1	12/4/23	Approved

3.2 Security

Keep your robot safe, don't put it in dangerous places or situations. Keep your Sphero and Github login safe, do not share your information.

3.2.1 Protection

After installing the Sphero app, there will be two login options: school and home. In the school section, you can choose to join as a student using a class code, become a teacher to create and manage a class, or simply dive into programming without signing in immediately. For the home section, logging in is possible either through email or Apple sign-in.

3.2.2 Authorization and Authentication

Consider using standard tools, connecting your number, email, or app.

3.3 Portability

Portability was an important factor in this project as we needed to transfer information from our computer to the robot so that it could work.

4. Use of a proven portable language;
5. Use of a particular operating system; Sphero And Github
6. The need for environment-independence - the product must operate the same regardless of operating systems, networks, development or production environments.

7. Requirements Confirmation/Stakeholder sign-off

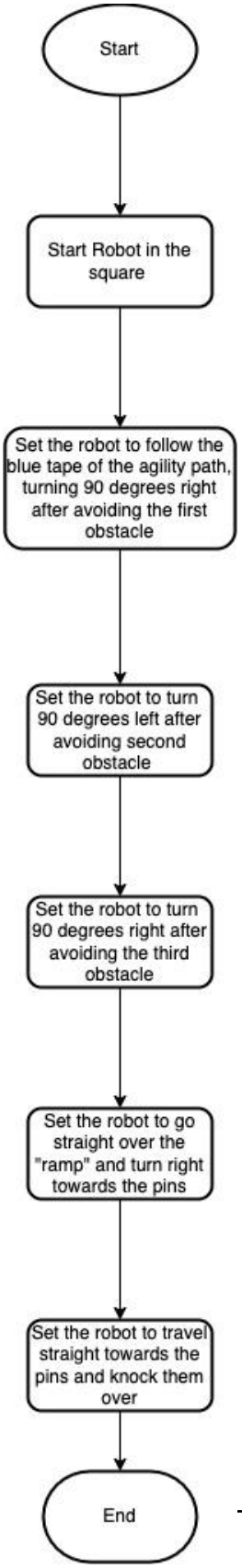
Meeting Date	**Attendees (name and role)**	**Comments**
12/4/2023	Bailey, Gaby, Angela	Confirmed all

8. System Design

8.1 Algorithm

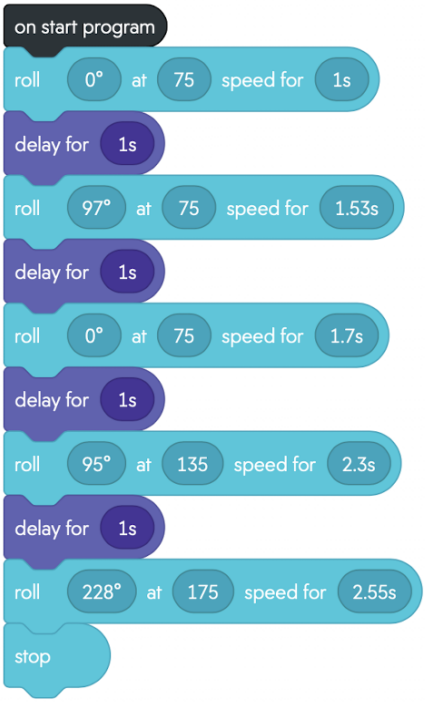
- Start Robot in the square
- Set the robot to follow the blue tape of the agility path, turning 90 degrees right after avoiding the first obstacle
- Set the robot to turn 90 degrees left after avoiding second obstacle
- Set the robot to turn 90 degrees right after avoiding the third obstacle
- Set the robot to go straight over the "ramp" and turn right towards the pins
- Set the robot to travel straight towards the pins and knock them over
- End

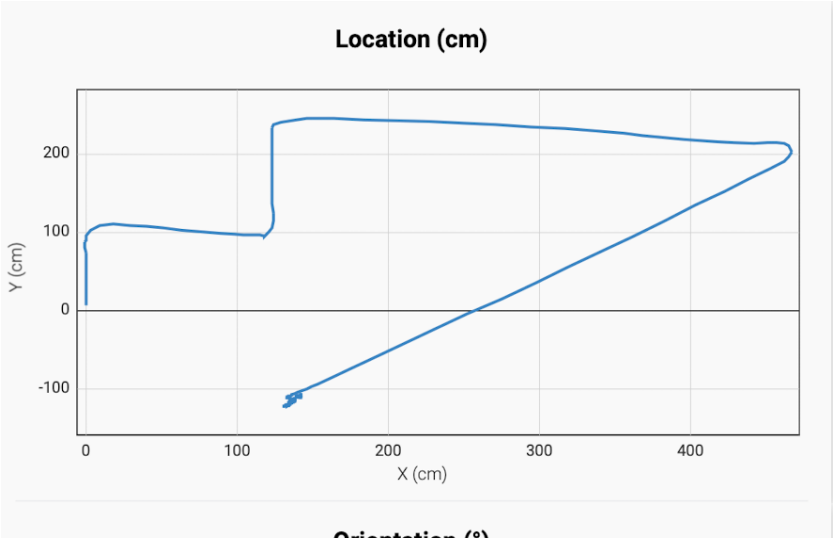
8.2 System Flow



8.3 Software

The block code written on the Sphero app or website was the software used to develop and deploy this application.





