Sprint 2 - Accuracy Design Document

November 18th, 2020

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1. Executive Summary

1.1 Project Overview

This project is the Accuracy leg of the triathlon. The goal of this leg is to get our Sphero robot to follow the figure 8 path five times, as close as possible to the blue line on the floor. The intended audience is our classmates in CS-104 and Professor Eckert. The path that our robot will be going through is close to this shape: ∞

1.2 Purpose and Scope of this Specification

In scope

This document addresses requirements related to phase 2 of Project A:

- The program we create is designed to follow the path in Howard Hall
- The software is designed to run on smooth surfaces

Out of Scope

- The program will not work on leg 1 or leg 3 of the triathlon
- The robot will not run on sand

2. Product/Service Description

2.1 Product Context

The product (our program) relies on the Sphero Edu app to run its code. The program also relies on a connected Sphero robot in order for the program to run. The program relies on the app and the robot in order to exist. The app and robot can run other code, but our code can not run on other apps or different brands of robot. This is the second of three sprints we will be doing.

2.2 User Characteristics

1. Computer Science Professor: Has experience using the robot in the past, has expertise in the field
2. Student: Limited experience in the field, has an interest in learning the field, has a background of using technology throughout their life
3. Child: No experience in the field, has an interest in technology, has a background using technology almost their whole life

2.3 Assumptions

- Test room in Howard Hall availability
- Sphero Edu app is available to run create our code on
- Robot is available and in possession of the group
- Assume that we have enough expertise to get the program running well

2.4 Constraints

- Restricted to remote work instead of collaborating in person
- Restricted to certain times to test in Howard Hall

2.5 Dependencies

- Algorithm needs to be complete before creating a flowchart
- Flowchart needs to be complete before programming the robot
- Program needs to have at least one line of code before the robot can move

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
ACCUR_01	Robot must be placed in the middle of the course before starting		1	11/16	Approved
ACCUR_02	Robot must start		1	11/16	Approved
ACCUR_03	Robot be able to move in a in a complete circle (360 degrees) in a clockwise direction to get halfway through the course		1	11/16	Approved
ACCUR_04	Robot must return to the middle of the course		1	11/16	Approved
ACCUR_05	Robot must then be able to move in another complete circle in a counterclockwise direction		1	11/16	Approved
ACCUR_06	Robot must return to the middle of the course		1	11/16	Approved
ACCUR_07	Robot must be looped to do the same movements 5 times		1	11/16	Approved
ACCUR_08	Robot must stop		1	11/16	Approved
ACCUR_09	Robot must speak “I am the winner”		2	11/16	Approved
ACCUR_010	Robot must flash multicolored lights for 5 seconds		1	11/16	Approved
ACCUR_111	Change numbers in the program to follow the path more accurately	Numbers will change based on multiple factors including the floor, distance, imperfections in the course.	2	11/16	Approved
ACCUR_112	Inspect the floor of Howard Hall to check for anything that would disrupt the path	The Tape on the floor of Howard Hall causes bumps in the track, important to take it into consideration.	2	11/16	Approved

3.2 Security

3.2.1 Protection

- Locked Zoom meetings to discuss project
- Password protected computers
- Github editing locked to the members of our group

- Files sent through locked Zoom meetings

3.2.2 Authorization and Authentication

No Authorization or Authentication was used for this project

3.3 Portability

- We used Sphero Edu for the code which is using javascript. Javascript is a very portable language per internet research.
- The program is easily uploadable to Github

4. Requirements Confirmation/Stakeholder sign-off

Meeting Date	Attendees (name and role)	Comments
11/16/20	Jordan, Chelsea, Emily	confirmed all

