Sprint 3: Agility Design Document

November 26, 2019

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# Executive Summary

## Project Overview

This project will allow us to test the endurance, speed, and agility of different Sphero robots in a class-wide competition. The intended audience for our project is our Professor and the other competitors.

## Purpose and Scope of this Specification

This document addresses requirements related to the endurance section of the triathlon.

In scope

* the program will only be able to be run inside of the classroom HH208

Out of Scope

* the program will not be used over the internet, only within the confines of HH208 and with the singular laptop that the program was written on

# Product/Service Description

*In this section, describe the general factors that affect the product and its requirements. This section should contain background information, not state specific requirements (provide the reasons why certain specific requirements are later specified).*

## Product Context

The product used in this project, the Sphero robot, is related to the other robots it is competing against in that they are all the same model and contain the same programing capacity. The robots we are working with are self-contained in that they are not interconnected and the code we create can only control one robot at a time. Our code is universal for every robot in the class, so the code can interface with a variety of related systems (in this case, with many different robots). For our purposes, however, our robot will remain self-contained and we will only be programing for our specific Sphero robot.

## User Characteristics

General Customer Profile:

* The users are students
* The users have had experience in manually driving the robot as well as programing specific tasks for the robot in the Sphero Edu app.
* The user’s expertise is experience in coding in Python as well as the Sphero program
* The users of this product are strictly the students in the specified group that are competing in the robot triathlon.

## Assumptions

Assumptions that may affect the requirements include: not being able to sign out a robot when needed, not having access to Howard Hall room 208 when needed, unawareness of the capabilities of our Sphero robot, time management, and equal effort from all group members.

## Constraints

* Parallel operation with other systems: The program created for our specific Sphero robot might not be compatible with newer models of Sphero robots.
* Access and management: Not having access to the designated obstacle course space in HH208, not having enough time with the robot, and not having access to the robot.
* System resource constraints: limited amount of disk space or capacity for programing in the Sphero app.
* Other: Not having sufficient knowledge on the capabilities of the robot.

## Dependencies

* Before attempting this project, our group must obtain sufficient knowledge of the capabilities of our robot.

# Requirements

## Functional Requirements

| Req# | Requirement | Comments | Priority | Date Rvwd | SME Reviewed / Approved |
| --- | --- | --- | --- | --- | --- |
| AGIL-01 | The system will begin in the stage 1 square and will encounter 3 objects that it must avoid. | Agility Process = “Avoid Objects” | 2 | 11/19/19 | Arielle Sinicin |
| AGIL-02 | After avoiding the objects, the system will stop in the stage 2 square. | Agility Process = “Correct Square” | 1 | 11/19/19 | Arielle Sinicin |
| AGIL -03 | The system will then proceed to the stage 2 square and jump over the ramp. | Agility Process = “Ramp Jump” | 1 | 11/19/19 | Arielle Sinicin |
| AGIL -04 | At this position, the group will re-aim the robot and the system will move towards a set of pins and knock over as many as possible. | Agility Process = “Robot Bowling” | 1 | 11/19/19 | Arielle Sinicin |
| AGIL -05 | After knocking over the pins, the system will finish in the same square that it started (stage 1 square). | Agility Process = “Correct Square” | 2 | 11/19/19 | Arielle Sinicin |

## Security

### Protection

* In order to access the code, one must sign into their individual Sphero account.
* In order to add, delete, or edit information within the project, the group member must be named a “collaborator” in the GitHub repository for the project.

### Authorization and Authentication

In order to access the code and the project documents, one must be named a “collaborator” for the GitHub repository containing this information. In addition, the specific code for the programing of the robot is located in a desktop app for Sphero under the log in of strictly group members.

## Portability

* Code is located solely on the desktop app of one group members laptop; however, this code can be shared publicly through the Sphero database.
* The project documents and information are also stored in a GitHub repository that all group members have access to.
* This program will only be used within this group for the specific purpose of the end competition, so it does not have to have large portability between other host machines or operating systems.

