Sprint 1: Endurance Design Document

October 29, 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

## 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 Reviewed | SME Reviewed / Approved |
| --- | --- | --- | --- | --- | --- |
| ENDUR-01 | The system must successfully travel around (circumnavigate) the periphery of HH208 | Endurance Process = “Circumnavigation” | 2 | 10/16/19 | Arielle Sinicin |
| ENDUR-02 | The system must remain within the provided path located at a distance of 4 feet from each outside wall. | Endurance Process = “Stay On Track” | 1 | 10/16/19 | Arielle Sinicin |
| ENDUR-03 | The system must not collide with any objects as it travels around the room. | Endurance Process = “Stay On Track” | 1 | 10/16/19 | Arielle Sinicin |
| ENDUR-04 | The system must begin with a green light and speak “ready set go”. | Endurance Process = “Starting Light Color and Speech” | 1 | 10/16/19 | Arielle Sinicin |
| ENDUR-05 | The system must end with a red light and speak “I’m done and I need water”. | Endurance Process = “Ending Light Color and Speech” | 1 | 10/16/19 | Arielle Sinicin |
| ENDUR-06 | The system must start and end its circumnavigation at the same location indicated by a square on the path. | Business Process = “Beginning and End Location” | 1 | 10/16/19 | 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

|  |  |  |
| --- | --- | --- |
| Meeting Date | Attendees (name and role) | Comments |
| 10//19 | Arielle Sinicin, Matthew Silano, Jabril Shakur | Confirmed ENDUR-01 - ENDUR-06 |

# System Design

## Algorithm

1. Using the Sphero app, connect to the robot
2. Place the robot in its starting position
3. The robot will turn its light green at its starting position
4. The robot will speak “ready, set, go”.
5. Aim the robot in the correct direction
6. Roll the robot in a straight line for 9.8 seconds toward the first corner of the room.
7. Stop the robot
8. Spin the robot 90 degrees
9. Roll the robot in a straight line for 5.6 seconds toward the second corner of the room.
10. Stop the robot
11. Spin the robot 90 degrees
12. Roll the robot in a straight line for 9.8 seconds toward the third corner of the room.
13. Stop the robot
14. Spin the robot 90 degrees
15. Roll the robot in a straight line for 5.6 seconds toward the fourth corner (starting position) of the room.
16. The robot will stop at the exact same point that it started.
17. The robot will turn its light red
18. The robot will speak “I’m done and I need water”.

## 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 | 10/23/19 | 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 | 10/23/19 | the robot should roll towards opposing corner | The robot rolls in the wrong direction | Arielle | Fail |
| Determine the optimal speed for the robot | 10/23/19 | The speed will remain the same for the entire circumnavigation | The robot’s speed changed based on the terrain and if it had it’s case on | Arielle, Matt | Pass |
| The robot must remain in a straight line before turning the corner | 10/23/19 | After robot determines the correct angle it will be able to travel straight | The robot does not travel straight. It is difficult to aim the robot in the beginning and it must be done manually. This makes each run different every time. | Arielle, Matt | Fail |
| How long must the robot travel before turning the corner at each wall of the rectangle | 10/23/19 | Duration will change based on the length of each side | The duration for the long side was a little less than double that of the short side. | Arielle, Matt | Pass |
| The robot must stop at each corner and turn at the correct angle | 10/23/19 | The robot will stop then calibrate to the correct calculated angle (90 degrees) | The robot correctly stopped, delayed, and turned at the exact angle specified. | Arielle, Matt | Pass |
| The robot must remain within the 4-foot parameters | 10/23/19 | If the robot travels in a straight line it will stay on track | On the best attempt the robot remained straight. However, on many attempts the robot went outside of the perimeter. | Arielle, Matt | Pass |
| The robot must stop where it started | 10/23/19 | The speed will have to be slow enough for the robot to make an accurate stop | The robot never stopped at the exact location because it did not remain straight. | Arielle, Matt | Pass |
| The robot must begin with a green light and speak “ready set go”. | 10/23/19 | The robot will turn green and speak “ready set go”. | The robot turned green and spoke the correct line. | Arielle, Matt | Pass |
| The robot must end with a red light and speak “I’m done and I need water”. | 10/23/19 | The robot will turn red and speak “I’m done and I need water”. | The robot turned red and spoke the correct line. | Arielle, Matt | Pass |

## Task List/Gantt Chart

Separate outside document

## 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** |
| --- | --- | --- | --- |
| **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** |