Sprint 3 - Agility Design Document

April 18th, 2024

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1. Executive Summary

1.1 Project Overview

In this project, we are testing our group's and our individual ability to problem solve, quantify, organize, document, code, test, and present a software system. This process is called 'software engineering'. We will display this ability through the programming of a robot to perform the task of traveling around a figure eight path which is laid on the classroom floor. The intended audience for this project is Professor Eckert, and our classmates.

1.2 Purpose and Scope of this Specification

In Scope

This document addresses requirements related to Sprint 3 of the Robotics Project:

- Modification of Performance optimization for this sprint
- Modification of code to travel around an obstacle course.
- Use of code to ensure speed and accuracy align with project requirements

Out of Scope

The following items in sprint 1 and 3 of the robotics project are out of scope:

- Modification of code for robot to travel in the square of the classroom
- Modification of code to travel in a figure 8 motion to meet requirements.

2. Product/Service Description

2.1 Product Context

This product is a robot which can be controlled by the user. This sets it apart from other robots that can function without the user programming the function, as this one cannot. This robot allows for the user to program things such as color, sound, speed and direction at which it travels. It is also an independent product and does not interact with many related systems.

2.2 User Characteristics

- Students, professors, and staff will use this product.
- Must have a computer or a phone that is compatible with the Sphero Edu application.
- Must have some coding experience to program the product.
- Needs some technical expertise.

2.3 Assumptions

- Assumed that a member of the group has access to the sphero application, if not the group must be changed, or the requirement must change.
- Assumed user has access to the test room, if not they will be unable to complete tests.

- Assumed user must understand and know how to use the features of the Sphero application, if not they must learn before testing begins.
- Assumed user has access to specific project requirements, these are needed to complete the project properly.
- Assumed the user has internet connection

2.4 Constraints

- If the robot is damaged.
- Old software being used to try run the code.
- Different software being used to try run the code.
- The device that has the code doesn't have Bluetooth.
- If the language is not Sphero Edu block code.

2.5 Dependencies

- A MacOS or iPhone is needed to conduct the code.
- Application must be downloaded to the device.
- The code must be current.
- Bluetooth must be on and connected to the device.
- Robot must be working and properly charged.

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	The Robot will start in a square	Required for full credit	1	04/16	Approved
ENDUR_02	Robot will avoid the first object	Required for full credit	2	04/16	Approved
ENDUR_03	Robot will avoid the second object	Required for full credit	2	04/16	Approved
ENDUR_04	Robot will avoid the third object	Required for full credit	2	04/16	Approved
ENDUR_05	Robot will travel over the ramp	Required for full credit	1	04/16	Approved
ENDUR_06	Robot will knock over as many pins as possible		3	04/16	Approved
ENDUR_07	Robot doesn't collide with anything	Required for full credit	2	04/16	Approved
ENDUR_08	The speed of the robot is tbc	We cannot confirm the exact speed as different floor surfaces change the speed the robot goes. For example, the robot would go faster on a smooth concrete floor, compared to a rough one.	3	04/16	Approved

3.2 Security

3.2.1 Protection

- Encryption
- Password login
- Log of user activity
- Data integrity checks
- Private server

3.2.2 Authorization and Authentication

Only members of our group (Lucy, Callan and Alexander) and Professor Eckert will have access/ be responsible for creating the code, and will have access through a link provided by one group member. GitHub has strict authorization protocols which means our link is protected. This precaution ensures that the code is not changed by anyone.

3.3 Portability

- The robot is 100% host dependant
- The environment must have a flat and smooth surface for the robot to travel on
- The device that is writing the code must have Sphero Edu
- The language used is block code
- GitHub and Sphero Edu are very portable programs and allow for use on multiple devices so all group members can have access.

4. Requirements Confirmation/Stakeholder sign-off

Meeting Date	**Attendees (name and role)**	**Comments**
04/15/2024	Lucy and Callan	Started SDD, and planned Gantt Chart
04/16/2024	Lucy and Callan	Confirmed all requirements
04/16/2024	Lucy, Callan, and Alexander	Finished SDD

