Sprint 2 - Accuracy Design Document

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1. Executive Summary

1.1 Project Overview

The project's intended audience is students, staff, and the professor. Its main purpose is for students to be able to create a program through the Sphero Edu app, learn block coding, and design an algorithm that will meet the necessary requirements for the project to be satisfactory.

1.2 Purpose and Scope of this Specification

- Product design manager: Melissa Blanc Doblas
- Purpose of this project: Successfully understand and implement block coding techniques to ensure the robots algorithm is correct and follows the right path and maintains project integrity

  Project objectives

  - Develop specialized algorithm to ensure the robot follows the intended path
  - Provide user-friendly algorithm for students and faculty to view
  - implement features to maintain group efficiency and provide valuable feedback to controller/viewer
  - Integrate specified algorithms for robot to carry out deviated path correctly
  - Ensure system of steps and is correct and done in a timely manner
  - Ensure system of steps meets the overall project requirements and standards
  - Control and maintain group member productivity while working around pre-set schedules

2. Product/Service Description

- The Sphero's battery life significantly decreases our group's ability to test and design the robot's algorithm
- The tape outline (although new) can sometimes push the robot off its intended course, making the group reset the test run completely
- The final limiting factor is Sphero's app, which doesn't allow for fine-tuning of the input algorithm. This can be challenging especially when attempting to get the Sphero to turn at specific points in the run

2.1 Product Context

2.2 User Characteristics

User	**Experience**	**Expertise**	**General Characteristics**	
Student	None- done it before	Depending on the year and major. The student might have used equipment	Students may have different reasons based on year, major, and other interest	**X**
Professors	1-15	contain most knowledge depending on the major	have used equipment for years based on major	
Other Faculty	None	No relation to the equipment results in little knowledge about the product.	might find it interesting based on their type of work.	

2.3 Assumptions

- *Sphero Edu and Spark robots need to work. One can not function without the other.*
- *Charger included, without one will delay the project*
- *It can speak, if it can not then, requirement "must say ready set go before" can not be achieved*
- *The color can be changed, if it could not requirement "Colors should be red at the end" can not be achieved*
- *Has to have the function to go in a circle. If not, the requirement "finished figure 8" becomes impossible.*
- *Has to have the function for a loop. If not, the requirement "loop 5 times" becomes impossible.*

2.4 Constraints

- ***bluetooth range***
- ***physical limitations;may not be ideal for certain terrains(uneven surfaces)***
- ***sensor precision (lack of advanced sensors)***
- ***programming limitations***
- ***data processing***
- ***connectivity***
- ***surface requirements (best on smooth surfaces.uneven can reduce accuracy and mobility)***
- ***payload capacity(lightweight and cannot interact with heavy object)***
- ***time for debugging(need to be recharged)***

2.5 Functional Requirements

Software dependency
Sphero Edu app ; required for programming the SPRK+ using block based coding .
available for ios,android ,windows etc…
bluetooth drivers ;ensure that the robot has the correct drivers for bluetooth
hardware dependencies like ;compatible device (a computer with BLE to communicate with the SPRK+)
stable surface
clear workspace
adequate lighting for accurate recognition
programming dependencies

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
Requirement 1-Accuracy	Connect Robot	Make sure Bluetooth is enabled on the device	High	11/11	Approved
Requirement 2-Accuracy	Find the right commands that will guide the robot	Find right commands so robot travels successfully	High	11/11	Approved
Requirement 3-Accuracy	Use of correct spin rotation	Make sure the robot rotates at the right direction	High	11/11	Approved
Requirement 4-accuracy	Use of correct duration	The robot's duration will change base on how long it takes it to run the figure	High	11/11 - 11/15	Approved

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
Requirement 5-Accuracy	Correct heading	Make sure it is at a correct angle	High	11/11 - 11/15	Approved
Requirement 6-Accuracy	Use of correct speed	The robot's speed will be adjusted based on how it responds to the command (too fast/slow)	Medium	11/11 - 11/15	Approved

2.6 Security

2.6.1 Protection

2.6.2 Authorization and Authentication *Portability*

- The XD block coding used in the Sphero app is portable, but only for cross-platform-based apps
- The use of block coding overall limits software portability

3. Requirements Confirmation/Stakeholder sign-off

Meeting Date	Attendees (name and role)	Comments
11/11/24	Fabiana Torres - Manager Melissa Blanc Doblas - Collaborator Dabanca Chery - Collaborator Aiden Ramsay - Collaborator	- Connect Robot: Approved - Find the right commands: Approved
11/13/24	Fabiana Torres - Manager Melissa Blanc Doblas - Collaborator Dabanca Chery - Collaborator Aiden Ramsay - Collaborator	- Correct spin: Approved - Correct heading: Approved
11/14	Fabiana Torres - Manager Melissa Blanc Doblas - Collaborator Dabanca Chery - Collaborator Aiden Ramsay - Collaborator	- Correct speed: Approved
11/15	Fabiana Torres - Manager Melissa Blanc Doblas - Collaborator Dabanca Chery - Collaborator Aiden Ramsay - Collaborator	- Correct duration: Approved

4. System Design

4.1 Algorithm

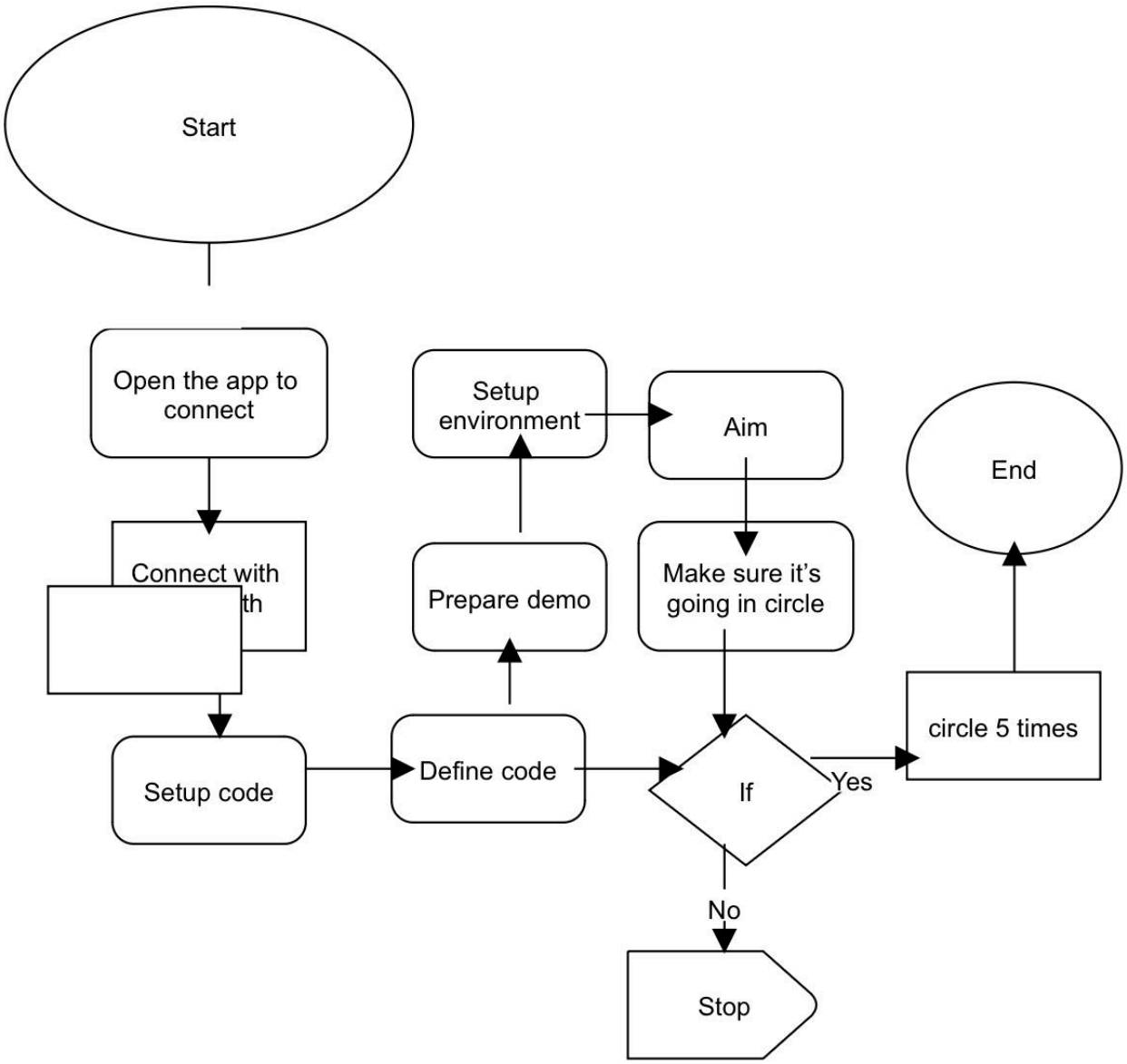
JavaScript Code

```javascript
var str0 = 'circle';
var str1 = 'heading';
var heading = 'heading';
var amount = 'duration';
var count = 'count';
var heading = 360;
var Speed = 120;
var DelayTime = 0.5;
var c0 = 100;
var AS = 360;
var time = 100;


async function startProgram() {
    setStabilization(true);
    setHeading(0);
    setSpeed(33);
    for (var _i0 = 0; _i0 < 5; ++_i0) {
        await spin(400, 18.75);
        await spin(-360, 16);
        await delay(0.025);
    }
    await speak('i am the winner!', false);
    stopRoll();
    for (var _i1 = 0; _i1 < 100; ++_i1) {
        setMainLed(getRandomColor());
        await delay(0.1);
        await delay(0.025);
    }
    setMainLed({ r: 119, g: 255, b: 103 });
}

```

System Flow



4.2 Software

The language we used to create the product was blockcode language which is provided in the Sphero Edu app. It is the photo provided below

4.3 Hardware

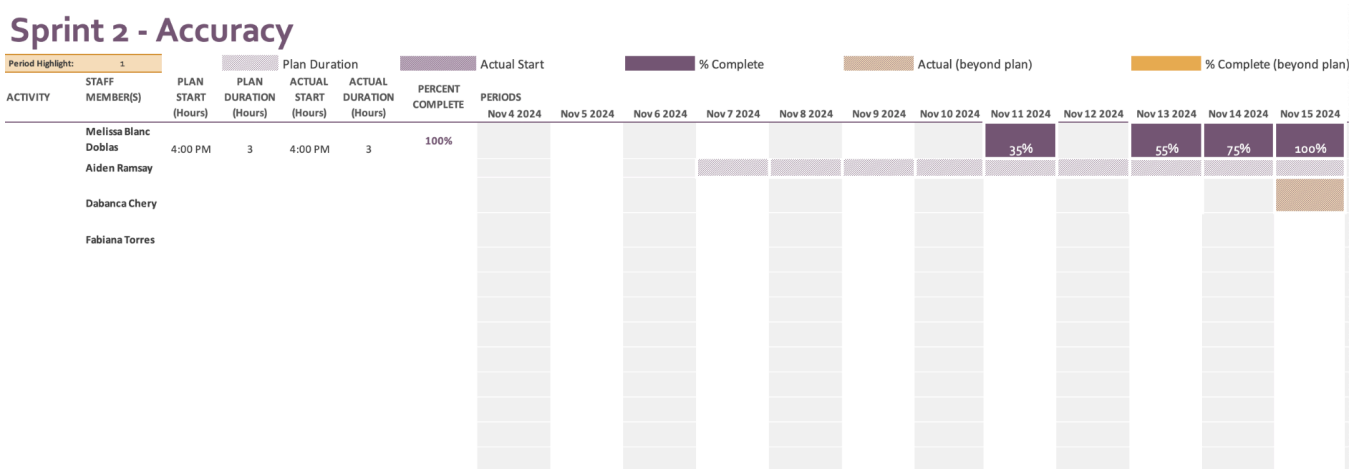
Core hardware;The robot (sensors,motors,battery,transparent shell)
laptop used to run the app
compatible platforms like ios ,android windows…
optimal microcontroller integration ;external sensors triggering the robot actions
custom environment
external sensors
line made with the blue tape sp the robot can follow
bluetooth adapters
iot integration devices

4.4 Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
if it go in a circle	11/11/24	to spin and go down the circle	just spin	Fabiana, Melissa	fail
roll 0, roll 90, roll 180 roll 230	11//11/24	to spin in a circle	spin half circle then went off route	Fabiana, Melissa	fail
roll 90 roll 139 roll 45 roll 300	11/11/24	to spin a circle	spin half way	Fabiana,	fail
roll 100 roll 139 roll 35 roll 230	11/11/24	to spin a circle	spin a circle	Fabiana	pass

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
roll 100 roll 139, roll 35 roll 230	11/13/24	to spin a circle	went 25 of the circle and started to circle somewhere else	Fabiana, Melissa	fail
heading 0 speed 40 spin 180 10s spin -180 10s	11/13/24	to spin a circle	spin half before doing the opposite	Fabiana, Melissa	fail
Spin -360 15s spin 360 15s	11/14/24	to spin a circle	spin 75 of the circle before going the other way	Fabiana, Melissa	fail?
Spin -360 18s spin 360 18s	11/15/24	to spin a circle	spin close to a circle	Melissa,	pass
spin -360 for 18.5s	11/15/24	to spin a circle	spin around the circle	Melissa, Dabanca	pass
speak i am the winner main led random color loop 200	11/15/24	say i am the winner and flash colors	say i am the winner and flash colors	Melissa, Dabanca	pass

4.5 Task List/Gantt Chart



4.6 Staffing Plan

Name	Role	Responsibility	Reports To
Fabiana Torres	Manager	Staffing plan, Github, Gantt Chart, 3, 4 Requirements	
Melissa Blanc Doblas	Collaborator	Test Planning, Software, Assumptions, User Characteristic	Manager
Aiden Ramsay	Collaborator	Algorithm, Portability, EDD, Product Descriptions, Purpose and Scope	Manager
Dabanca Chery	Collaborator	System flow, Hardware, Dependencies, Constraints	Manager