***[Robotics Project] Design Document***

**[Robotics Project] Design Document**

December 2 2019

Use this Requirements Specification template to document the requirements for your product or service, including priority and approval (Must do).

This document will also serve as a System Design Document (How to) and will include sections detailing system flow, algorithms, staffing plan, software/hardware, and Test Plan

This document contains instructions and examples which are for the benefit of the person writing the document and should be removed before the document is finalized.

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**1.  Executive Summary**

***1.1  Project Overview***

In this project we will code a Sphero+ robot to three different tasks. The first task being and Endurance test where the robot will drive around the edges of Howard Hall 208 five feet away from the wall. The second task is the Speed test where the robot will drive in a figure eight starting and ending in the same location. The final being an obstacle course where the robot will do certain tasks and end on an X on the ground. Its intended audience is for our teacher Professor Eckert and the rest of our Intro to problem solving class.

***1.2  Purpose and Scope of this Specification***

This specification is for our Professor, Professor Eckert and for the rest of our computer science class. In this part of the project we programmed our robot to go through an obstacle course, jump and land on a spot on the ground, and knock down markers like bowling pins.

**2.  Product/Service Description**

There are a few different factors that apply to the robot. First the robot moves differently depending on how charged it is. Second the robot moves differently depending if the plastic cover is on or not. Third the robot is heavily affected by the floor it is on and may move differently each time because of it.

***2.1  Product Context***

This product is a pretty good product compared to other projects. It is fairly easy to use and can be used with different devices such as a computer, and phone. It is set up so that you can drag and drop you code and download other people's codes if you need help.

***2.2  User Characteristics***

Student/Faculty/Staff- can use this to see how we made our robot go around the room.

***2.3  Assumptions***

We assume that we have a device that can run the Sphero program. We also assume that we have access to room 208 to test the robot. We also assume that we have a Sphero robot and some knowledge of coding.

***2.4  Constraints***

There are not many constraints besides if you do not have enough space to hold the code or if your robot is not charged.

***2.5  Dependencies***

Some dependencies are that the robot needs 3 hours to charge, it needs to update every so often, and you need the specific software for it to work

**3.  Requirements**

* The robot must start on the X marked on the ground
* The robot must go through the obstacle course without hitting any bottles
* The robot must jump over the binder on the ground
* The robot must stop on the mark on the ground after the jump
* The robot must knock over the markers like bowling pins

**Priority Definitions**

* Priority 1 –The robot must go through the obstacle course
* Priority 1 – The robot must jump over the binder
* Priority 1– The robot must knock over the markers like bowling pins
* Priority 2- The robot must not hit any obstacles in the obstacle course
* Priority 2 - The robot must start on the mark on the ground
* Priority 3- The robot must knock down all markers

***3.1  Functional Requirements***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Req#** | **Requirement** | **Comments** | **Priority** | **Date Rvwd** | **SME Reviewed / Approved** |
| Agility\_1 | The robot must start on the mark on the ground | The marked was placed by our professor and is the start of the course | 2 | 11/25/19 | Joseph DeRosa,  Mujeeb Ali, Elijah Barnes |
| Agility\_2 | The robot must go through the obstacle course | The obstacle course was laid out by the professor. | 1 | 11/25/19 | Joseph DeRosa,  Mujeeb Ali, Elijah Barnes |
| Agility\_3 | The robot must jump over the binder. | The binder was placed on the ground as part of the course by our professor. | 1 | 11/25/19 | Joseph DeRosa,  Mujeeb Ali, Elijah Barnesr |
| Agiliy\_4 | The robot must knock over the markers like bowling pins | He pins were placed by as part of the course by our professor. | 1 | 11/25/19 | Joseph DeRosa,  Mujeeb Ali, Elijah Barnes |
| Agility\_5 | The robot must not hit any obstacles in the obstacle course. | The bottles were placed by our professor on the course | 3 | 11/25/19 | Joseph DeRosa,  Mujeeb Ali, Elijah Barnes |

***3.2  Security***

**3.2.1  Protection**

As protection the Sphero edu program keeps you code for you under your account. If someone takes the code it will be very easy to see if someone copied someone else because you can just look up code. Each account has its own username and password so no one can steal your information unless they have them.

**3.2.2  Authorization and Authentication**

Username and password used to get access to the sphero account with the code.

***3.3  Portability***

The code is very easily portable, it is able to be transferred from your phone to computer very easily. This makes it very easy to use.