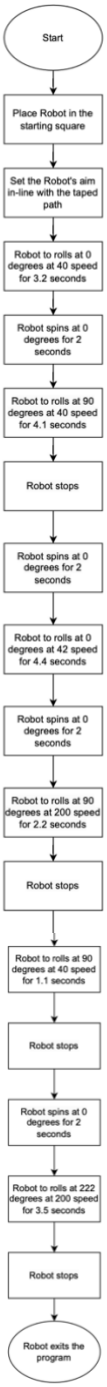
5. System Design

5.1 Algorithm

1. Place Robot in the starting square
2. Set Robot to travel along the first line till it reaches the corner (avoids object 1)
3. Set Robot to travel along the second line till it reaches the corner (avoids object 2)

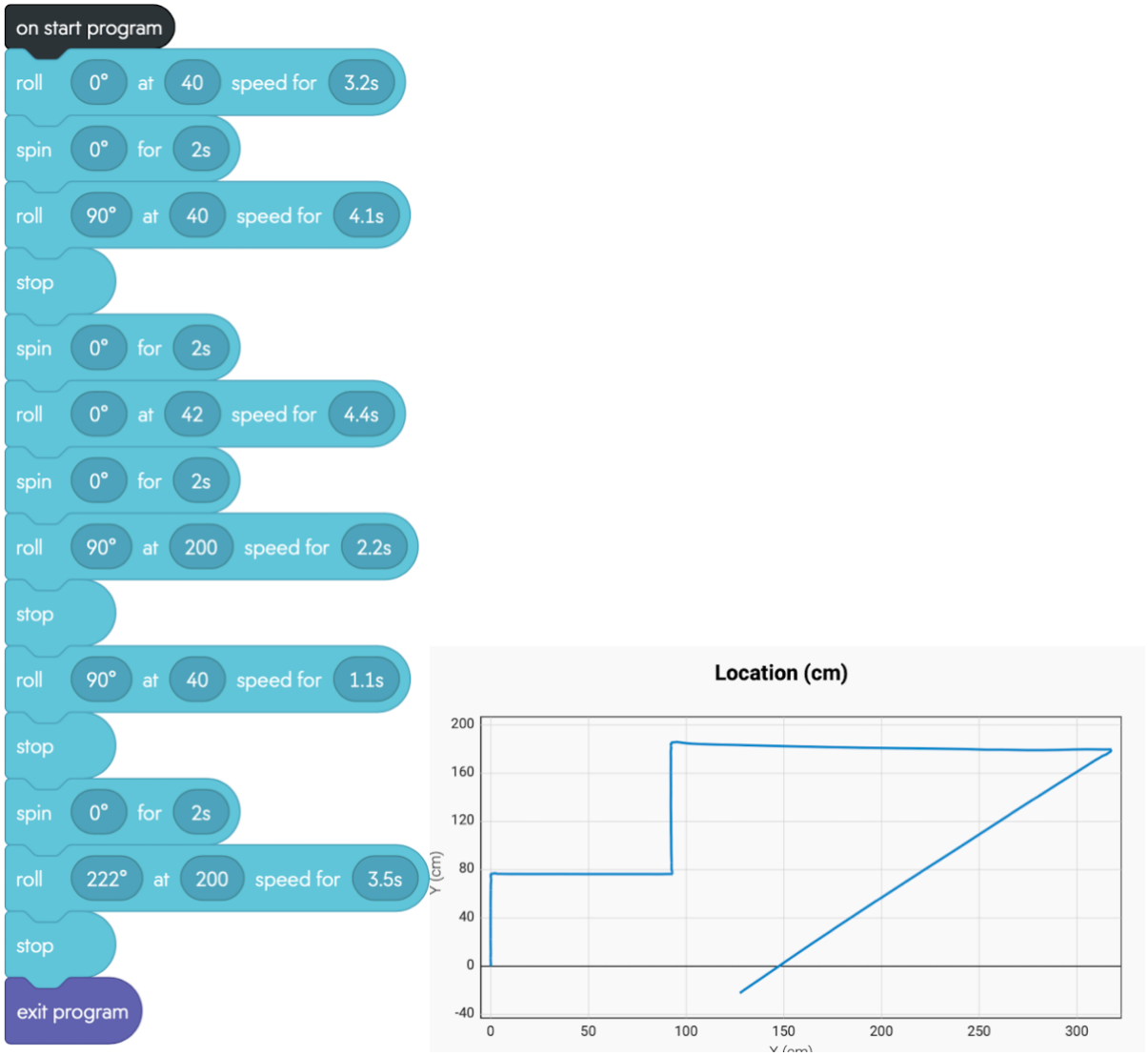
4. Set Robot to travel along the third line till it reaches the corner (avoids object 3)
5. Set Robot to travel to the ramp
6. Set Robot to travel over the ramp
7. Set Robot to stop after the ramp
8. Set the Robot to travel straight line into the pins
9. Set the Robot to exit program

5.2 System Flow



5.3 Software

The software use used for this task was Sphero Edu, which is a user-friendly platform designed for educational programming. The programming language utilized within Sphero Edu was block code. Block code offers a visual and intuitive programming approach, which uses interlocking puzzle-like pieces to construct code sequences. This method simplifies programming, and is accessible for beginners by providing a straightforward way to create coding.



5.4 Hardware

The hardware that we used for this sprint was a computer. We used the computer in a variety of different ways, the first being downloading the programming application Sphero Edu. We continued to use the computer for development tasks. For testing purposes, we used the Spark Plus Robot to access the functionality of our application. Furthermore, to showcase the application's capabilities, we used an iPhone to record a video that we will upload online.

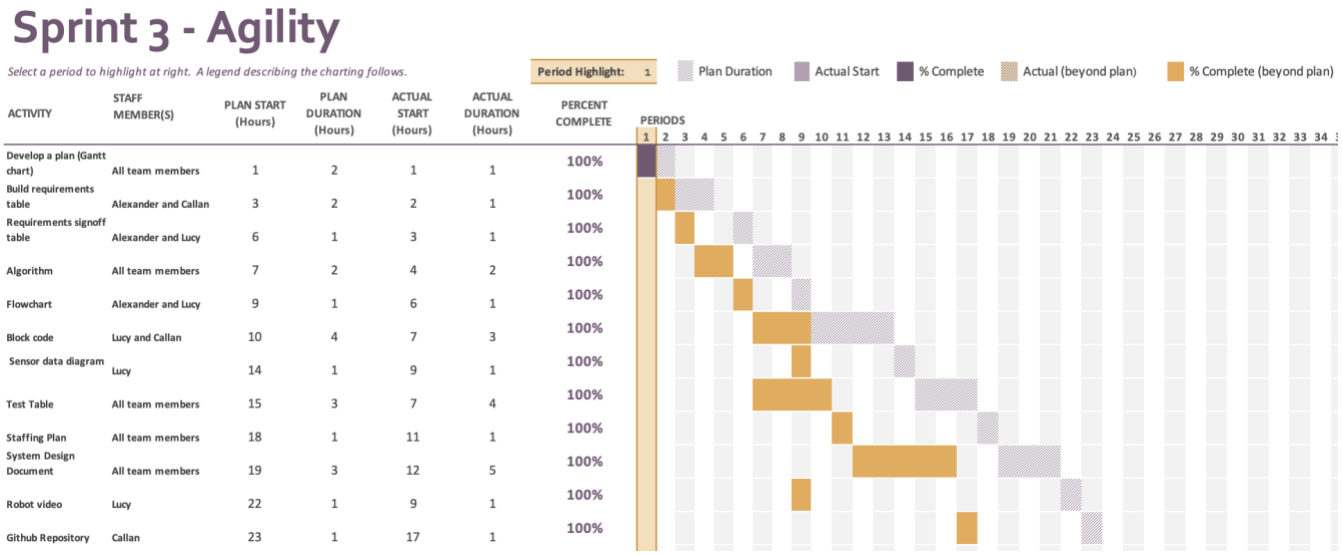
5.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
To place the Robot in the starting square	04/16	The Robot is successfully place in the square	The Robot is successfully place in the square	Lucy	Pass
To make the Robot travel straight till it reaches the first corner and not crash into object 1.	04/16	The Robot successfully travels in a straight line till it reaches the first corner, where it will stop. It will not crash into object 1.	The Robot travelled off to the right and hit object 1	Lucy	Fail
To make the Robot travel straight till it reaches the first corner and not crash into object 1.	04/16	The Robot successfully travels in a straight line till it reaches the first corner, where it will stop. It will not crash into object 1.	The Robot travelled straight, but didn't make it to the first corner.	Lucy	Fail
To make the Robot travel straight till it reaches the first corner and not crash into object 1.	04/16	The Robot successfully travels in a straight line till it reaches the first corner, where it will stop. It will not crash into object 1.	The Robot successfully travelled in a straight line till it reached the first corner, and did not crash into object 1.	Lucy	Pass
To make the Robot travel straight till it reaches the second corner and not crash into object 2.	04/16	The Robot successfully travels in a straight line till it reaches the second corner, where it will stop. It will not crash into object 2.	The Robot travelled in a straight line but it didn't reach the corner	Lucy	Fail
To make the Robot travel straight till it reaches the second corner and not crash into object 2.	04/16	The Robot successfully travels in a straight line till it reaches the second corner, where it will stop. It will not crash into object 2.	The Robot travelled in a straight line but it travelled past the second corner	Lucy	Fail

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
To make the Robot travel straight till it reaches the second corner and not crash into object 2.	04/16	The Robot successfully travels in a straight line till it reaches the second corner, where it will stop. It will not crash into object 2.	The Robot successfully travelled in a straight line till it reached the second corner, it didn't crash into object 2.	Lucy	Pass
To make the Robot travel straight till it reaches the third corner and not crash into object 3.	04/16	The Robot successfully travels in a straight line till it reaches the third corner, where it will stop. It will not crash into object 3.	The Robot drove off to the right and crashed into object 3.	Lucy	Fail
To make the Robot travel straight till it reaches the third corner and not crash into object 3.	04/16	The Robot successfully travels in a straight line till it reaches the third corner, where it will stop. It will not crash into object 3.	The Robot travelled in a straight line, but went too far after the corner	Lucy	Fail
To make the Robot travel straight till it reaches the third corner and not crash into object 3.	04/16	The Robot successfully travels in a straight line till it reaches the third corner, where it will stop. It will not crash into object 3.	The Robot successfully travelled in a straight line till it reached the third corner, it did not crash into object 3.	Lucy	Pass
To make the Robot drive towards the ramp	04/16	The Robot successfully drives in a straight line towards the ramp	The Robot successfully drives in a straight line towards the ramp	Lucy	Pass
To make the Robot drive over the ramp	04/16	The Robot successfully travels over the ramp	The Robot didn't have enough speed to travel over the ramp	Lucy	Fail
To make the Robot drive over the ramp	04/16	The Robot successfully travels over the ramp	The Robot travelled up the ramp, but on an angle	Callan	Fail
To make the Robot drive over the ramp	04/16	The Robot successfully travels over the ramp	The Robot successfully travels over the ramp	Callan	Pass

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
To make the Robot drive to the beginning of the final line of tape	04/16	The Robot drives to the beginning of the final line of tape	The Robot drove too far	Callan	Fail
To make the Robot drive to the beginning of the final line of tape	04/16	The Robot drives to the beginning of the final line of tape	The Robot drives to the beginning of the final line of tape	Callan	Pass
To make the Robot travel in a straight line towards the pins, knocking over as many as possible	04/16	The Robot travels in a straight line towards the pins and knocks over lots of pins	The Robot didn’t followed the taped line, and travelled off to the left and didn’t knock any pins	Callan	Fail
To make the Robot travel in a straight line towards the pins, knocking over as many as possible	04/16	The Robot travels in a straight line towards the pins and knocks over lots of pins	The Robot didn’t followed the taped line, and travelled off to the left and didn’t knock any pins	Callan	Fail
To make the Robot travel in a straight line towards the pins, knocking over as many as possible	04/16	The Robot travels in a straight line towards the pins and knocks over lots of pins	The Robot travels in a straight line towards the pins and knocks over lots of pins	Callan	Pass
To make the Robot stop and exit the program	04/16	The Robot stops and exits the program	The Robot stops and exits the program	Callan	Pass

5.6 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	2	1	1	100%
Build requirements table	Alexander and Callan	3	2	2	1	100%
Requirements signoff table	Alexander and Lucy	6	1	3	1	100%
Algorithm	All team members	7	2	4	2	100%
Flowchart	Alexander and Lucy	9	1	6	1	100%
Block code	Lucy and Callan	10	4	7	3	100%
Sensor data diagram	Lucy	14	1	9	1	100%
Test Table	All team members	15	3	7	4	100%
Staffing Plan	All team members	18	1	11	1	100%
System Design Document	All team members	19	3	12	5	100%
Robot video	Lucy	22	1	9	1	100%
Github Repository	Callan	23	1	17	1	100%

5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Lucy	Problem Solver	Leader for writing the algorithm, checks the SSD, and films the robot	Callan
Callan	Recorder	Records the information and fills it out onto the SDD	Lucy
Alexander	Coder	Writes the flowchart and the code	Lucy and Callan