# **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 senor 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 de download 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 |

## **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

## **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.

## **2.5** **Dependencies**

The robot requires coding in order for it to operate.

It requires testing so it can operate correctly and efficiently.

# **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

## **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 |
| 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 |

## **3.2** **Security**

### **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.”

### **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>

## **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.

# **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 |

# **5. System Design**

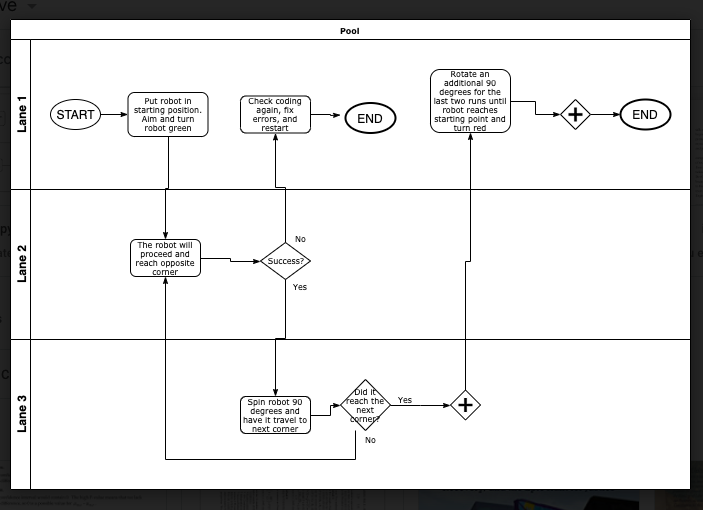
This section will provide all details concerning the technical design, staffing, coding, and testing the system

## **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!”

## **5.2** **System Flow**



## **5.3** **Software**

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

## **5.4** **Hardware**

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

## **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 |
| 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 |

## **5.6** **Task List/Gantt Chart**

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## **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** |
| **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 |