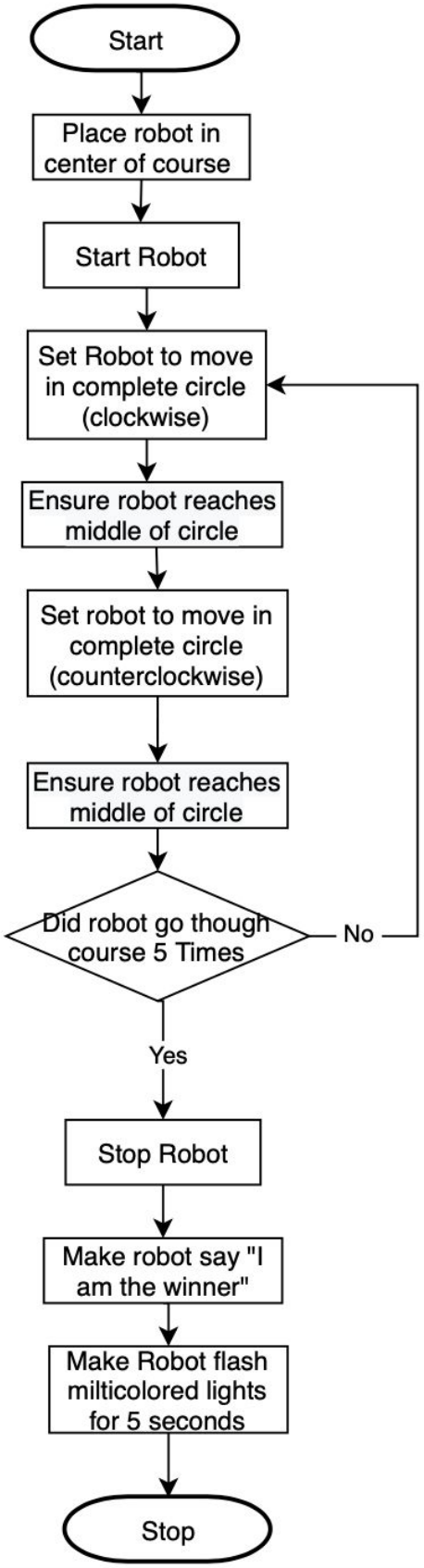
5. System Design

5.1 Algorithm

Algorithm for Accuracy Sprint

1. Place robot in the middle of the course
2. Start robot
3. Set robot to move in a complete clockwise circle
4. Make robot reach the middle of the course
5. Set robot to move in a complete counterclockwise circle
6. Make robot reach the middle of the course
7. Repeat steps 3-6 until the robot has gone through the path 5 times
8. Stop robot
9. Make robot speak “I am the winner”
10. Make robot flash multicolored lights for 5 seconds

5.2 System Flow



5.3 Software

- Zoom: We used Zoom to communicate during the project
- Sphero Edu: We used Sphero Edu to program the robot
- Google Docs: We used Google Docs for this document and to create the algorithm, it allowed for collaboration
- Microsoft Excel: Used for the Gantt Chart
- Draw.io: Used to create the flowchart
- Github: Used to upload important files to our repository
- Text Messages: We used text to communicate during the project as well

5.4 Hardware

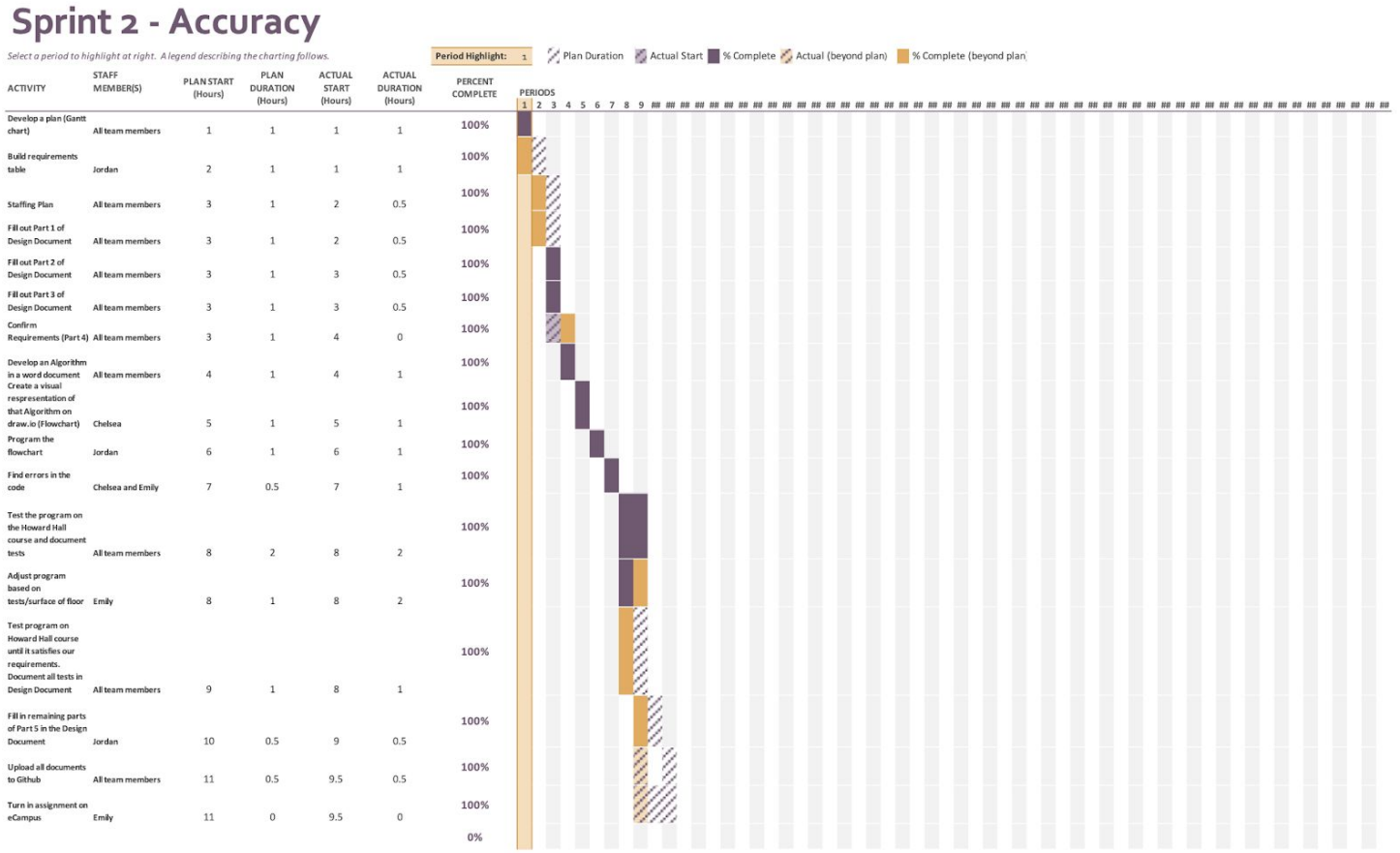
- Sphero Robot
- Jordan's Macbook Pro
- Chelsea's Macbook Air
- Emily's Macbook Air
- Emily's iPhone 11

5.5 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
To start robot	11/18/2020	Robot will start	Robot started	Emily	Pass
See if we can get robot moving in a clockwise circle	11/18/2020	Robot will move in a circle	Robot moved in a straight line	Emily	Fail
See if we can get robot moving in a clockwise circle	11/18/2020	Robot will move in a circle	Robot went in a circle	Emily	Pass
Get the circle to be as wide as the course	11/18/20	The circle the robot moves in will follow the course	The circle was way too narrow	Emily	Fail
Get the circle to be as wide as the course	11/18/20	The circle the robot moves in will follow the course	The circle was the perfect width	Emily	Pass
See if we can get robot going in a counterclockwise circle	11/18/2020	Robot will move in a counterclockwise circle	Robot moved in a clockwise circle	Emily	Fail
See if we can get robot going in a counterclockwise circle	11/18/2020	Robot will move in a counterclockwise circle	Robot moved in a counterclockwise circle	Emily	Pass
Loop the existing program 5 times	11/18/2020	Robot will repeat the figure 8 5 times	Robot repeated the figure 8 5 times	Emily	Pass
Stop the program in the middle of the course	11/18/2020	Robot will stop at the midpoint	Robot stopped a little off to the right	Emily	Fail

