

Sprint 1 - Endurance Design Document

October 23, 2023

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1. Executive Summary

1.1

1.2 Project Overview

This project is showing our ability to problem solve, quantify, organize, document, code, test, and present a software system. For this project we will be working with our group overcoming an endurance based challenge relating to software engineering. We will be using a robot to show that we accomplished the task at hand. The intended audience for this project is the Professor and the rest of the students taking CS-101.

1.3 Purpose and Scope of this Specification

In Scope

This document addresses requirements related to Sprint 1 of the Robotics Project.

- modification of code to travel in a square to meet requirements
- modification of performance optimization for this sprint
- rule based classification

Out of Scope

The following items in Sprint 2 and Sprint 3 of the Robotics Project are out of scope.

- modification of code to travel around obstacle course
- modification of code to travel in a figure eight

2. Product/Service Description

2.1 Product Context

This product relates to other products in the fact that they are controllable robots. The difference between his product and others is that instead the robot can only perform in certain paths that are programmed into the robot. It is an independent product. It does not interact with a variety of related systems.

2.2 User Characteristics

- Student and staff will use this product
- Need coding experience
- Must have access to a computer or phone
- Technical expertise

2.3 Assumptions

- Assumed user has access to Sphero +, if not available must change requirement
- Assume user has access to Sphero Edu, if not can't complete the project
- Assumed that user has access to test room, can't complete tests if not available
- If user does not know how to access app, then requirements would have to change

2.4 Constraints

- Old software being used to run the code
- Different software being used to run the code
- Robot is damaged

- Device that has code doesn't have bluetooth
- Language is not Sphero Edu block code

2.5 Dependencies

- Code must be done on Mac or iPhone
- Robot must be fully charged
- Code must be up to date
- Robot synced with bluetooth to the coding device.

3. Requirements

3.1 Functional Requirements

| Req# | Requirement | Comments | Priority | Date Rvwd | SME Reviewed / Approved |
|----------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|-------------------------|
| ENDUR_01 | Robot has green color at start | Required to get full credit. | 1 | 10/27 | Approved |
| ENDUR_02 | Robot says, "Ready set go" right before starting | Required to get full credit. | 1 | 10/27 | Approved |
| ENDUR_04 | At finish robot turns red | Required to get full credit. | 1 | 10/27 | Approved |
| ENDUR_05 | At finish robot says, "I'm done and I need water" | Required to get full credit. | 1 | 10/27 | Approved |
| ENDUR_06 | Robot travels to first corner, 22ft from the start | | 2 | 10/27 | Approved |
| ENDUR_07 | Robot turns 90 degrees clockwise at first corner | | 2 | 10/27 | Approved |
| ENDUR_08 | Robot travels to second corner, 11ft 8in from the first corner | | 2 | 10/27 | Approved |
| ENDUR_09 | Robot turns 90 degrees clockwise at second corner | | 2 | 10/27 | Approved |
| ENDUR_10 | Robot travels to the third corner, 21ft 6in from the second corner. | | 2 | 10/27 | Approved |
| ENDUR_11 | Robot turns 90 degrees clockwise at third corner | | 2 | 10/27 | Approved |
| ENDUR_12 | Robot travels to final position (where it started), 11ft 10 in from the third corner | | 2 | 10/27 | Approved |
| ENDUR_13 | Speed of the robot is tbd. | The exact speed is unknown because there may be different speeds that work better than others, also depending on the floor consistency and if it is exactly level. | 3 | 10/27 | Approved |

3.2 Security

3.2.1 Protection

- encryption
- password login
- private server
- constant server checks
- logging user activity

3.2.2 Authorization and Authentication

Only members of the group making the code and the professor will be able to see the code. This will make sure that the code isn't changed by a random person. It will be accessed through a link provided by one person.

3.3 Portability

- The robot is host dependent
- The device that is writing code must have Sphero Edu
- The environment must be flat and smooth that the robot is used in
- There needs to be a good network connection

4. Requirements Confirmation/Stakeholder sign-off

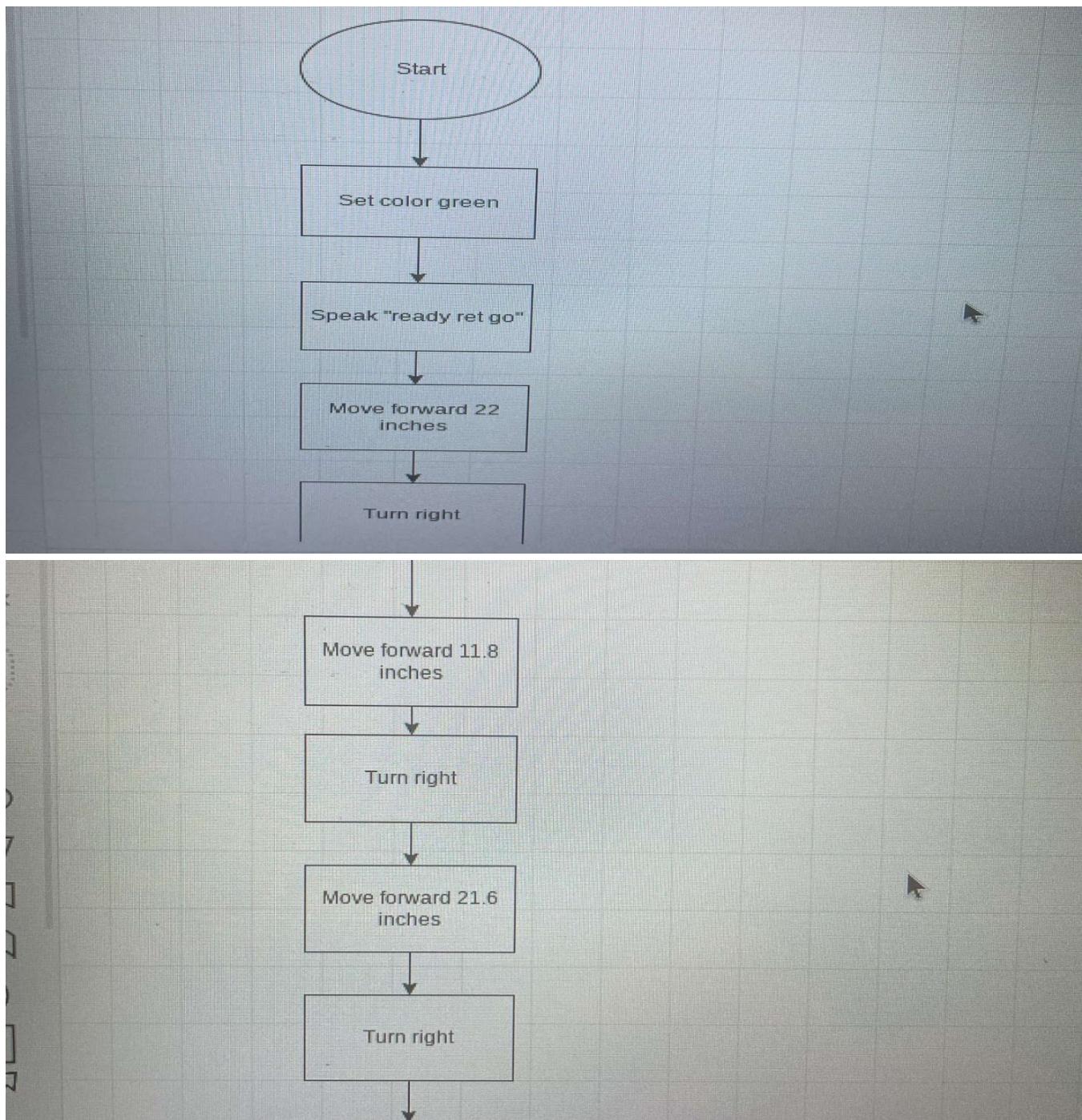
| Meeting Date | Attendees (name and role) | Comments |
|---------------------|----------------------------------------------------|-----------------------------------|
| 10/27 | Conor(Recorder), Ziv(Problem Solver), Lucas(Coder) | Confirmed all of the Requirements |

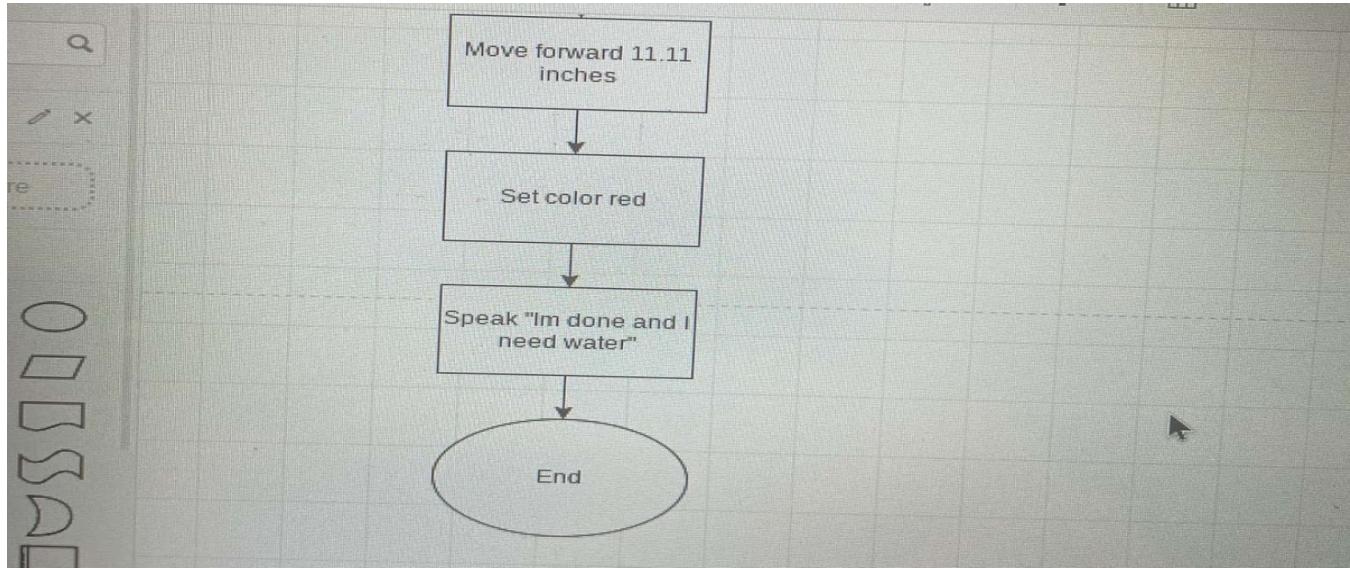
5. System Design

5.1 Algorithm

1. set Robot color to green
- 2.set the Robot to say "Ready set go"
- 3.set the Robot to travel 22ft to the first corner
- 4.when done, set the Robot to turn 90 degrees clockwise
- 5.set the Robot to travel 11ft 8in to the second corner
- 6.when done, set the Robot to turn 90 degrees clockwise
- 7.set the Robot to travel 21ft 6in to the third corner
- 8.when done, set the Robot to turn 90 degrees clockwise
- 9.set the Robot to travel 11ft 10 in to the first corner
- 10.set Robot color to red
- 11.set the Robot to say "I'm done and I need some water"

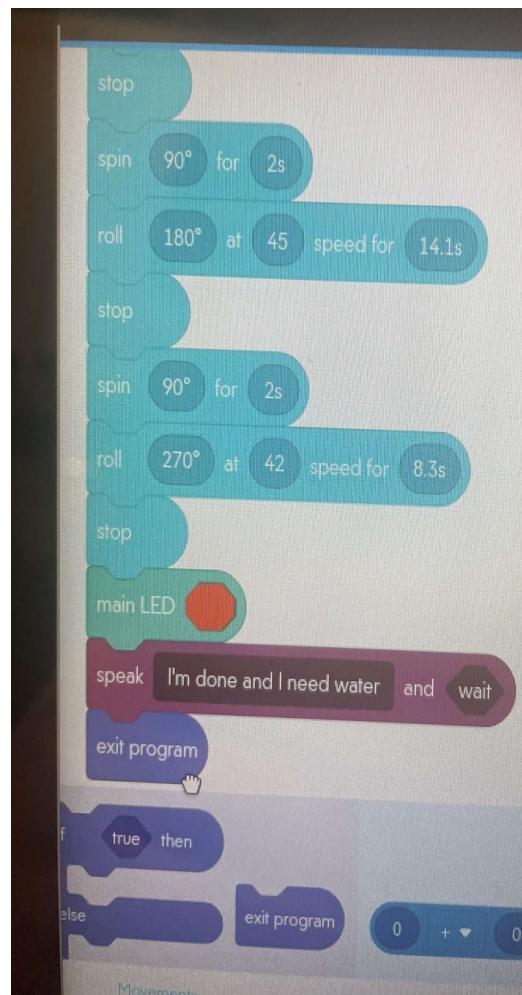
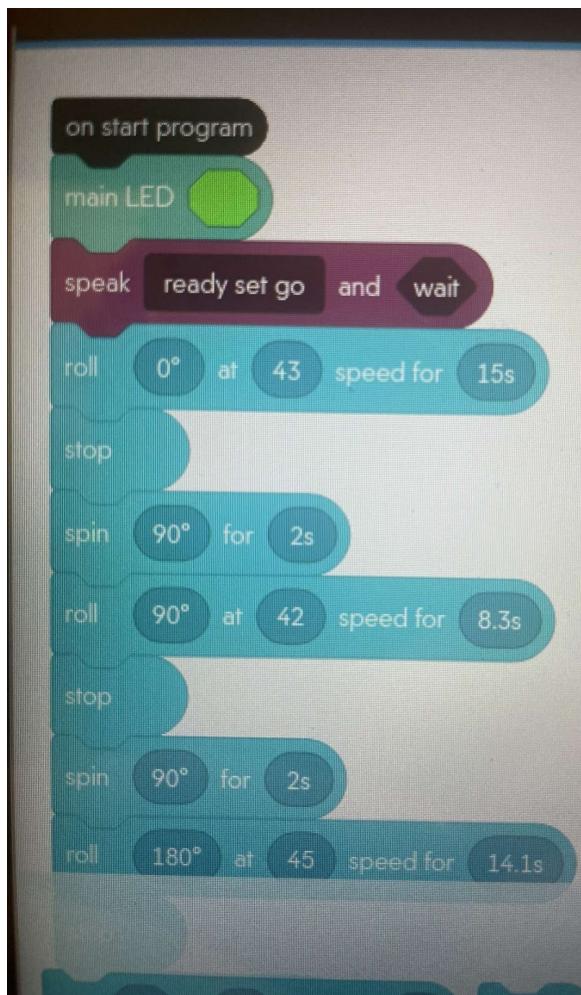
5.2 System Flow





5.3 Software

The software program that was used was Spehro Edu. The language that was used was block code. Block code is a visual and easy approach to programming that uses puzzle-like pieces that link together to form code. It is very easy and user accessible for beginners.



5.4 Hardware

Hardware that was used for this Sprint was a computer. We used the computer to download the programing application Sphero Edu. The computer was used to develop the application. We used the Spark Plus robot to test our application. To demonstrate our application we used a phone to record a video that will be uploaded online.

5.5 Test Plan

| Reason for Test Case | Test Date | Expected Output | Observed Output | Staff Name | Pass/Fail |
|------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------|-----------|
| Make sure the robot color changes green and says ready set go. | 11/1 | Robot turns green and says ready set go | robot turns green and says ready set go | Conor | Pass |
| Figure out the speed and times required to travel the first side of the square | 11/1 | Robot travels along the tape and stops around halfway through the first side. | Robot travels along the tape and stops around halfway through the first side. | Conor | Pass |
| Make sure the robot can reach the first corner. | 11/1 | Makes it to the end of the first side of square and stops at corner | Robot was crooked and didn't make it to the end | Conor | Fail |
| Make sure the robot can reach the first corner. | 11/1 | Makes it to the end of the first side of square and stops at corner | Robot went too far and didn't stop on the corner. | Conor | Fail |
| Make sure the robot can reach the first corner. | 11/1 | Makes it to the end of the first side of square and stops at corner | Robot traveled in a straight line and stopped perfectly at the corner. | Conor | Pass |
| Make sure the Robot makes it to the first corner and then makes it to the second corner. | 11/1 | Robot makes it to the first corner, turns and makes it to the second corner and stops. | Robot made it to the first corner, turns and makes it to the second corner and stops. | Conor | Pass |
| Robot around the square to the third corner following tape. | 11/1 | Robot travels around the tape and stops at the third corner. | The robot was a little short of the third corner. | Conor | Fail |
| Robot around the square to the third corner following tape. | 11/1 | Robot stops at the third corner. | The robot traveled too far. | Conor | Fail |
| Robot around the square to the third corner following tape. | 11/1 | Robot stops at the third corner. | The robot stopped perfectly at the third corner. | Conor | Pass |
| Robot around the square to the starting point stops and stops. | 11/1 | Robot travels around the tape and makes it to the starting point and stops. | The robot stopped perfectly at the start point. | Conor | Pass |

| Reason for Test Case | Test Date | Expected Output | Observed Output | Staff Name | Pass/Fail |
|-----------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------|-----------|
| At the end when the robot stops it changes color to red and speaks outloud. | 11/1 | When the robot stops , it turns red and says, "I'm done and I need water." | Robot turned red at finish and said, "I'm done and I need water" | Conor | Pass |
| Robot makes it perfectly around the whole square without error and changes colors and speaks when needed. | 11/1 | Robot makes it around squared and says what it needs to say and changes color. | Robot made it around the square and says what it needs to say and changes color. | Conor | Pass |

5.6 Task List/Gantt Chart

| ACTIVITY | STAFF MEMBER(S) | PLAN | PLAN | ACTUAL | ACTUAL | PERCENT COMPLETE |
|------------------------------|------------------|------------------|---------------------|------------------|---------------------|------------------|
| | | START (Hours) | DURATION (Hours) | START (Hours) | DURATION (Hours) | |
| Develop a plan (Gantt chart) | All team members | 1 | 2 | 1 | 1 | 100% |
| Build requirements table | Conor | 3 | 2 | 2 | 1 | 100% |
| Algorithm | Ziv | 3 | 1 | 2 | 1 | 100% |
| FlowChart | Lucas | 4 | 2 | 3 | 1 | 100% |
| Block code | Lucas | 4 | 2 | 3 | 2 | 100% |
| Sensor data diagram | Lucas | 6 | 1 | 6 | 1 | 100% |
| Test table | Conor | 6 | 1 | 6 | 1 | 100% |
| Staffing Plan | All team member | 1 | 1 | 1 | 1 | 100% |
| System Design Document | Conor | 1 | 10 | 1 | 9 | 100% |
| Robot video | Ziv | 6 | 1 | 6 | 1 | 100% |
| Github Repository | Lucas | 8 | 1 | 7 | 9 | 100% |
| Review SSD | Ziv | 9 | 1 | 9 | 1 | 100% |
| Submit Sprint | Lucas | 10 | 1 | 10 | 1 | 100% |

5.7 Staffing Plan

| Name | Role | Responsibility | Reports To |
|-------|----------------|---------------------------------------------------------|------------|
| Ziv | Problem Solver | write the algorithm and film the robot, checks over SSD | Conor |
| Conor | Recorder | Record info and fill out the SSD | Lucas |
| Lucas | Coder | Write the flowchart and the code | Ziv+Conor |