

Sprint 3 - Agility Design Document

December 3, 2020

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1.Executive Summary

1.1Project Overview

This product is intended for children as a toy for them to play with and could use to race other bots.

1.2Purpose and Scope of this Specification

The purpose of this project is to meet the requirements given and to get the robot to follow the path and avoid all the obstacles. Then the robot will knock over as many pins as possible.

2.Product/Service Description

2.1Product Context

This product is a toy that children can use with other toys. It is independent because it does not rely on anything. The interface does not have a variety of related systems.

2.2User Characteristics

The staff are Dan, Victor, and Ana. Each staff member is doing a different job. All staff members are freshmen taking an Intro to Computer Science. Dan and Victor are the coding experts and Ana is the script.

2.3 Assumptions

The main thing that might affect the requirements would be our expertise on how to code the robot to follow the path and avoid the objects. Also, the way it moves after the ramp also has an impact on the robot.

2.4 Constraints

The robot can only travel in a perfect path or it will hit the obstacles. Each time we run the robot we have to estimate how many degrees to add or take off the code. The speed is also very important because when it goes up the

2.5 Dependencies

This project requires us to set up the robot facing the same direction or the angles would become different. This project also requires us to follow a path while avoiding objects. It also requires us to go fast enough that we can go up a ramp and knock down pins.

3. Requirements

3.1 Functional Requirements

| Req # | Requirement | Comments | Priority | Date Rvwd |
|----------|-----------------------|--|----------|-----------|
| AGILI_01 | Avoid first obstacle | No contact at all | 1 | 12/1/2020 |
| AGILI_02 | Avoid second obstacle | No contact at all | 1 | 12/1/2020 |
| AGILI_03 | Avoid third obstacle | No contact at all | 1 | 12/1/2020 |
| AGILI_04 | Go up ramp | Make sure it has enough momentum to go up ramp | 1 | 12/1/2020 |
| AGILI_05 | Knock down pins | Knock down as many as possible | 3 | 12/1/2020 |
| AGILI_06 | | | | |

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|----------|--|--|--|--|
| AGILI_07 | | | | |
| AGILI_ 8 | | | | |
| AGILI_09 | | | | |
| AGILI_09 | | | | |
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3.2Security

We locked the robot in our room to make sure nothing happened to it

3.2.1Protection

We used sphero on a macbook that is password protected.

3.2.2Authorization and Authentication

We used sphero to run our code and test it.

3.3Portability

We used sphero and the robot relied on the code from sphero to decide what will be activated.

4.Requirements Confirmation/Stakeholder sign-off

| Meeting Date | Attendees (name and role) | Comments |
|--------------|---|-------------------|
| 12/1/2020 | Dan(Programmer), Victor(Project Manager), Ana(Scribe) | Everyone attended |
| 12/2/2020 | Dan(Programmer), Victor(Project Manager), Ana(Scribe) | Everyone attended |

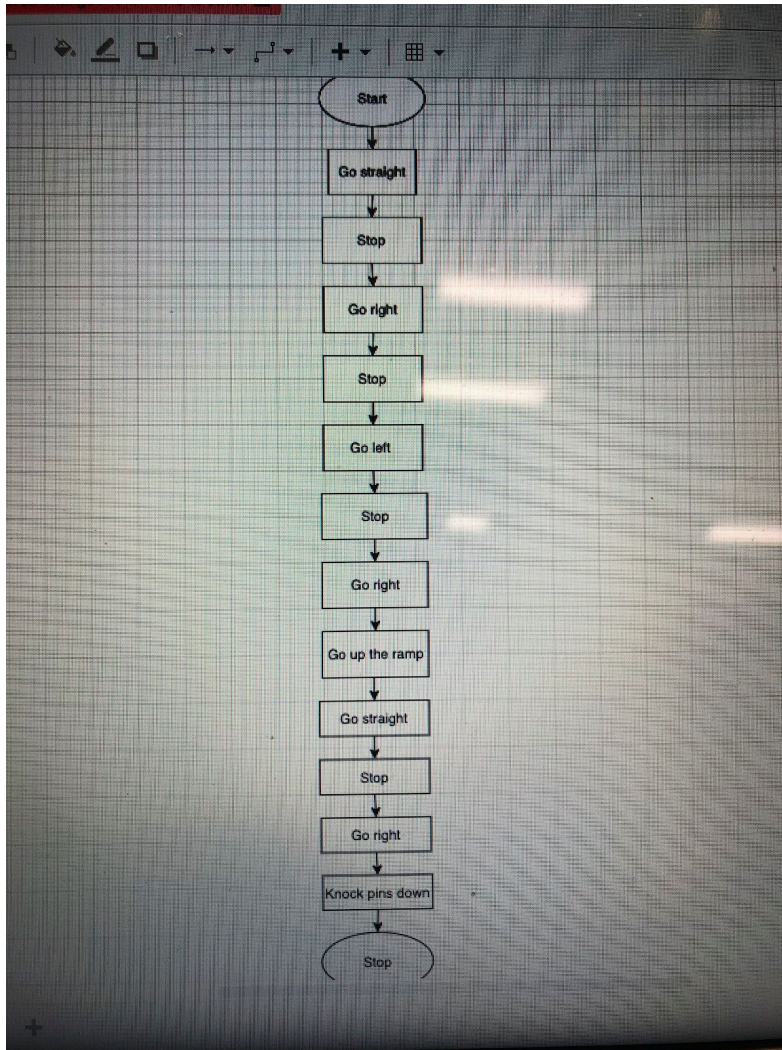
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5.System Design

