Sprint 3 - Agility Design Document

December 2nd, 2020

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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# Executive Summary

## Project Overview

This product is going to attempt to knock down as many pins as possible on the course while dodging obstacles along the way.

## Purpose and Scope of this Specification

The purpose of this toy is to knock down pins on a course. Before it reaches the pins, it is tasked with dodging different obstacles in its path and completing a jump on a ramp while staying on the intended course.

In scope

The following items in phase 3 of Project A are in scope:

* The robot would be used for commercial use.
* It must be used for knocking pins down.
* Intended for entertainment purposes.

Out of Scope

The following items in phase 3 of Project A are out of scope:

* This robot is not intended to be used as a lethal weapon.
* This is not to designed to jump over high obstacles.
* Robots are not intended to knock down anything other than the pins.

# Product/Service Description

This product is designed to make accurate turns as to avoid various obstacles. It is also designed to pick up speed quickly to be able to make its way up to an inclined plane. After making its way up the incline and impacting with the ground, it should be able to maintain whatever course it is following. It should also be able to pick up speed after impacting with the ground as to be able to hit the pins with force. The product can assist engineers, drivers, and potentially even athletes with understanding how be able to make accurate turns and being able to maintain accuracy while recovering from an impact.

## Product Context

This product is to try and avoid obstacles, jump over a ramp and finally knock down pins. This will be used as a toy for children, for entertainment purposes. The sole purpose of this machine is so children can watch the robot go through obstacles, jump over the ramp and knock down pins.

## User Characteristics

Profiles should include:

* Children over the age of 7.
* Adults.
* Teachers
* Arcade employee’s

## Assumptions

* There must be a clear path on the ground, so nothing blocks the robot on its path.
* The path must be flat so the robot can get accurate reading, until it reaches the ramp.
* People of all ages that use this toy should read the instructions and have a general understanding of the toy.
* There is a large enough space for the robot to roam, leaving a large amount of room so the pins can fully fall.

## Constraints

Describe any items that will constrain the design options, including

* The code will not change until it is done manually.
* Once the code is written the robot will complete the code unless the measurements are changed.
* The program is only in block code.
* The robot must compare it to a blueprint electronically.

## Dependencies

List dependencies that affect the requirements. Examples:

* The product will need to be charged daily.
* The robot must have an excellent GPS signal for accurate measurements.
* The ground must be smooth, flat, and not obstructed.

# Requirements

Priority Definitions

The following definitions are intended as a guideline to prioritize requirements.

* Priority 1 – The requirement is a “must have” as outlined by policy/law
* Priority 2 – The requirement is needed for improved processing, and the fulfillment of the requirement will create immediate benefits
* Priority 3 – The requirement is a “nice to have” which may include new functionality

It may be helpful to phrase the requirement in terms of its priority, e.g., "The value of the employee status sent to DIS **must be** either A or I" or "It **would be nice** if the application warned the user that the expiration date was 3 business days away". Another approach would be to group requirements by priority category.

## Functional Requirements

The following table is an example format for requirements.

| Req# | Requirement | Comments | Priority | Date Rvwd | SME Reviewed / Approved |
| --- | --- | --- | --- | --- | --- |
| ENDUR\_01 | The robot will dodge all obstacles in its path | The robot will be moving slow to ensure the accuracy of the turns | 1 | 11/30 | 11/30 |
| ENDUR\_02 | The robot will speed up once it approaches the ramp | The robot will stop where it started. | 2 | 11/30 | 11/30 |
| ENDUR\_03 | The robot will stop after it hits the ground. | The robot would have to make a stop after the impact with the ground or it would've kept rolling. | 1 | 11/30 | 11/30 |
| ENDUR\_04 | The robot would move (almost) full speed towards the pins. | The robot would be moving so fast to try to knock as many pins as possible over | 2 | 11/30 | 11/30 |

## Security

### Protection

* All users - robots will only work from the sphero.edu application
* It will have a pre-installed code that will only design obstacle-based courses.
* GPS tracking.
* There is a hard protection shell around the robot.
* The robot can only be accessed with the account associated with it.

### Authorization and Authentication

* You must sign into sperho.edu on the app.

## 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: 100%
* Percentage of code that is host dependent: 50%.
* Use of proven portable language: Block Code
* Use of a particular operating system: Robot/ Block code.
* The product will work the same for any environment, but the application will differ between each type of use.