8.4 Hardware

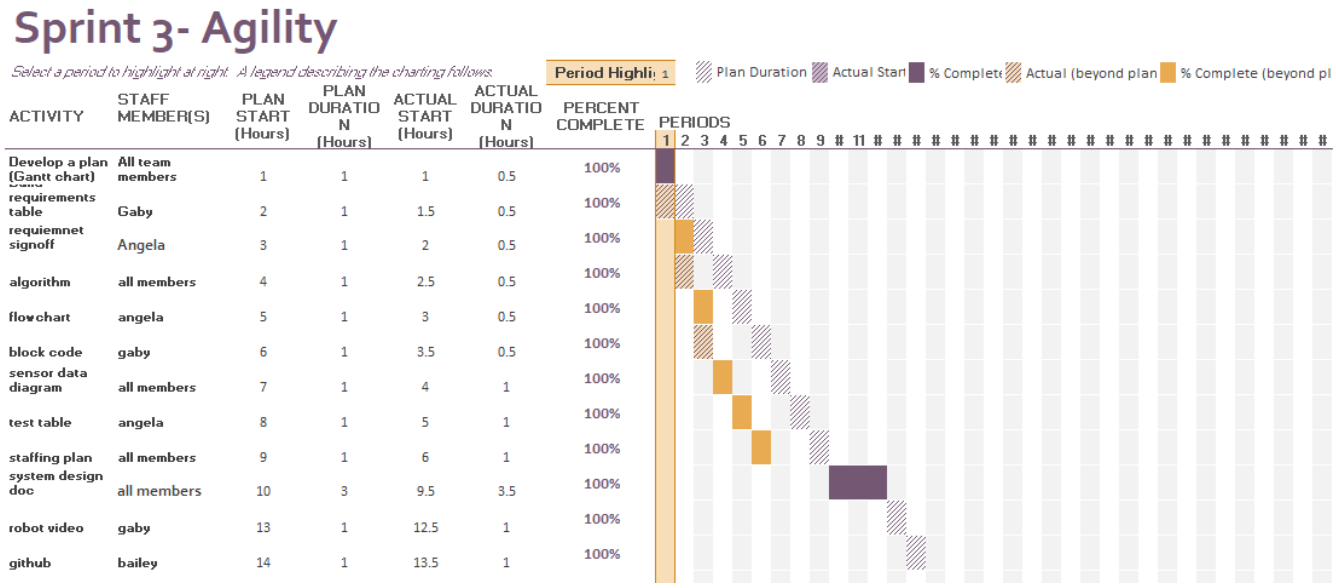
The hardware used to develop and test this project was macOS and Windows

8.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Pass the first obstacle	12/4/23	Go straight and then turn to the right	Went straight turned right	Gaby, Bailey	Pass
Pass the first two obstacles	12/4/23	Go straight, turn right, and then turn left without touching the bottles	Touched bottles	Gaby, Bailey	Fail
Pass the first two obstacles	12/4/23	Go straight, turn right, and then turn left without touching the bottles	Went straight, turned right, turned left without touching bottles	Gaby, Bailey	Pass
Pass the third obstacles and make it over binder	12/4/23	Make the first three turns and jump without hitting the bottles	Successfully made the first three turns without hitting the bottles and jumped over the binder.	Angela	Pass

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Start at third turn to see if the robot can make the jump and the last turn	12/4/23	Hit the pins at the end while also making the jump	Successfully made the jump but passed the stopping point and missed the pins	Angela	Fail
Start at third turn to see if the robot can make the jump and the last turn	12/4/23	Hit the pins at the end while also making the jump	Successfully made the jump, and hit pins	Angela	Pass
Get past all the turns, jump, and hit the pins	12/4/23	Complete the course without hitting any obstacles and hitting all the pins	Completed the course without hitting any obstacles and hitting all the pins	Angela	Pass

8.6 Task List/Gantt Chart



ACTIVITY	STAFF MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATION (Hours)	PERCENT COMPLETE
Develop a plan (Gantt chart)	All team members	1	1	1	0.5	100%
requirements table	Gaby	2	1	1.5	0.5	100%
requiemnet signoff	Angela	3	1	2	0.5	100%
algorithm	all members	4	1	2.5	0.5	100%
flowchart	angela	5	1	3	0.5	100%
block code	gaby	6	1	3.5	0.5	100%
sensor data diagram	all members	7	1	4	1	100%
test table	angela	8	1	5	1	100%
staffing plan	all members	9	1	6	1	100%
system design doc	all members	10	3	9.5	3.5	100%
robot video	gaby	13	1	12.5	1	100%
github	bailey	14	1	13.5	1	100%

8.7 Staffing Plan

Name	Role	Responsibility	Reports To
Angela	SDD Creator/Editor	Create and edit the System Design Document	All members
Bailey	Github owner	Upload videos	All members
Gaby	Programmer	Create Block Code and Test	All members