5.1Algorithm

- The first thing the robot needs to do is go straight without touching the object on the right
- then turn right.
- Then it goes straight and avoids the object on the left
- turn left.
- Then the robot avoids the object on the right and then turns right.
- The robot goes straight until it gets to the box
- then goes in the shape of a box and stops on the other side.
- Then it goes straight and turns right.
- Lastly, the robot goes straight fast and attempts to knock down as many pins as possible.

5.2System Flow



5.3 Software

We are using sphero block code to make and test our robot.

5.4 Hardware

We are using laptops to program the robot. The robot we are using is a sphero bot.

5.5 Test Plan

| Reason for Test Case | Test Date | Expected Output | Observed Output | Staff Name | Pass/Fail |
|----------------------|-----------|-----------------|-----------------|------------|-----------|
|----------------------|-----------|-----------------|-----------------|------------|-----------|

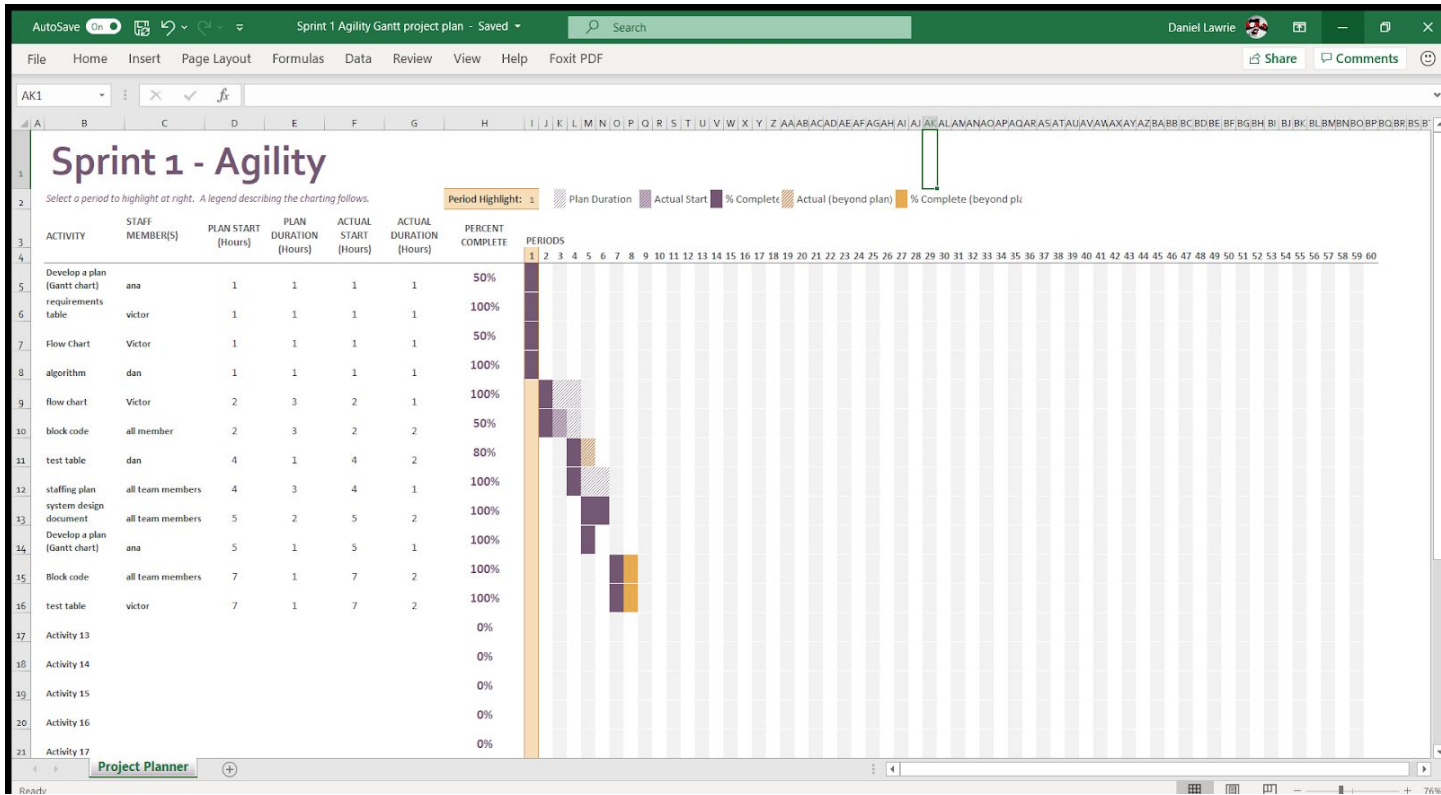
| | | | | | |
|---|-----------|--|--|---------------|------|
| To get the robot past the first object. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn. | The robot successfully avoided the first object and made the 90° right turn. | Victor Lemuz | Pass |
| To get the robot past the first and second object. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn and continue straight to stop at the second object's right side to make a 90° left turn. | The robot successfully avoided the first object but collided with the second | Victor Lemuz | Fail |
| To get the robot past the first and second object. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn and continue straight to stop at the second object's right side to make a 90° left turn. | The robot successfully avoided the first object but collided with the second | Daniel Lawrie | Fail |
| To get the robot past the first and second object. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn and continue straight to stop at the second object's right side to make a 90° left turn. | The robot successfully went past the first two objects. | Daniel Lawrie | Pass |
