Sprint 3 - Agility Design Document

November 28th, 2022

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1. Executive Summary

1.1 Project Overview

The purpose of this project is to test the Sphero's physical endurance and speed around the obstacle course. It is intended to show the project members' own skills in planning, working together, coding, and the ability to have the robot do as calculated.

1.2 Purpose and Scope of this Specification

In scope:

- Agility: An obstacle course the robot must speed through and make it to the end.

Out of Scope:

- Accuracy: An obstacle course with 2 circles shaped like a figure-8 the robot is meant to go through
- Endurance: An obstacle course shaped like a square the robot must circumnavigate through

2. Product/Service Description

2.1 Product Context

There are multiple people working on the same product, but in different groups. Although we are all aiming for the same output, there are different decisions that everyone will make to solve and finish the Agility part of the obstacle course. We are documenting the data we observe and creating plans based on our own judgment.

2.2 User Characteristics

- Professor Eckert: He has experience in computer science and teaches at Monmouth University. He went to Kean University and received a bachelor of science from Stockton State College. He's a certified network engineer and has done research on simulations, data analysis, algorithmic development, and quality control.

2.3 Assumptions

- The times each group member can meet up
- The availability of room HH 208
- If the sphere robot is capable of being used
- Group members abilities to code and work as a team

2.4 Constraints

- Access to robot
- Management
- Time
- Resources to Coding

2.5 Dependencies

- Every team member should be assigned accordingly
- We will need multiple testing days in order to make sure the robot works perfectly
- Algorithm and Flowchart are needed beforehand
- Robot must be halfway programmed to at least start Test Case

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
AGIL_01	Robot starts on X	Simple and easy. All that needs to be done is to place the robot down and check the sensor.	Have robot face sender for start	11/29/22	11/29/22
AGIL_02	Robot moves straight forward 3’3”	Slow and steady. The robot can easily make it past the first line	Have robot complete first line without hitting obstacles	11/29/22	11/29/22
AGIL_03	Robot turns 90 degrees and moves forward 3’3”	There were a few bumps here and there into the obstacles, but eventually the first zig-zag was completed	Robot must turn and avoid obstacles in process	11/29/22	11/29/22
AGIL_04	Robot turns -90 degrees and moves forward 3’7”	This section is like AGIL_02. As long as the robot stops we’re set. It’s been making perfect progress so far once it passes AGIL_03.	Robot has to complete third line without bumping into obstacles	11/29/22	11/29/22
AGIL_05	Robot turns 90 and moves forward 7’5” and jumps over ramp during process	The robot has to speed up during this. Too much speed makes it go too far so figuring out the best speed is helpful. Lowering speed helped the robot complete the task.	Have fast enough movemen t to jump ramp and stop where needed	11/29/22	11/29/22
AGIL_06	Robot turns right and moves 9’1”	Robot rushes down the line at a good speed in order to have enough force to reach the markers.	Robot rushes down line to meet markers	11/29/22	11/29/22
AGIL_07	Robot knocks over markers	The robot tends to go right and miss the markers at first.	Knock down all 10 markers	11/29/22	11/29/22

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved

3.2 Security

3.2.1 Protection

- Constant checks from team members
- Saving System
- No leaking or sharing with anyone outside of the group

3.2.2 Authorization and Authentication

- Authorization to Camryn, Sahmi, and Nathan, as well as Professor Gil Eckert

3.3 Portability

- Sent to Github into Repository: https://github.com/sahmin89/Agility
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- Shared along group members
- Use in English
- Use of a clear, clean, and straight environment at the correct length

4. Requirements Confirmation/Stakeholder sign-off

Include documentation of the approval or confirmation of the requirements here. For example:

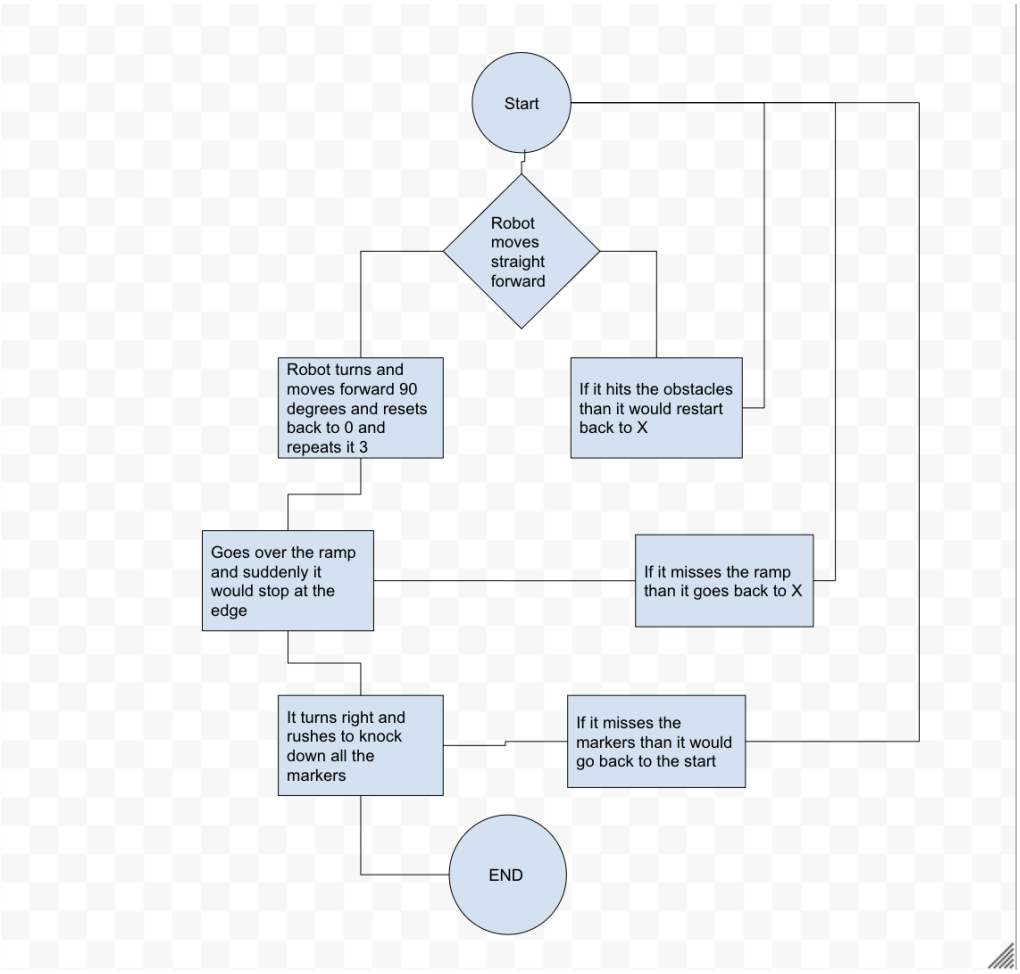
Meeting Date	Attendees (name and role)	Comments
11/29/22	Camryn, Sahmi, Nathan	Worked on and completed every task of Sprint 3 Agility

5. System Design

5.1 Algorithm

- Robot starts on X
- Robot moves straight forward 3’3”
- Robot turns 90 degrees and moves forward 3’3”
- Robot turns -90 degrees and moves forward 3’7”
- Robot turns 90 and moves forward 7’5” and jumps over ramp during process
- Robot turns right and moves 9’1”
- Robot knocks over markers

5.2 System Flowchart



5.3 Software

The software we are using is called Sphero Edu. It is a drag and drop code.

