Sprint 1 - Endurance Design Document

March 28, 2022

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1. Executive Summary

1.1 Project Overview

For this project, our robot, Sphero SPRK+, will move in a rectangular pathway, guided by blue tape in our classroom.

1.2 Purpose and Scope of this Specification

The purpose of this specification is to run the robot in a rectangular course that can be used by students.

In scope

This document addresses requirements related to the first sprint of a series of sprints.

Out of Scope

The following items in sprint 1 are out of scope:

- User modifications.
- Clients requesting more work done without paying extra.

2. Product/Service Description

The general factors that affect the product and its requirements are the pathway in the classroom and the placement of the robot. It will have to move in a straight path and turn right on every corner.

2.1 Product Context

This product is one of many products manufactured to be used by the Sphero robot. It can be used interchangeably with many products depending on the customer's needs. This particular product is part of a series of systems that will be used on the Sphero robot.

2.2 User Characteristics

- University students with minimal technical expertise.
- School tech teachers.
- Anyone with a simple understanding of robots.

2.3 Assumptions

This product requires software to be installed in our devices with a functional bluetooth connection. If the software is not available, the user will not be able to use the product.

2.4 Constraints

- The code design is constrained by the use of the Shero app's blockcode's pre-existing format.
- The product's functionality is constrained to the classroom it was tested in, with the exact measurements of the tape that lines the floor.

2.5 Dependencies

This product will require an environment that is similar to the one provided at the time of programming. This product will require an obstacle free surface to operate appropriately.

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	Robot should start with a green light and speak “Ready, set, go”	confirmed	Yes	03/14/2022	All
ENDUR_02	Robot should stop at a red light and speak, “I’m done and I need water.”	confirmed	Yes	03/14/2022	All
ENDUR_03	Robot must travel to each of the blue tape corners and turn right at each one.	confirmed	Yes	03/28/2022	All
ENDUR_04	Robot must return to its starting location.	confirmed	Yes	03/25/2022	All
ENDUR_05	Robot should not collide with any objects as it goes around the room.	confirmed	Yes	03/25/2022	All

3.2 Security

3.2.1 Protection

- The system is protected with a user login and password requirement.
- This system is also protected with a history log of all activity performed on it from logging in to logging out.
- The system requires verification from a human, therefore protecting it from malicious robots.

3.2.2 Authorization and Authentication

- Human authentication is required by CAPTCHA upon setting up the user profile.
- User authentication is also required through the mechanism PubCookie.

3.3 Portability

This product is very portable, the only thing you need is the Shpero robot, a device that has the Sphero app and a bluetooth feature, the blockcode on the sphero app, and the robot charging port.

4. Requirements Confirmation/Stakeholder sign-off

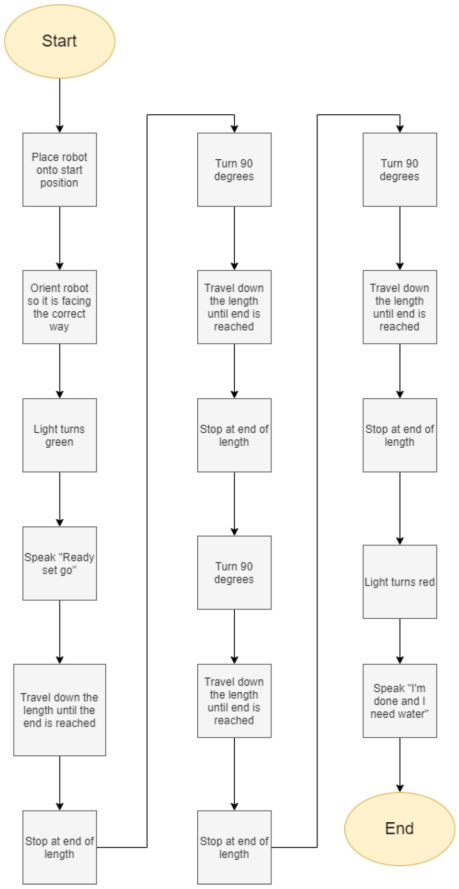
Meeting Date	Attendees	Comments
03/14/2022	Maheen (Project Planner and Coordinator) Gina (Project Manager)	confirmed ENDUR_01 and ENDUR_02.
03/25/2022	Maheen (Project Planner and Coordinator) Gina (Project Manager)	confirmed all except ENDUR_03.
03/28/2022	Maheen (Project Planner and Coordinator) Gina (Project Manager)	confirmed all.