| To get the robot past the first, second, and third object. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and make a 90° degree right turn. | The robot successfully avoided the first three parts of the course by avoiding the three objects following the course path. | Victor Lemuz | Pass |
| To get the robot past the three objects and go up the ramp. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and | The robot successfully avoided all three objects by going through the course and went up the ramp to come to a stop at the last corner and turn 135° to the right. | Victor Lemuz | Pass |

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|---|-----------|---|--|--------------|------|
| | | make a 90° degree right turn, then continue straight and go up the ramp to stop at the corner an make a 135° degree right turn | | | |
| To get the robot to complete the course: (Following the course) avoid all three objects, go up the ramp, and knock as many pins down as possible. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and make a 90° degree right turn, then continue straight and go up the ramp to stop at the corner an make a 135° degree right turn, and finally continue straight to knock as many pins down possible. | The robot completed the majority of the course but missed the pins completely. | Victor Lemuz | Fail |
| To get the robot to complete the course: (Following the course) avoid all three objects, go up the ramp, and knock as many pins down as possible. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and make a 90° degree right turn, then continue straight and go up the ramp to stop at the corner an make a 135° degree right turn, and finally continue straight to knock as many pins down possible. | The robot avoided all of the objects but went off course after the ramp. | Victor Lemuz | Fail |
| To get the robot to complete the course: (Following the course) avoid all three objects, go up the ramp, and knock as many pins down as possible. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to | The robot collided with the second object. | Victor Lemuz | Fail |

