

Endurance Design Document

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Table of Contents

1. EXECUTIVE SUMMARY.....	3
1.1 PROJECT OVERVIEW.....	3
1.2 PURPOSE AND SCOPE OF THIS SPECIFICATION.....	3
2. PRODUCT/SERVICE DESCRIPTION.....	3
2.1 PRODUCT CONTEXT	3
2.2 USER CHARACTERISTICS	3
2.3 ASSUMPTIONS	3
2.4 CONSTRAINTS	3
2.5 DEPENDENCIES.....	4
3. REQUIREMENTS	4
3.1 FUNCTIONAL REQUIREMENTS	5
3.2 SECURITY	5
3.2.1 Protection	5
3.2.2 Authorization and Authentication.....	6
3.3 PORTABILITY.....	6
4. REQUIREMENTS CONFIRMATION/STAKEHOLDER SIGN-OFF	6
5. SYSTEM DESIGN	6
5.1 ALGORITHM	6
5.2 SYSTEM FLOW	6
5.3 SOFTWARE.....	6
5.4 HARDWARE.....	6
5.5 TEST PLAN	7
5.6 TASK LIST/GANTT CHART.....	7
5.7 STAFFING PLAN.....	7

1. Executive Summary

1.1 Project Overview

A robot must successfully travel around the periphery of HH208, while speaking and displaying colors as it moves along. This project will be presented to the class of CS-104-03, Professor Eckert, and potentially any other staff or student in the Computer Science/Software Engineering department.

1.2 Purpose and Scope of this Specification

The purpose of this project is to see if the robot can endure going around a set perimeter without going out of the given parameters. The purpose of this specification is to test the ability of the robot to follow directions when given by the developer. The intended audiences is all students and staff in the Computer Science/ Software Engineering department who have a well-rounded knowledge of the project and the concepts surrounding the project.

2. Product/Service Description

Sphero edu is a company that is based around teaching and educating students about math, science, arts, social studies, and coding. Specifically, we are using a robot that was created by Sphero called "BOLT" to be used to help teach students (and those interested) how to code.

Sphero's BOLT has an electric sensor that can be used to detect light. It also has a compass in it that can be used to direct the robot north. The robot has Bluetooth and can be connected to one device at a time. There is an app that can be downloaded on types of devices to command the robot using javascript/block code.

Factors that could potentially affect the product's performance is its software, the personal ability of the sphere robot and the knowledge and precision of the user. Since the robot is spherical, it is not precise in its movements. Depending on the user's precision and placement, the route of the robot can be perfect or very off. The software of the robot has not been made to accommodate this issue, but otherwise, it is very user-friendly.

2.1 Product Context

This product relates to other products by the self-operating function. Other products such as a Roomba are programmed to go around the whole house and vacuum. It is self-contained. Yes, it does interface with a variety of related systems. The robot relies on the Sphero app and coding to be able to function in the way the user desires it to function.

2.2 User Characteristics

USER	EXPERIENCE LEVEL	TECHNICAL EXPERIENCE	REASON FOR USING BOLT
Student	Beginner	None	Competition / to learn how to code / class project
Student	Intermediate	Some	Competition / to hone coding skills /class project
Student	Advanced	A lot	Competition / for fun / class project
Faculty	Beginner	None	Because Prof Eckert asked them
Faculty	Intermediate	Some	Because Prof Eckert asked them
Faculty	Advanced	A lot	Because Prof Eckert asked them
Random	Beginner	None	For fun / to help teach
Random	Intermediate	Some	For fun / to help teach
Random	Advanced	A lot	For fun / to help teach

1.4 2.3 Assumptions

The robot will be connected to Bluetooth to operate/run
The robot runs on block/JavaScript code
The robot will be able to complete the course provided for by Prof Eckert

1.5 2.4 Constraints

- There may be an updated and better operating system.
- Security may be weak b/c others could have access to the code that's programmed in the robot
- Robot's framework is a sphere so you can't accurately point it in the direction you want it to go to.

1.6 2.5 Dependencies

The robot requires coding in order for it to operate.
It requires testing so it can operate correctly and efficiently.

