Sprint 1 - Endurance Design Document

HH208

Circumnavigation

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1. Executive Summary

1.1 Project Overview

This project tests the capabilities of the Sphero SPRK+ programmable robot.

1.2 Purpose and Scope of this Specification

Purpose of this specification is to examine the ability of the Sphero SPRK+ to go around a specified path of a rectangle without bumping into anything.

In scope

- Robot functions properly on a flat surface
- Supports all devices with Bluetooth
- Waterproof outer shell

Out of Scope

- Should not be operated outside
- Bluetooth will be disconnected with a range of more than 100 feet.

2. Product/Service Description

2.1 Product Context

This project is a third of the main Robotics Triathlon project which consists of two more sprints testing accuracy and agility.

1. Endurance

2. Accuracy

3. Agility

2.2 User Characteristics

In order to use the robot, users only need to understand the basic concepts of block code. No knowledge of programming is required to operate it. Users should have access to a device that supports Bluetooth and an open space with a flat surface to meet the requirements.

2.3 Assumptions

- Availability of an indoor flat surface meeting the required measurements
- Equipment will only work on certain operating systems

2.4 Constraints

- Use of the officially measured course was not available
- Limited number of robots (one per group)

2.5 Dependencies

- Sphero SPRK+ needs to be charged every 60 minutes
- Check the availability of maximum area of flat surface before working on the block code

3. Requirements

3.4 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Robot moves from Point A to Point B and stops	Point B is 22’ from Point A	1	11/9	11/9
ENDUR_02	Robot moves from Point B to Point C and stops	Point C is 11’8” from Point B	1	11/9	11/9
ENDUR_03	Robot moves from Point C to Point D and stops	Point D is 21’6” from Point C	1	11/9	11/9
ENDUR_04	Robot moves from Point D to A and stops	Point A is 11’10” from Point D	1	11/9	11/9
ENDUR_05	Robot says “Ready set go” before initiating first move	Occurs on Point A	1	11/9	11/9
ENDUR_06	Robot says “I am done and I need water” when final move has been completed	Occurs on Point A after all movement has been completed	1	11/9	11/9
ENDUR_07	Robot main LED turns green before initiating first move	RGB(0, 180,0)	1	11/9	11/9
ENDUR_08	Robot main LED turns red when final move has been completed	RGB(255, 0, 0)	1	11/9	11/9

3.5 Security

3.5.1 Protection

- No personally identifiable information stored in the robot itself
- Water resistant and scratch resistant outer cover
- Works with third-party security experts to audit the Sphero Edu platform
- Data encrypted in transit and at rest where possible

3.5.2 Authorization and Authentication

Users will have to make an account on sphero.edu in order to access the program.

3.6 Portability

- Program robot with the Draw, Block, or JavaScript Canvas
- Compatible with iOS 10+, Android 5+, Windows 10, macOS, Chrome OS

4. Requirements Confirmation/Stakeholder sign-off

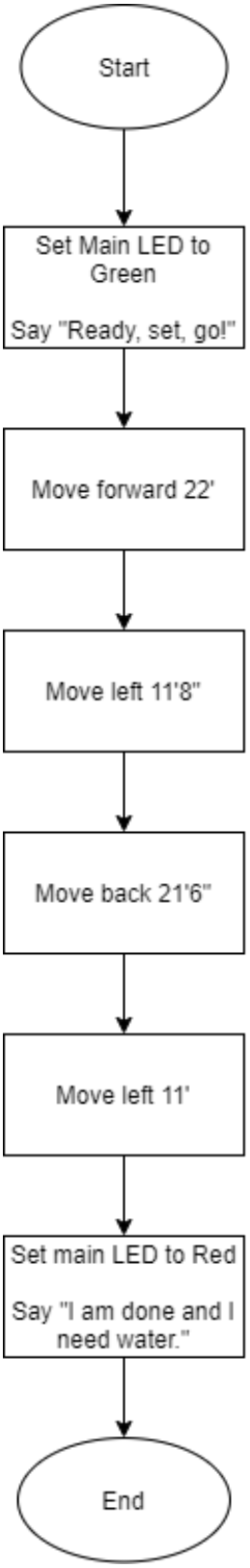
Meeting Date	Attendees (name and role)	Comments
11/9/20	Zainab, Nick, Tyler	Confirmed all requirements

