Sprint 3 - Agility Design Document

December 3rd, 2020

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# Executive Summary

## Project Overview

This project will demonstrate to Professor Eckert, the sphero robot navigating the agility course. This includes, avoiding three obstacles, going over a ramp, and knocking pins over.

## Purpose and Scope of this Specification

Sphero robot will complete the agility course to show to Professor Eckert.

In scope

This document addresses requirements related to Agility Sprint of Robot Project :

* Robot must start in designated square
* Robot must navigate around first obstacle
  + Then second obstacle
  + Then third obstacle.

Out of Scope

The following items in Agility Phase of Robot Project are out of scope:

* After avoiding obstacles, robot will jump ramp.
* Then the robot continue to following agility course and knock over pins.

# Product/Service Description

Robot must complete agility course by following designated blue path. In doing so, the robot will avoid three obstacles, jump a ramp, and knock over pins at the end of the course.

## Product Context

This robot is one of many different types produced by the company Sphero. The robot is independent of other robots and is self-contained within its ball form. It can be connected and utilized by anything that has a bluetooth connection and has the Sphero.edu app. The device connected to the robot can use remote controls or code to control what the robot does and how it moves.

## User Characteristics

General customer profiles:

* Can be used by almost anyone, i.e.: teachers, students, adults, kids, average joe.
* Little experience is needed to learn and understand how to control robot.
* User must have basic understanding of using a computer and minimal background in coding.
* Not for toddlers, will break if thrown or handled too roughly.

## Assumptions

Robot is properly charged, usage of floor space or designated area, and device with Bluetooth compatibility and the Sphero.edu application.

## Constraints

Constraints of design options:

* Updated version of bluetooth
* Updated version of Sphero.edu app
* Workspace due to social distancing and other safety precautions
* Personal devices, such as laptops or phones
* Required use of predesigned block codes on Sphero.edu app
* Creating three obstacles, making a ramp, getting pins to knock over

## Dependencies

Dependencies that affect the requirements:

* Require occasionally updates to system software
* Must be the specific Sphero robot provided by university
* Block code must be completed first

# Requirements

\*\*\*Due to constraints and working remotely, we were unable to get pins to knock over.

* Robot must complete agility course
* Priority 1:
  + Must start in designated square
  + Must follow path laid out by blue tape and avoid first obstacle
  + Must then avoid second obstacle
  + Must avoid third and final obstacle
  + Must continue to follow path and jump ramp
  + Must finish course by flowing rest of path and knocking pins over at the end.

## Functional Requirements

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Req# | Requirement | Comments | Priority | Date Rvwd | SME  Reviewed/approved |
| Agility\_1 | Start in square | Start in square for best results | 1 | 12/2/20 | Approved |
| Agility\_2 | Go straight and make a right turn | Avoid obstacle 1 | 1 | 12/2/20 | Approved |
| Agility\_3 | Go straight and make a left turn | Avoid obstacle 2 | 1 | 12/2/20 | Approved |
| Agility\_4 | Go straight and make a right turn | Avoid obstacle 3 | 1 | 12/2/20 | Approved |
| Agility\_5 | Go over the ramp and make a 135-degree turn | Gain enough speed to go over ramp | 1 | 12/2/20 | Approved |
| Agility\_6 | Go straight and knock down the pins | Make sure to knock down most of the pins | 1 | 12/2/20 | Approved |

## Security

### Protection

Factors that will protect the system:

* Keep account information for github.com and Sphero.edu secret
* Logging activity
* Historical data sets
* Charting roles and who does specific jobs

### Authorization and Authentication

Use of Github.com and Sphero.edu and Microsoft Office products through our accounts

## Portability

Specify attributes of the system that relate to the ease of porting:

* Host dependent code is used for entire block code in controlling robot
* Used JavaScript in block code form on Sphero.edu
* Works with specific block code set up on any compatible device
* Works anywhere there is enough space

# Requirements Confirmation/Stakeholder sign-off

|  |  |  |
| --- | --- | --- |
| Meeting Date | Attendees (Names and Roles) | Comments |
| 12/2/20 | Michael (Co-manager)  Daniel (Co-manager) | Called to finalize block code and confirm all requirements have been met. |

Include documentation of the approval or confirmation of the requirements here. For example:



# System Design

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

## Algorithm

* Start in designated square
* Follow path laid out in blue tape
  + In doing so, will:
    - Avoid obstacle 1
    - Avoid obstacle 2
    - Avoid obstacle 3
* Continue to follow path and jump ramp
* Continue to follow path until end is reached, where sphero robot will knock over pins

## System Flow

A picture containing text, white, day

Description automatically generated

## 

## Software

Block code that is a representation of JavaScript which was controlled through the Sphero Edu software.

Graphical user interface

Description automatically generated

## Hardware

Sphero Edu was used to control the Sphero robot which was version SPRK+. This was done through Bluetooth from a personal laptop that allowed connection between the SPRK+ and the Sphero Edu app to access the block code.

## Test Plan

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reason for Test Case** | **Test Date** | **Expected Output** | **Observed Output** | **Staff Name** | **Pass/Fail** |
| First test | 12/2/20 | make sphero run the course to get a feel for it | sphero ran the course and did terribly just how we predicted | Daniel and Michael | Pass |
| Avoid obstacle 1 | 12/2/20 | The sphero should now avoid obstacle 1 | Sphero did follow the designated path | Daniel and Michael | Pass |
| Avoid obstacle 2 | 12/2/20 | Sphero should avoid obstacle 2 | Did avoid second obstacle but went off the path | Daniel and Michael | Fail |
| Avoid obstacle 3 | 12/2/20 | Should avoid obstacle 3 and stay on path | Did avoid obstacle 3 and stayed on the path | Daniel and Michael | Pass |
| Go over ramp | 12/2/20 | Sphero had enough speed to go over the ramp | Lacking the desired speed to go over the ramp | Daniel and Michael | Fail |
| Make the 135-degree turn | 12/2/20 | Make the sharp turn to go into pins | Did make the sharp turn correctly | Daniel and Michael | Pass |
| Knock over the pins | 12/2/20 | Should knock down most of the pins | Did knock down most of the pins | Daniel and Michael | Pass |

## Task List/Gantt Chart

Full Gnatt chart on GitHub [here](file:///C:\Users\angel\OneDrive\Documents\Sprint%203%20Agility%20.xlsx)

Chart

Description automatically generated



## Staffing Plan

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Role | Responsibility | Reports To |
| Michael | Co-manager | Oversee and complete all parts of assignment | Professor Eckert |
| Daniel | Co-manager | Oversee and complete all parts of assignment | Professor Eckert |