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|---|-----------|---|--|--------------|------|
| | | stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and make a 90° degree right turn, then continue straight and go up the ramp to stop at the corner an make a 135° degree right turn, and finally continue straight to knock as many pins down possible. | | | |
| To get the robot to complete the course: (Following the course) avoid all three objects, go up the ramp, and knock as many pins down as possible. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and make a 90° degree right turn, then continue straight and go up the ramp to stop at the corner an make a 135° degree right turn, and finally continue straight to knock as many pins down possible. | The robot completed the majority of the course but knocked down 1 pin. | Victor Lemuz | Fail |
| To get the robot to complete the course: (Following the course) avoid all three objects, go up the ramp, and knock as many pins down as possible. | 12/1/2020 | The robot will go past the first object's left side and stop to make a 90° right turn, continue straight to stop at the second object's right side to make a 90° left turn, continue straight and stop at the third object's left side and make a 90° degree right turn, then continue straight and go up the ramp to stop at the corner an make a 135° degree right turn, and finally continue straight to knock as | The robot completed the entire course by avoiding all three objects, went up the ramp, and knocked down 7/10 pins. | Victor Lemuz | Pass |

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| | | many pins down possible. | | |
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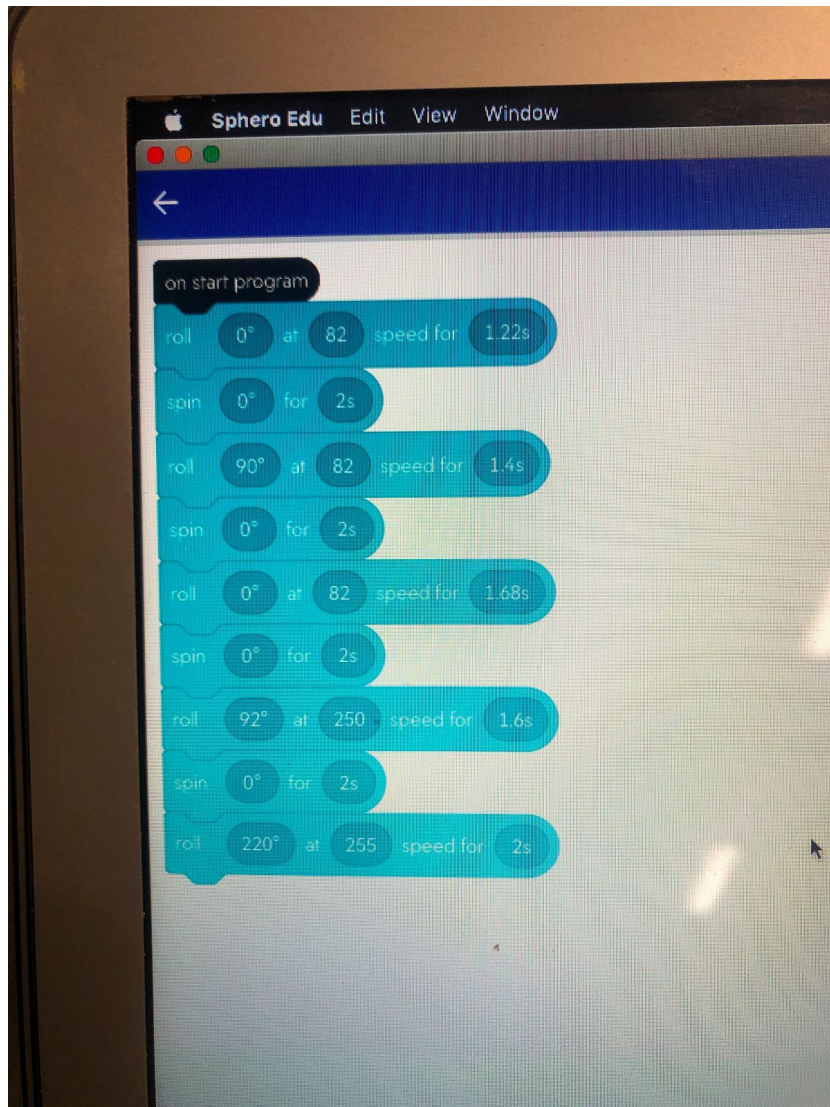
5.6Task List/Gantt Chart



5.7Staffing Plan

| Name | Role | Responsibility | Reports To |
|---------------|-----------------|------------------------------------|-------------------------------|
| Daniel Lawrie | Programmer | Programming | Victor Lemuz |
| Victor Lemuz | Project Manager | Review codes, equipment | Daniel Lawrie |
| Ana Levytska | Scribe | Documents and organizes work dates | Victor Lemuz Daniel Lawrie |

Picture of Block Code:



Picture of Sensor Data:

