Sprint 3 – Agility Design Document

April 18, 2024

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1. Executive Summary

1.1 Project Overview

The objective is to program the robot to navigate the obstacle course accurately and safely, avoid all obstacles, roll up ramps with ease, and knock down as many pins as it can with the use of block code and specialized software.

1.2 Purpose and Scope of this Specification

Describe the purpose of this specification and its intended audience. Include a description of what is within the scope what is outside of the scope of these specifications. For example:

In scope

This document addresses requirements related to phase 2 of Project A:

modification of Classification Processing to meet legislative mandate ABC.
modification of Labor Relations Processing to meet legislative mandate ABC.

Out of Scope

The following items in phase 3 of Project A are out of scope:

modification of Classification Processing to meet legislative mandate XYZ.
modification of Labor Relations Processing to meet legislative mandate XYZ.
(Phase 3 will be considered in the development of the requirements for Phase 2, but the Phase 3 requirements will be documented separately.)

Product/Service Description

Product Context

The Sphero Edu program allows block code control of the Sphero Bolt Robot utilized in this project. In addition, the product can roll to certain places at predetermined speeds and directions.

User Characteristics

- University Students
- Entry level Computer Science knowledge

Assumptions

- Assumes the Sphero Edu software is installed on device
- Assumes that the robot has been calibrated to face the initial direction of movement before commencing the program.

Constraints

- Size of classroom HH208
- Limited time available in HH208

Dependencies

- This requirement necessitates the use of the latest version of the Sphero EDU software.
- Requires up to date version of Sphero EDU software.
- Also dependent on objects and markers provided for the sprint.

Requirements

1.3 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Travel forward without hitting glass bottle	Simple first step	1	4/18/24	Approved
ENDUR_02	Roll at a 90-degree angle passing the next object without contact	Increased difficulty lining up second object	1	4/18/24	Approved
ENDUR_03	Roll at a 0-degree angle passing the next object without contact	Increased difficulty due to having pass 3 objects	1	4/18/24	Approved
ENDUR_04	Roll at a 90-degree angle at a high speed to get over the ramp	Difficult to set up how fast and where to set up ramp.	1	4/18/24	Approved
ENDUR_05	Roll at a 225-degree angle at a high speed to knock down the pins	Easier than some of the others due to no objects being avoided	1	4/18/24	Approved

1.4 Security

Protection

The primary safeguard preventing accidental access to the system is the Bluetooth connection established with a specific device. Access to the robot requires establishing a Bluetooth connection, with only one user able to connect at any given time.

Authorization and Authentication

To grant authorization for robot usage, users are required to authenticate the robot by providing its name through the Sphero Edu Software

Portability

- Exceptional environmental independence, guaranteeing that the product functions reliably in a variety of networks, operating systems, and production or development environments.
- Deployment across many devices and systems is made easier by compatibility with several platforms, such as Windows, MacOS, Android, iOS, and more.

Requirements Confirmation/Stakeholder sign-off

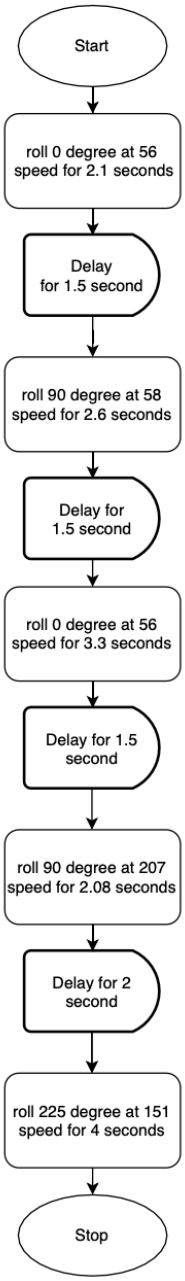
Meeting Date	Attendees (name and role)	Comments
04/15/24	Trey H, Trey P, Flavia D	Confirmed all requirements
04/18/24	Trey H, Trey P, Flavia D	Confirmed all requirements

System Design

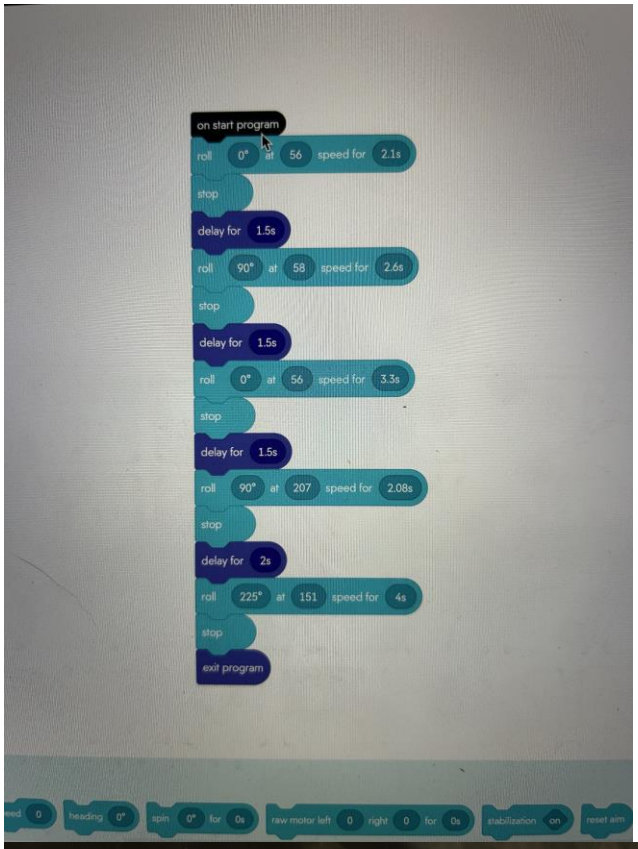
Algorithm

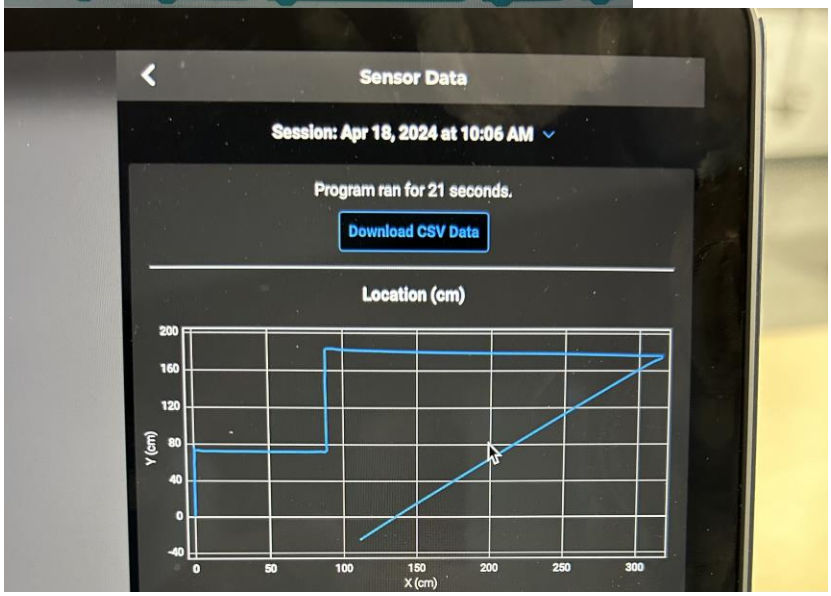
- Start
- Step 1: Roll 0 degree at 56 speeds for 2.1 second
- Step 2: Stop
- Step 3: Delay for 1.5 second.
- Step 4: Roll 90 degrees at 58 speed for 2.6 seconds.
- Step 5: Stop
- Step 6: Delay for 1.5 second.
- Step 7: Roll 0 degree at 56 speed for 3.3 seconds
- Step 8: Stop
- Step 9: Delay for 1.5 second.
- Step 10: Roll 90 degrees at 207 speed for 2.08 seconds
- Step 11: Stop
- Step 12: Delay for 2 seconds.
- Step 13: Roll 225 degrees at 151 speed for 4 seconds
- Step 14: Stop
- Done.

1.5 System Flow



Software





Hardware

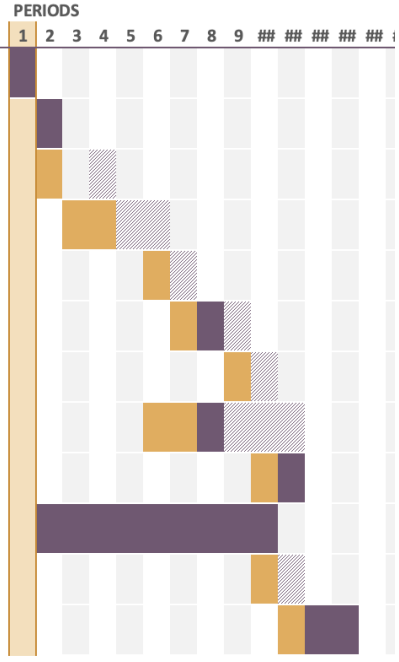
- MacBook Pro
- Sphero edu

1.6 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Test if robot goes around first object	4/18/24	Robot will go around object without hitting it	The robot hit the object	Trey H, Trey P, Flavia D	Fail
Test if robot goes around the first object	4/18/24	Robot goes around the object without hitting it	The robot went around the object	Trey H, Flavia D, Trey P	Pass
Test if robot goes around the second object	4/18/24	Robot goes around both objects	The robot went around both objects	Trey H, Flavia D, Trey P	Pass
Test if robot goes around the third object	4/18/24	Robot goes around all three objects	The robot went around all three objects	Trey H, Flavia D, Trey P	Pass
Test if robot successfully goes over the ramp	4/18/24	Robot will roll over the ramp	Robot did not successfully roll up the ramp	Trey H, Flavia D, Trey P	Fail
Test if robot successfully goes up the ramp	4/18/24	Robot will roll over the ramp	Robot did successfully roll up the ramp	Trey H, Flavia D, Trey P	Pass
Test if robot knocks over the pins	4/18/24	Robot will knock over all the pins	Robot did successfully knock over all the pins	Trey H, Flavia D, Trey P	Pass

Task List/Gantt Chart

ACTIVITY	STAFF MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATION (Hours)	PERCENT COMPLETE
Gantt chart	All team members	1	1	1	1	100%
Build requirements table	Flavia D.	2	1	2	1	100%
Requirements signoff table	All team members	4	1	2	1	100%
Create Algorithm	Trey P.	5	2	3	2	100%
Create Flowchart	Trey H.	7	1	6	1	100%
Perform Block code	All team members	8	2	7	2	100%
Sensor data diagram	Trey P.	10	1	9	1	100%
Test Table	All team members	8	4	6	3	100%
Staffing Plan	Flavia D.	11	1	10	2	100%
System Design Document	All team members	2	9	2	9	100%
Robot Video	Trey H.	11	1	10	1	100%
GitHub Repository	All team members	12	2	11	3	100%



Staffing Plan

Name	Role	Responsibility	Reports To
Trey H	Group Member	Algorithm, robot video, system design doc	Flavia D and Trey P
Flavia D	Group Member	Fow chart, System design doc	Trey H and Trey P
Trey P	Group Member	GitHub Repository owner, System design doc	Trey H and Flavia D