5. System Design

5.4 Algorithm

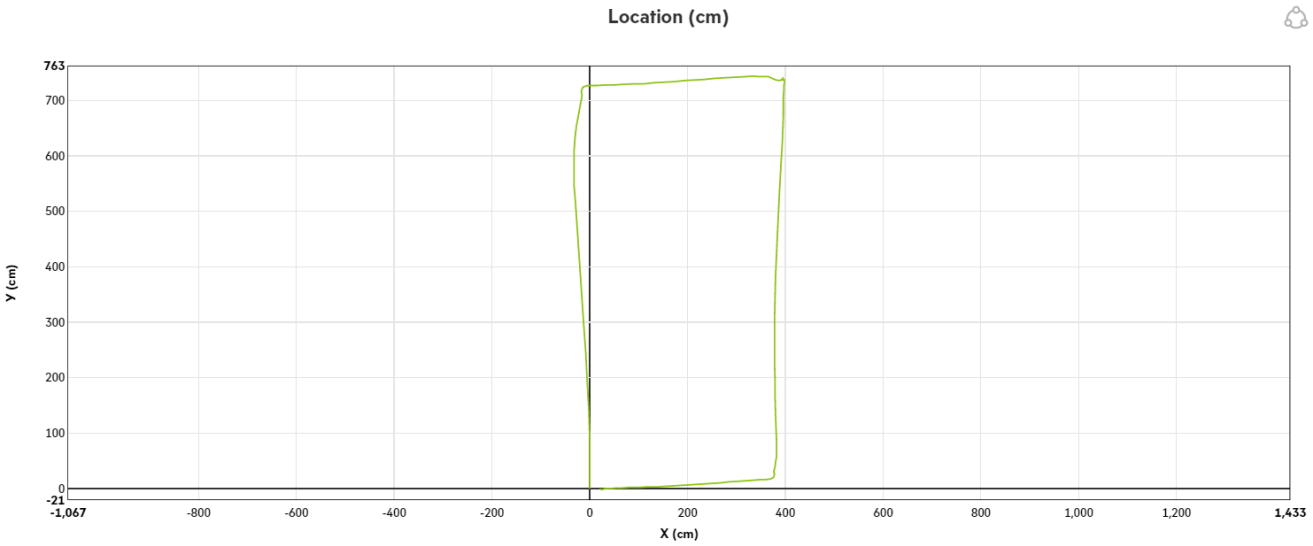
1. Start Program
2. Main LED turns green (RGB 0, 180, 0)
3. Robot says “Ready set go”
4. Robot moves 0 degrees for 22’ and stops
5. Robot moves 90 degrees for 11’8” and stops
6. Robot moves 180 degrees for 21’6” and stops
7. Robot moves 270 degrees for 11’10” and stops
8. Main LED turns red (RGB 255, 0, 0)
9. Robot says “I am done and I need water”
10. Stop Program

5.5 System Flow



5.6 Software

Sphero Edu mobile application was downloaded in order to program the robot through block code. Sphero Edu also allows users to see sensor data and write their own code in JavaScript. Windows 10 was used to document and record the test results.



5.7 Hardware

Code was developed on iPhone (iOS 10+) and tested on a Windows 10 Laptop.

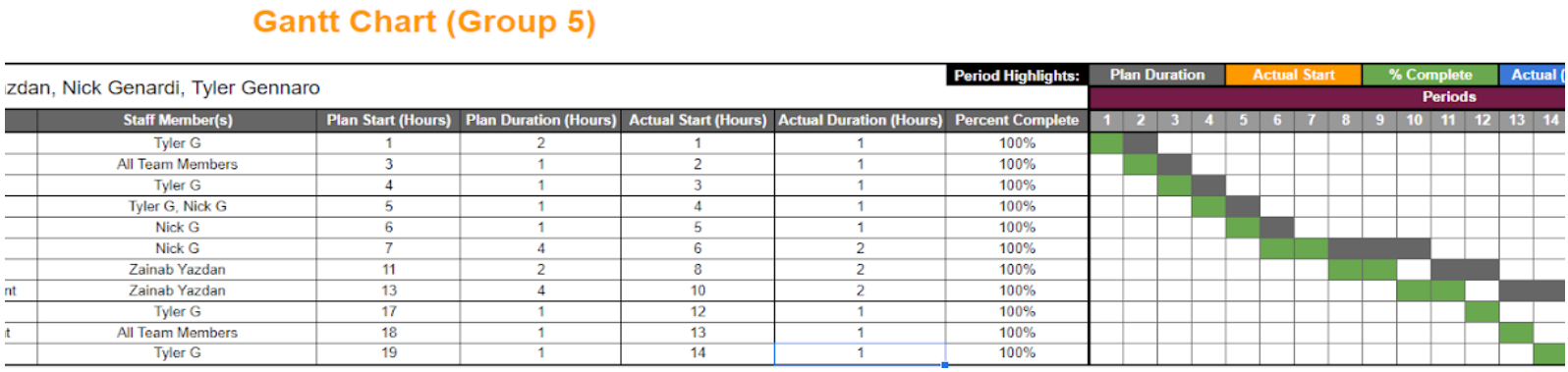
5.8 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Check if the robot's main LED turns green	11/11/20	LED turns green	Led turns green	Tyler	Pass
Check if Robot says "ready set go" before initiating first step	11/11/20	Robot says "ready set go"	Says "ready set go" before first step	Tyler	Pass
Check if the robot moves from A along the path and stops at point B	11/11/20	Moves along the path and stops at B	Moves along the path and stops midway	Tyler	Fail
Check if robot moves from A along the path and stops at B	11/11/20	Moves along the path and stops at B	Goes past point B	Tyler	Fail
Check if robot moves from point A and stops at B	11/11/20	Moves along the path and stops at B	Moves along the path and stops at B	Tyler	Pass
Did robot turn and proceed to next stop	11/11/20	Robot turns and proceeds to next stop	Robot turns and proceeds to next stop	Tyler	Pass
Check if robot proceeds from point C and stops at D	11/11/20	Proceeds and stops at D	Proceeds and stops past D	Tyler	Fail

Check if robot proceeds from C and stops at D	11/11/20	Proceeds and stops at D	Proceeds and stops at D	Tyler	Pass
Did the robot return to its original starting point?	11/11/20	Robot returns to starting point	Robot returns to starting point	Tyler	Pass
Check whether the robot says “I am done and I need water” after completion	11/11/20	Says “I am done and I need water” after completion	Says “I am done and I need water” after completion	Tyler	Pass

5.9 Task List/Gantt Chart

Sprint 1 - Gantt Chart



5.10 Staffing Plan

Name	Role	Responsibility	Reports To
Tyler Gennaro	Project Lead	Coordinate group and activities	Instructor
Nick Genardi	Developer	Develop flowchart and code	Tyler Gennaro
Zainab Yazdan	Documenter	Document observations for use in this document	Tyler Gennaro