Stop the program in the middle of the course	11/18/2020	Robot will stop at the midpoint	Robot stopped perfectly in the center	Emily	Pass
Make the robot say “I am the winner”	11/18/2020	Robot will speak that line	Robot spoke the right line	Emily	Pass
Make the robot flash different colors over 5 seconds	11/18/2020	Robot will change colors multiple times	Robot did not change colors	Emily	Fail
Make the robot flash different colors over 5 seconds	11/18/2020	Robot will change colors multiple times	Robot robot did not light up at all	Emily	Fail
Make the robot flash different colors over 5 seconds	11/18/2020	Robot will change colors multiple times	Robot changed colors multiple times over the 5 second period	Emily	Pass

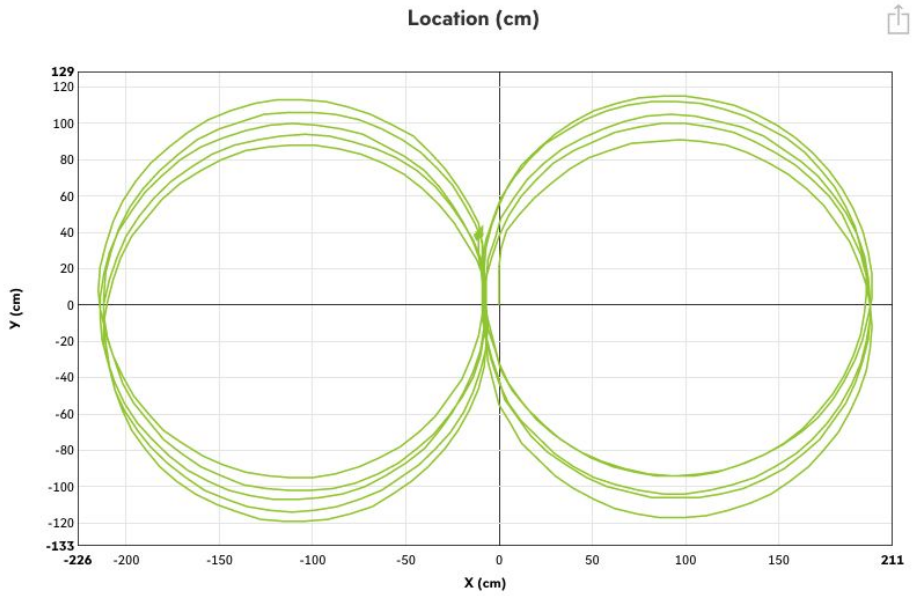
5.6 Task List/Gantt Chart



5.7 Staffing Plan

Name	Role	Responsibility	Reports To
Jordan	Team Leader, Staff Manager, Gantt Chart Manager, Programmer, Algorithm and Software Developer	To lead and oversee overall projects, to work with team members to develop programs, algorithms, and software, contribute ideas to overall project and sprint 1 document. Create the Gantt chart.	Professor Eckert
Emily	Team member, Software Tester, Idea Contributor, Software Developer, Repository owner	To work with team members to develop software/algorithms, to test robots on site (HH208), contribute ideas to the overall project.	Jordan
Chelsea	Team Member, Develop algorithm, Idea Contributor, Flowchart Developer	To work with team members to develop algorithms, develop software, and contribute ideas to the overall project and sprint 1 document. To create the flowchart.	Jordan

5.8 Sensor Data



5.9 Block Code


on start program
loop 5 times
speed 70
spin 360° for 8s
stop
speed 70
spin -360° for 7.8s
stop
speak im the winner and continue
fade from to over 3s
fade from to over 3s
main LED
stop