2. 3. Requirements

1. The robot must be programmed to meet task requirements.
2. The robot must successfully travel around the room without interruption.
3. The robot must run the figure 8 course
4. The robot must run and complete the obstacle course

2.1 3.1 Functional Requirements

In the example below, the requirement numbering has a scheme - BR_LR_0## (BR for Business Requirement, LR for Labor Relations). For small projects simply BR-## would suffice. Keep in mind that if no prefix is used, the traceability matrix may be difficult to create (e.g., no differentiation between '02' as a business requirement vs. a test case)

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ENDUR_01	The robot should start and finish in the same place as indicated by the course	Have to find a way to code the robot so it can go around the whole course	1	10/18/19	10/25/19
ENDUR_02	The robot should continue around the course without straying from the path	we have to find a way to aim the robot perfectly so the robot doesn't stray from the path	2	10/18/19	10/25/19

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ENDUR_03	The robot should not collide with any objects as it goes along the room	Measure the dimensions from the wall to the path and calculate that into our code	3	10/18/19	10/25/19
ENDUR_04	The robot should start green	In the program have to code the robot to light up	4	10/18/19	10/25/19
ENDUR_05	The robot should speak "Ready, Set, Go!" when it starts.	In the program have to code so the robot will speak promptly	- 5	10/18/19	10/25/19
ENDUR_06	The robot should end Red	Program the robot to end with red as it begins to slow down at the last point	-6	10/18/19	10/29/19
ENDUR_07	The robot should speak "I'm Done! I Need Water" when it ends	At the end when the robot stops have it speak so we have to program the robot to do that	-7	10/18/19	10/29/19

2.2 3.2 Security

2.2.1 3.2.1 Protection

"We responsibly source critical components from trusted vendors & suppliers. We also audit our factories for ethical worker treatment. The hardware that we create is loaded with firmware that is developed to ensure proper functionality and security of the system. Each robot we create is built with a batch serial number to identify any issues that may arise, and to facilitate logistics."

2.2.2 3.2.2 Authorization and Authentication

Sphero edu promises authenticity with all its products. An internal security review and audits are done routinely on their products. There is an automated security monitoring that Sphero provides on all it's products to check on the code and o fix any issues that may arise. Verified data Encryption. Sphero follows the guidelines drawn up by the Children's Online Privacy Protection Act (COPPA) to ensure the safety and privacy of child users.

To find out more about the product's security, click on the hyperlink below:

<https://s3.amazonaws.com/static.gosphero.com/downloads/infographic/Sphero-Safety-Infographic.pdf>

2.3 3.3 Portability

If portability is a requirement, specify attributes of the system that relate to the ease of porting the system to other host machines and/or operating systems. For example,

- Percentage of components with host-dependent code;
- Percentage of code that is host dependent;
- Use of a proven portable language;
- Use of a particular compiler or language subset;
- Use of a particular operating system;
- The need for environment-independence - the product must operate the same regardless of operating systems, networks, development or production environments.

3. 4. Requirements Confirmation/Stakeholder sign-off

Include documentation of the approval or confirmation of the requirements here. For example:

Meeting Date	Attendees (name and role)	Comments
10/23/19	Bryan Le (Assistant Manager) Kiki Kanik (Management) Veronica Marquez (Project Manager)	We each went over our tasks and approved the code
10/29/19	Bryan Le (Assistant Manager) Kiki Kanik (Management) Veronica Marquez (Project Manager)	We went over the last finishing touches of all areas of the project which include code, document, flow chart, gnatt chart

4. 5. System Design

This section will provide all details concerning the technical design, staffing, coding, and testing the system

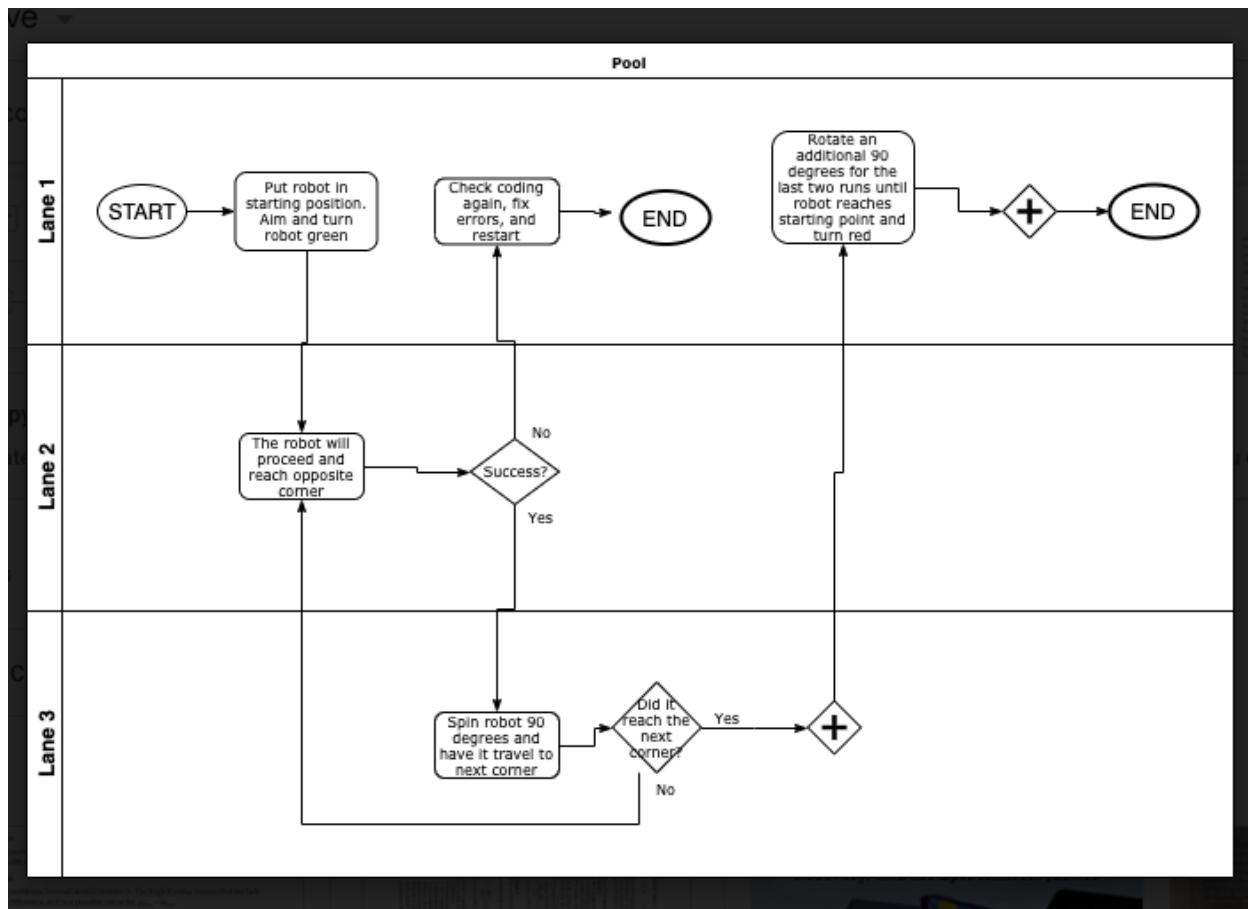
4.1 5.1 *Algorithm*

Develop and describe here the algorithm that will be used to provide the required performance of your software

1. Using the Sphero app, connect the robot
2. Put the robot at its starting position
3. Aim the robot in the direction desired/correct
4. Turn the robot green
5. Have the robot speak "Ready, Set, Go!"
6. Roll the robot for 4.33 seconds towards the opposite corner from where it started.
7. Stop
8. Wait 3 seconds
9. Spin the robot 90 degrees
10. Roll the robot for 3.33 seconds towards the next corner
11. Stop
12. Wait 3 second
13. Spin the robot 180 degrees
14. Roll the robot for 4.33 seconds towards the next corner
15. Stop
16. Wait 3 seconds
17. Spin the robot 270 degrees
18. Roll the robot for 3.33 seconds towards the starting point
19. Stop
20. Turn the robot red
21. Have the robot speak "I'm done, and I need Water!"

4.2 5.2 *System Flow*

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4.3 5.3 Software

The software that will be used to develop this project is block coding, including javascript behind the block coding itself.

4.4 5.4 Hardware

The hardware that is going to be used is to ensure the project will run is a sphero edu

4.5 5.5 Test Plan

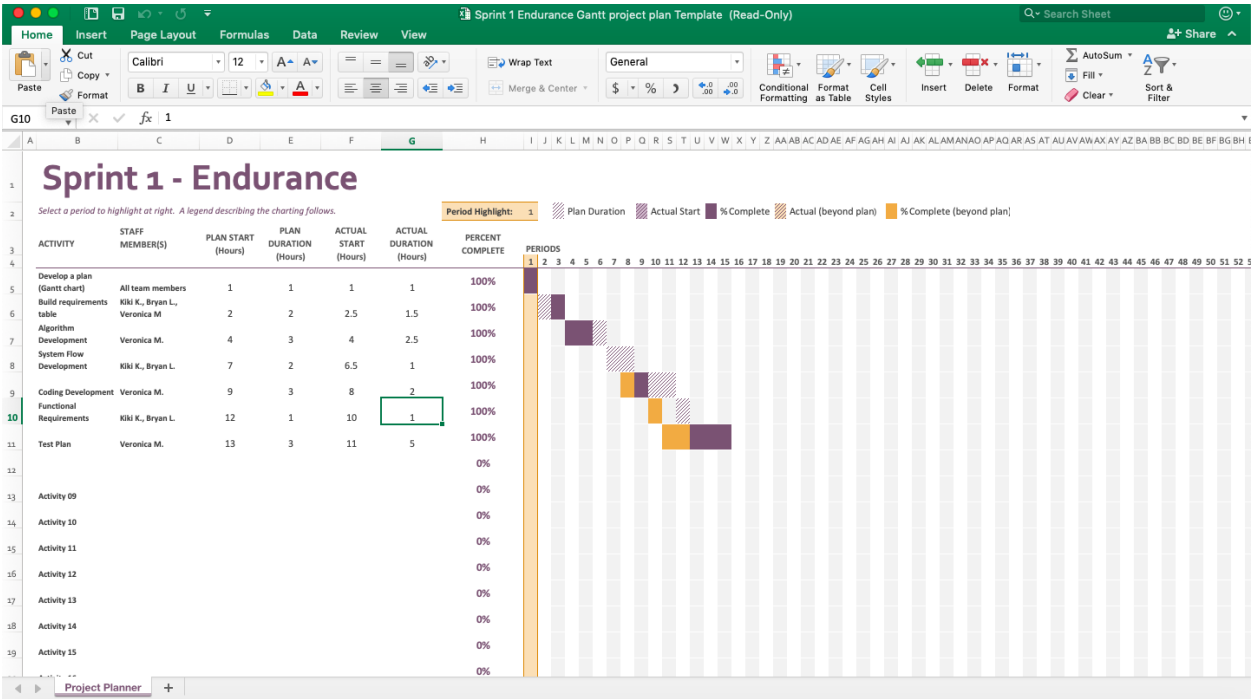
Include a test plan showing all unit tests performed for this application, Include test rational, test date, staff member, pass/fail status

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
Aim the robot	10/18/19	The blue light will be aimed towards the direction needed	Blue light was aimed properly towards wanted direction	Veronica Marquez	Pass
Run robot	10/18/19	Robot will go from start position heading towards the next corner	Robot went in the opposite direction, away from the starting point	Veronica Marquez	Fail

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Re-aim robot	10/18/19	Blue light will be aimed again towards the direction wanted	Blue light was aimed as wanted	Veronica Marquez	Pass
Re-run robot	10/18/19	Robot will go from start position heading towards the next corner	Robot went towards the next corner, blue light was aimed correctly	Veronica Marquez	Pass
Robot stays on path	10/18/19	To ensure robot goes from starting point to the next point, staying on path	Robot went out of the path	Veronica Marquez	Fail
Re- run robot to stay on path	10/25/19	To ensure robot goes from starting point to the next point, staying on path	Robot went out of the path once again	Veronica Marquez	Fail
Re-aim robot	10/25/19	Blue light will be aimed once again to ensure it is properly straight so robot doesn't go off path	Blue light was aimed as straight as I thought it was	Veronica Marquez	Pass
Re-run robot to see if it stays on path	10/25/19	To ensure robot will stay on path from starting point to the next point	Robot stayed on path	Veronica Marquez	Pass
Ran the robot from start to finish	10/25/19	To ensure robot can endure going around the path without going out of the parameters given	Robot after 3rd point began to go off the path, but made it to the finish and stayed in the yellow.	Veronica Marquez	Fail
Re-run the robot from start to finish	10/25/19	To ensure robot will stay on path the whole time	Robot stayed on path for the whole run except for the end point it missed the yellow completely	Veronica Marquez	Fail
Re-aimed the robot	10/25/19	To ensure the blue light is as straight towards the direction wanted	Blue light was aimed as straight as I thought was necessary	Veronica Marquez	Pass
Re-run the robot from the start to finish	10/29/10	To ensure robot can endure going around the path without going out of the parameters given	The robot went around the path successfully and stayed in the yellow at the end	Veronica Marquez	Pass

4.6 5.6 Task List/Gantt Chart



4.7

4.8 5.7 Staffing Plan

Insert a chart/table that depicts the roles and responsibilities of each team member that worked on this project

Name	Role	Responsibility	Reports To
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Veronica Marquez	Project Manager, Coder, Tester	Responsible for all project deliverables, update the project plan. Write the code that will allow the robot to achieve the requirements. Test the written code to ensure no errors are presented with the robot and the code itself.	Prof. Eckert, Team
Kiki Kanik	Management	Paperwork, Co-Tester	Prof. Eckert, Team
Bryan Le	Assistant Manager	Complete Documents	Prof. Eckert Team

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