**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** |
| 11/20/19 | Joseph DeRosa, Group Member  Mujeeb , Group Member  Elijah Barnes , Group Member | Stared to test our code and started on the design document. |
| 11/25/19 | Joseph DeRosa, Group Member  Mujeeb , Group Member  Elijah Barnes , Group Member | Finished the code and the design document. |
| 12/2/19 | Joseph DeRosa, Group Member  Mujeb Ali,Group Member  Elijah Barnes, Group Member | Finished everything else and made sure everything was good. |

**5.  System Design**

***5.1  Algorithm***

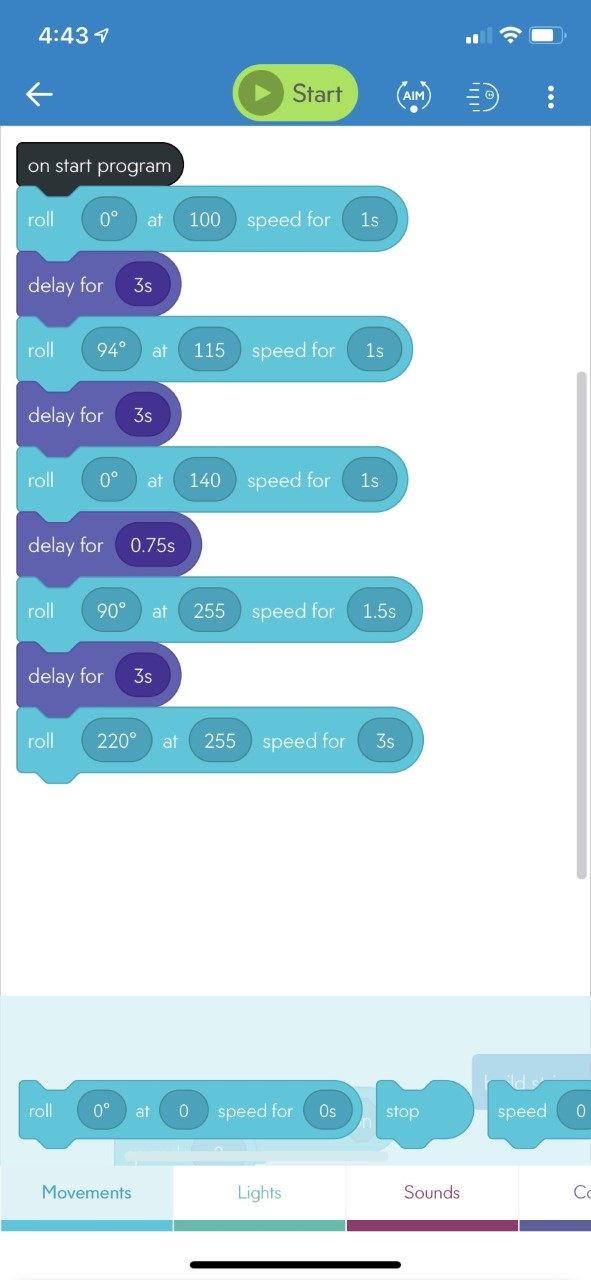
1. Place the robot on the mark on the ground
2. Start the code
3. The Robot starts at 0 degrees and rolls forward
4. The Robot stops
5. The Robot turn to 94 degrees and rolls forward
6. The robot stops
7. The Robot turns to 0 degrees and rolls forward
8. The Robot stops
9. The Robot turns to 90 degrees and rolls forward
10. The robot stops
11. The Robot turns to 220 degrees and rolls forward

***5.2  System Flow***

On another Document

***5.3  Software***

In order to code the robot we used the Sphero Edu program which was a drag and drop block code. This made it very easy to code the robot because all you needed to do was drag and drop blocks.



***5.4  Hardware***

We used our computers and Phones to run the app that allowed the robot to run the code.

***5.5  Test Plan***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reason for Test Case** | **Test Date** | **Expected Output** | **Observed Output** | **Staff Name** | **Pass/Fail** |
| Test to make sure the robot does not hit the first bottle | 11/22/19 | Robot will not hit the first bottle | Robot hit the first bottle | Joseph, Elijah, Mujeeb | Fail |
| Retry to see if robot will hit the first bottle | 11/22/19 | Robot will not hit the first bottle | Robot did not hit the first bottle | Joseph, Elijah, Mujeeb | Pass |
| Test to see if the robot will not hit the second bottle | 11/22/19 | The robot will not hit the second bottle | The robot did not hit the second bottle | Joseph, Elijah, Mujeeb | Pass |
| Test to see if the robot will hit the third bottle | 11/22/19 | The robot will not hit the third bottle | The robot completed the second circle of the figure 8 test | Joseph, Elijah, Mujeeb | Pass |
| Testo to see if the robot will jump over the binder and land on mark on the ground | 11/22/19 | The robot will jump over binder and land on mark on the ground | The robot jumped over the binder but missed the mark on the ground | Joseph, Elijah, Mujeeb | Fail |
| Retry to see if the robot will jump over the binder and land on the mark on the ground | 11/22/19 | The robot will jump over the binder and land on the mark on the ground | The robot jumped over the binder and landed on the mark on the ground | Joseph, Elijah, Mujeeb | Pass |
| Test to see if the robot will hit the markers like bowling pins | 11/22/19 | The robot will hit the markers like bowling pins | The robot hit the markers like bowling pins | Joseph, Elijah,  Mujeeb | Pass |

***5.6  Task List/Gantt Chart***

On another Document

***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** |
| Joseph DeRosa | Group Manager | Code, some questions | Mujeeb, Elijah |
| Mujeeb | Group Member | Gantt Chart, some questions | Joseph, Elijah |
| Elijah Barnes | Group Member | Flow Chart, some questions | Joseph, Mujeeb |