5.4 Hardware

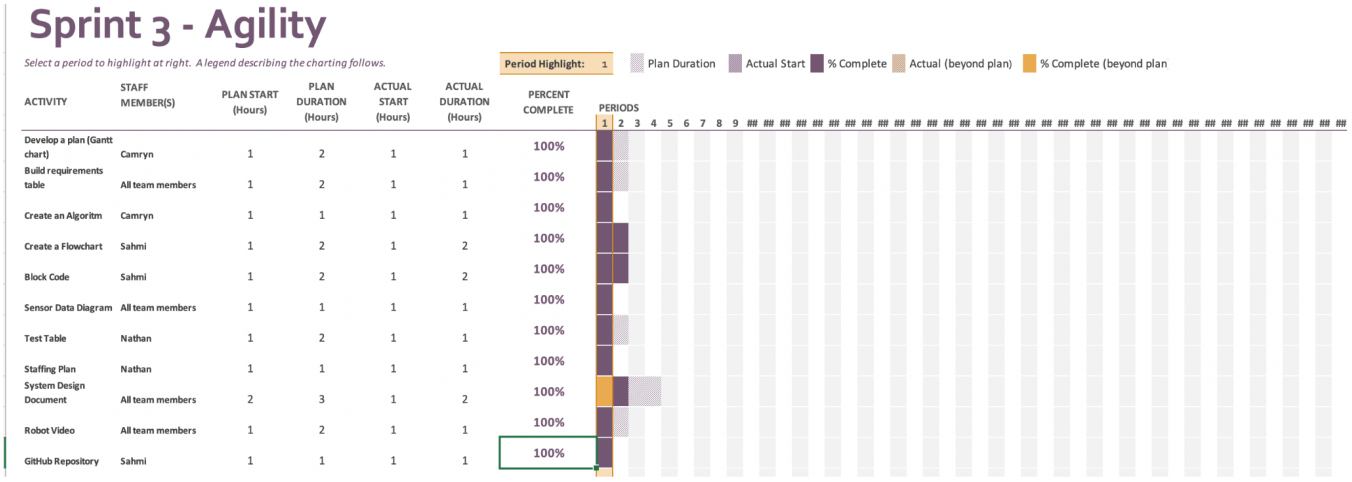
The hardware is the Sphero robot that our professor provided for us.

5.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Testing if robot completes first line	11/29/22	Robot will complete the first line	Robot went too far over the first line	Nathan	Fail
Testing if robot completes first line	11/29/22	Robot will complete the first line	Robot successfully completed the first line	Nathan	Pass
Testing if robot completes second line	11/29/22	Robot will complete the second line	Robot went off path and hit the second glass bottle	Nathan	Fail
Testing if robot completes second line	11/29/22	Robot will complete the second line	Robot stopped short of the end line	Nathan	Fail

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Testing if robot completes second line	11/29/22	Robot will complete the second line	Robot successfully completed the second line	Nathan	Pass
Testing if robot completes the third line	11/29/22	Robot will complete the third line	Robot stopped short because last line is longer	Nathan	Fail
Testing if robot completes the third line	11/29/22	Robot will complete the third line	Robot successfully completed the third line	Nathan	Pass
Testing if robot goes over ramp and stops at the final line	11/29/22	Robot will go over ramp and stop at correct point	Robot jumped the ramp but went too far over the line	Nathan	Fail
Testing if robot goes over ramp and stops at the final line	11/29/22	Robot will go over ramp and stop at correct point	Robot successfully went over the ramp and stopped at the correct point	Nathan	Pass
Testing if robot completes the final line and knocks down all the markers	11/29/22	Robot will stay on the line and knock over all the markers	Robot followed correct path and knocked all the markers down	Nathan	Pass

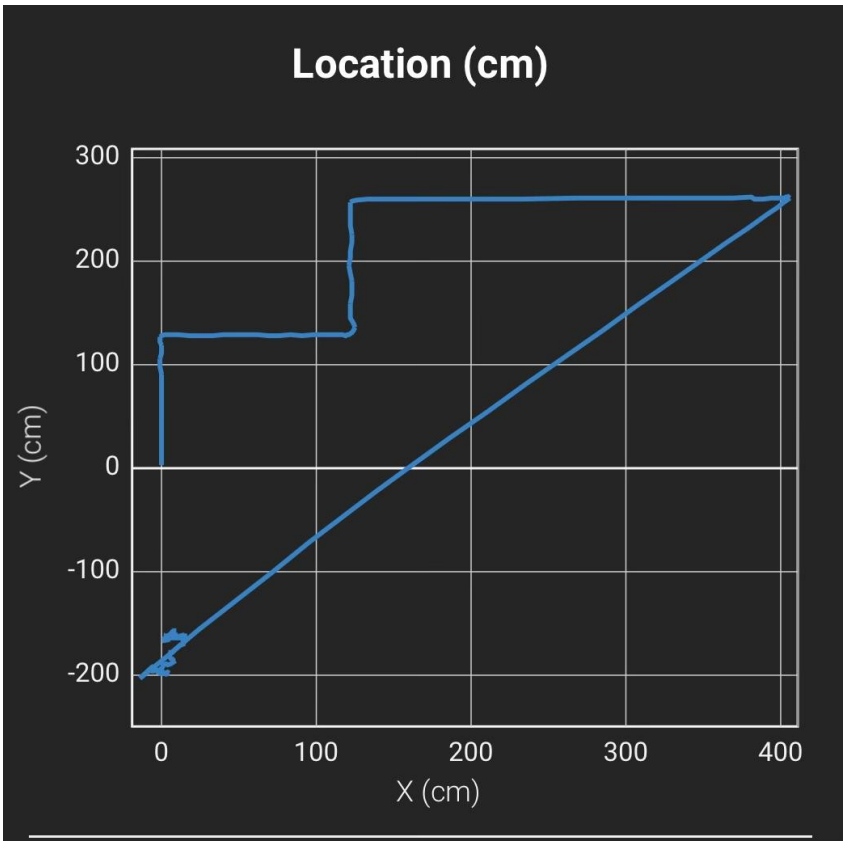
5.6 Task List/Gantt Chart



5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Sahmi	Software Design	Creates code, takes measurements, creates algorithms, and has the lead on making sure the robot follows the correct procedures.	Camryn

Name	Role	Responsibility	Reports To
Nathan	System Design	Provide all details concerning the technical design, staffing, coding, and testing the system	Camryn
Camryn	Project Manager	Receives and gives instructions, suggests changes that should be made to better the tests. Filled out Gantt chart and project summary.	Professor Eckert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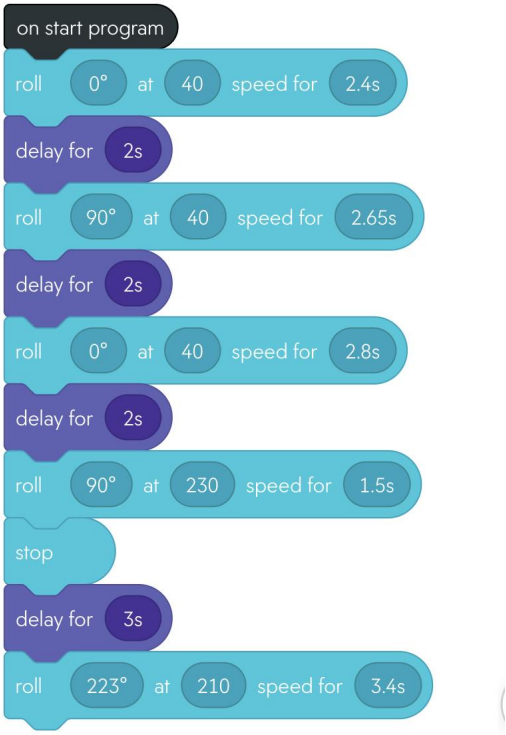
on start program
roll 0° at 40 speed for 2.4s
delay for 2s
roll 90° at 40 speed for 2.65s
delay for 2s
roll 0° at 40 speed for 2.8s
delay for 2s
roll 90° at 230 speed for 1.5s
stop
delay for 3s
roll 223° at 210 speed for 3.4s