# Requirements Confirmation/Stakeholder sign-off

|  |  |  |
| --- | --- | --- |
| Meeting Date | Attendees (name and role) | Comments |
| 11/30/2020 | Mia Lizzo, Vincent Negri, Ransom Miller, IV | Confirmed all. |

# System Design

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

## Algorithm

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

* Step 1: The robot will travel straight for 3.9 seconds.
* Step 2: The robot will stop.
* Step 3: The robot will make a 90° turn
* Step 4: The robot will travel straight for 4.1 seconds.
* Step 5: The robot will make a turn back to 0°.
* Step 6: The robot will travel straight for 4.7 seconds.
* Step 7: The robot will stop.
* Step 8: The robot will roll at 90°
* Step 9: The robot will move at 25 speed
* Step 10: The robot will travel straight for 4 seconds
* Step 11: The robot will roll at 90°
* Step 12: The robot will move at 230 speed
* Step 13: The robot will travel straight for 1.6 seconds
* Step 14: The robot will stop.
* Step 15: The robot will roll 90°
* Step 16: The robot will move at 25 speed
* Step 17: The robot will travel straight for 1.5 seconds
* Step 18: The robot will stop.
* Step 19: The robot will be delayed for 2 seconds.
* Step 20: The robot will roll 225°
* Step 21: The robot will move at 35 speed
* Step 22: The robot will travel straight for 2 seconds.
* Step 23: The robot will roll at 225°
* Step 24: The robot will move at 220 speed
* Step 25: The robot will travel straight for 4 seconds
* Step 26: Exit program.

## 

## System Flow

Develop a flowchart (and show here) that accurately depicts how your software application will act to fulfil the algorithm

Diagram

Description automatically generated

Diagram

Description automatically generated

## Software



## Hardware

* We used sphero.edu to develop, test and demonstrate this application.

## Test Plan

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

| **Reason for Test Case** | **Test Date** | **Expected Output** | **Observed Output** | **Staff Name** | **Pass/Fail** |
| --- | --- | --- | --- | --- | --- |
| Calibration Test | 11/18 | The robot will travel straight on the first line of the course | The robot did not follow the path correctly. | Ransom + Vinnie | Fail |
| Calibration Test | 11/18 | The robot will travel straight on the first line of the course | The robot successfully completed the first line of the course. | Ransom + Vinnie | Pass |
| Complete the first section of the course | 11/18 | The robot will avoid obstacles, completing the first part of the course. | The robot successfully completed the first section of the course. | Ransom + Vinnie | Pass |
| Complete the ramp section of the course | 11/18 | The robot will be able to go up and past the ramp | The robot was unable to get up the ramp | Ransom + Vinnie | Fail |
| Complete the ramp section of the course | 11/18 | The robot will be able to go up and past the ramp | The robot was unable to get up the ramp | Ransom + Vinnie | Fail |
| Complete the ramp section of the course | 11/18 | The robot will be able to go up and past the ramp | The robot was successfully able to go up the ramp | Ransom + Vinnie | Pass |
| Be able to stop at the corner after going over the ramp | 11/18 | The robot will be able to stop itself after going over the ramp at the corner of the course. | The robot was unable to stop itself at the corner | Ransom + Vinnie | Fail |
| Be able to stop at the corner after going over the ramp | 11/18 | The robot will be able to stop itself after going over the ramp at the corner of the course. | The robot was unable to stop at the corner | Ransom + Vinnie | Fail |
| Be able to stop at the corner after going over the ramp | 11/18 | The robot will be able to stop itself after going over the ramp at the corner of the course. | The robot was unable to stop at the corner | Ransom + Vinnie | Fail |
| Be able to stop at the corner after going over the ramp | 11/18 | The robot will be able to stop itself after going over the ramp at the corner of the course. | The robot was successfully able to stop itself at the corner after completing the ramp | Ransom + Vinnie | Pass |
| The robot will knock down all the pins | 11/18 | The robot will be able to complete the final section of the course and knock over all the pins | The robot was able to successfully complete the final section of the course and knock down 9/10 pins | Ransom + Vinnie | Pass |

## Task List/Gantt Chart

Chart

Description automatically generated

## Staffing Plan

| Name | Role | Responsibility | Report To |
| --- | --- | --- | --- |
| Mia Lizzo | Writer | To document the project and write the necessary definitions. Since she lives in Florida this is the only way possible. | Vincent Negri & Ransom Miller |
| Vincent Negri | Leader | To organize, plan and execute this project. Keep the necessary items on track to be completed. Stay on top of team members and himself. | Mia Lizzo & Ransom Miller |
| Ransom Miller, IV | Coder | To keep the robot and write the necessary code within the Sphero program. | Mia Lizzo & Vincent Negri |