5. System Design

5.1 Algorithm

The robot is placed in the start position facing forward. When the light turns green, the robot speaks and says, “ready set go.” The robot then travels down the length and stops at the end. He turns 90 degrees, travels down the length, and stops at the end once again. For a third time, the robot travels down the length and stops at the end of the length. The light turns red and the robot speaks and says, “I’m done and I need water.”

5.2 System Flow



5.3 Software

The software used to develop and deploy this system was the Sphero app which uses block codes and executes the program.

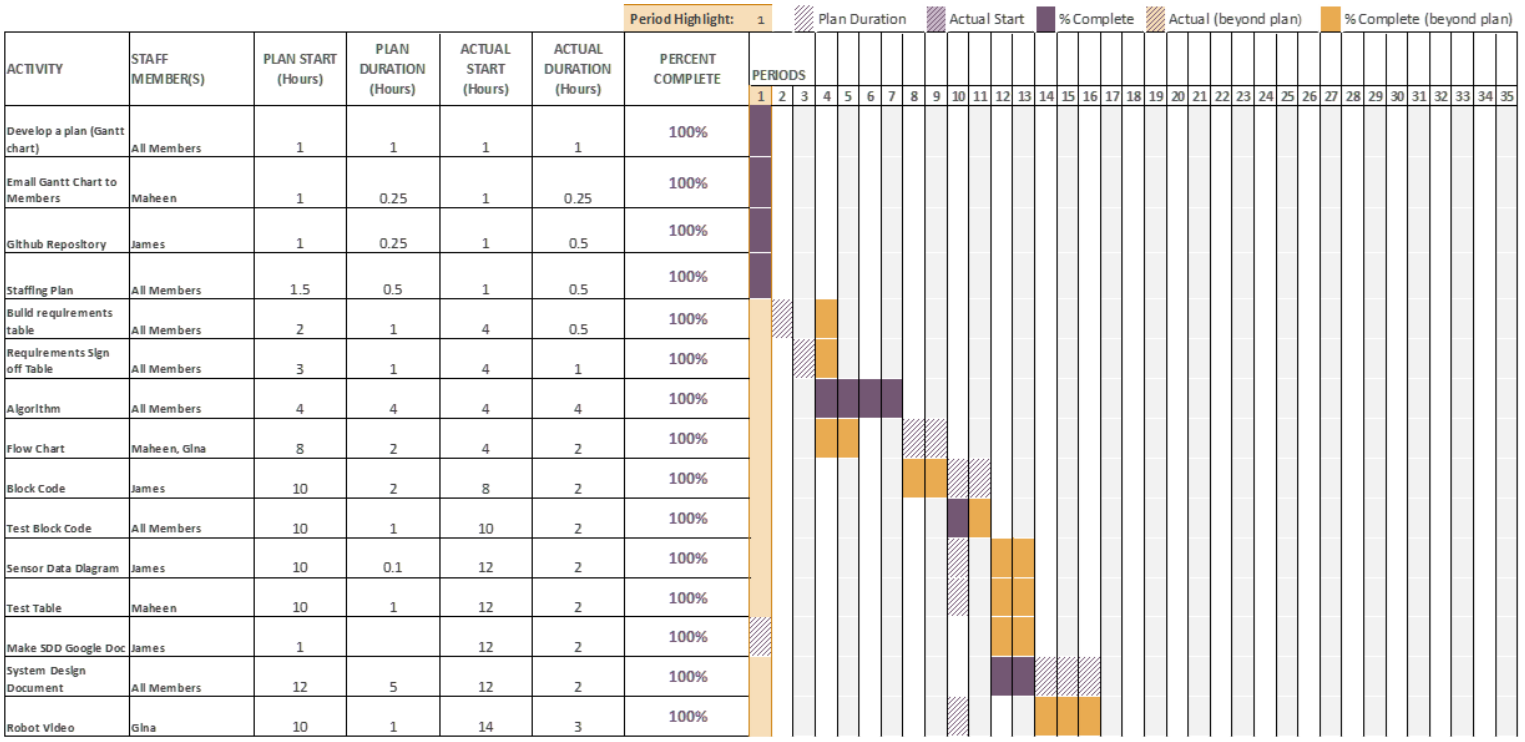
5.4 Hardware

The hardware platforms used to develop, test and demonstrate this application was the SPRK+ robot, an HP laptop, an ASUS laptop, A Xiaomi smartphone and a Motorola smartphone.

5.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Trial	03/16/2022	The robot will move in a small rectangle before the actual taped pathway.	The robot met the expectations and moved in the rectangular path.	Maheen Hanif-Ghafar Gina Elbanna	Pass
Trial	03/16/2022	The robot will speak “Ready set go” before moving.	The robot met the expectations and spoke the required words.	Maheen Hanif-Ghafar Gina Elbanna	Pass
Trial	03/16/2022	The robot will speak “I’m tired and I need water”	The robot failed to speak and the code stopped working.	Maheen Hanif-Ghafar Gina Elbanna	Fail
Trial	03/16/2022	The robot will speak “I’m tired and I need water”	Robot completed all requirements.	Maheen Hanif-Ghafar Gina Elbanna	Pass
Trial	03/25/2022	Robot will move in a rectangular path provided in the classroom.	The robot was unable to move at the correct measurements.	Maheen Hanif-Ghafar Gina Elbanna	Fail
Trial	03/25/2022	Robot will move in a rectangular path provided in the classroom.	The robot did not move in a straight line from the starting point.	Maheen Hanif-Ghafar Gina Elbanna	Fail
Trial	03/25/2022	Robot will move in a rectangular path provided in the classroom.	The robot was close to the blue taped pathway and almost met the required result.	Maheen Hanif-Ghafar Gina Elbanna	Fail
Trial	03/28/2022	Robot will move in a rectangular path provided in the classroom.	Robot completed all requirements.	Maheen Hanif-Ghafar Gina Elbanna	Pass

5.6 Task List/Gantt Chart



Period Highlight: 1 — Plan Duration — Actual Start — % Complete — Actual (beyond plan) — % Complete (beyond plan)

ACTIVITY	STAFF MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATION (Hours)	PERCENT COMPLETE
Develop a plan (Gantt chart)	All Members	1	1	1	1	100%
Email Gantt Chart to Members	Maheen	1	0.25	1	0.25	100%
Github Repository	James	1	0.25	1	0.5	100%
Staffing Plan	All Members	1.5	0.5	1	0.5	100%
Build requirements table	All Members	2	1	4	0.5	100%
Requirements Sign off Table	All Members	3	1	4	1	100%
Algorithm	All Members	4	4	4	4	100%
Flow Chart	Maheen, Gina	8	2	4	2	100%
Block Code	James	10	2	8	2	100%
Test Block Code	All Members	10	1	10	2	100%
Sensor Data Diagram	James	10	0.1	12	2	100%
Test Table	Maheen	10	1	12	2	100%
Make SDD Google Doc	James	1		12	2	100%
System Design Document	All Members	12	5	12	2	100%
Robot Video	Gina	10	1	14	3	100%

PERIODS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Gina Elbanna	Project Manager	Carrying out project tasks and motivating members to do work.	All members
Maheen Hanif Ghaffar	Project Planner and Coordinator	Actively making sure things are going according to plan and setting up meetings with the members.	All members
James Voss	Programmer	Designing code, algorithm and flowchart for functionality and testing.	All members