# 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 |
| 11/19/19 | Arielle Sinicin, Matthew Silano, Jabril Shakur | Confirmed AGIL-01 - AGIL-05 |

# System Design

## Algorithm

1. Using the Sphero app, connect to the robot
2. Place the robot in its starting position
3. The robot will begin at the stage 1 square
4. Aim the robot in the correct direction
5. Roll the robot at a speed of 50 towards the first stage with the three objects.
6. Avoid all three objects by following the zig zag path around them, turning at each 90-degree angle.
7. Stop the robot at the stage 2 square.
8. Turn the robot towards the ramp.
9. Roll the robot at a speed of 150 and jumps the ramp.
10. Re-aim the robot towards the pins in stage three.
11. Roll the robot at a speed of 100 and knocks over as many pins as possible.
12. Stop the robot at the starting square (the stage 1 square).

## System Flow

*Separate outside document.*

## Software

The software that will be used to develop and deploy this application is written in Java Script. The software where the code is written is located in the Sphero Edu desktop app, and the method of coding is simplified block coding.

## Hardware

The hardware platforms used to develop, test, and demonstrate this application is the Sphero Edu desktop app. This app allows developers to readily test their code by sending the program to the robot and running it at the click of a button. This app will be running on an apple laptop.

## Test Plan

| **Reason for Test Case** | **Test Date** | **Expected Output** | **Observed Output** | **Staff Name** | **Pass/Fail** |
| --- | --- | --- | --- | --- | --- |
| Aim the robot | 11/19/19 | The blue light shows the direction. | The blue light is pointing in the direction to go. | Arielle | Pass |
| Roll the robot in the aimed direction | 11/19/19 | The robot will roll towards stage 1. | The robot rolls in the wrong direction | Arielle | Fail |
| Determine the optimal speed for the robot | 11/19/19 | The speed will remain the same for the entire stage. | The robot’s speed is the slowest for stage one, a little faster for stage 2, and fastest for stage 3. | Arielle, Matt | Pass |
| The robot must remain along the zig zag path in order to avoid the objects. | 11/19/19 | The robot will turn along the path in order to avoid the objects. | The robot remained along the predetermined path once, but it was difficult to aim the robot perfectly. | Arielle, Matt | Pass |
| The robot must stop at the stage 2 square. | 11/19/19 | The robot will stop at the beginning square of the next stage. | The robot stopped at the correct square. | Arielle, Matt | Pass |
| The robot must successfully jump the ramp at an optimal speed. | 11/19/19 | The robot will go fast enough to clear the ramp safely. | The robot went fast enough to clear the ramp. | Arielle, Matt | Pass |
| The robot must stop at the stage 3 square. | 11/19/19 | The robot will slow down enough to accurately stop in the next square. | The robot accurately stops at this square. | Arielle, Matt | Pass |
| The robot must turn towards the pins. | 11/19/19 | The robot will stop then calibrate to the correct angle that faces the pins | The robot turned at the wrong angle until the final attempt. | Arielle, Matt | Pass |
| Determine the optimal speed for the robot to knock over as many pins as possible. | 11/19/19 | The robot will go fast enough to knock over a lot of pins. | The robot went at a fast speed and cut through the middle of the pins. | Arielle, Matt | Pass |
| The robot must stop where it started (stage 1 square) | 11/19/19 | The robot will slow down enough to accurately stop in the next square. | The robot does not stop at the correct square. | Arielle, Matt | Fail |

## Task List/Gantt Chart

Separate outside document

## Staffing Plan

| **Name** | **Role** | **Responsibility** | **Reports To** |
| --- | --- | --- | --- |
| **Arielle Sinicin** | Project Manager, Presentation Developer | Responsible for all project deliverables, updates the project plan | **Client, the team** |
| **Matthew Silano** | Tester, Documenter | programming, testing, documents development activities | **the team** |
| **Jabril Shakur** | Tester, Documenter | programming, testing, documents development activities | **the team** |