Sprint 2 - Accuracy Design Document
November 20, 2023

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- Experience: The student doesn't require a large background in computer science but they must know how to use the Sphero Edu app and be able to access the account with our code.
- Technical expertise: The student requires no technical expertise in order to use the product.

Assumptions

In order to fulfill the requirements, certain assumptions must be made. For example, the student doing the coding aspect of the project must be able to access the Sphero website on their laptop. Another example would be that the room in which the coding must be tested would be available to the students for use.

Constraints

- Some constraints of the project include time constraints, meaning the students must be able to coordinate schedules in order to be able to work on the project together. Another constraint is that the software needed to code the robot is only available on certain devices so the coding can't be done on a phone, it must be done on a laptop.

Dependencies

- This product requires the user to have downloaded the Sphero software on their computer, it also relies on the group's ability to work together and get stuff done in a timely manner, along with making sure everyone is on the same page.

Requirements

The requirements

Functional Requirements

Req#	Requirement	Comments	Priority	Date Rowdy	SME Reviewed / Approved
R1	Make an algorithm	The algorithm must ensure the robot can navigate the room per the specified criteria. It will be the foundation for programming the robot's actions.	1	11/15/23	YES
R2	Complete by 11/20/2023 at 11:59 PM	This deadline is set to ensure the project aligns with the overall timeline for deployment, and that everything is working by the time we need to submit.	1	11/15/23	YES

R3	Have the robot go around the room, change LED colors and speak without colliding into objects.	The robot must autonomously navigate the perimeter of the room without manual intervention.	1	11/15/23	YES
R4	The robot must start in the course laid out on the floor.	The robot must be positioned in the right place and be angled correctly in order to do a correct loop.	1	11/15/23	YES
R5	The robot must run the path 5 times successfully.	The robots speed and angle must be correct to ensure it does a proper loop.	1	11/15/23	YES
R6	The robot must start and finish in the same spot.	The robot must execute the code correctly in order for it to end up in the correct position, meaning we will need to test it a couple of times.	1	11/15/23	YES
R7	The robot must not stray from the indicated path.	Again this goes along with being properly coded and tested to make sure it works basically trial and error.	1	11/15/23	YES
R8	The robot must say “I am the winner” upon finishing the course.	Make sure the dialogue for the robot works and is loud enough for people to hear	1	11/15/23	YES
R9	The robot must flash multicolored lights for five seconds upon finishing the course.	Make sure the colors are correct along with the trail and error	1	11/15/23	YES
R10	Complete the system design document	A comprehensive design document is needed for development and testing teams to understand the	1	11/15/23	YES

		system's architecture.			
R11	Take a video of the robot going around the room	Video documentation is necessary for marketing and stakeholder review.	1	11/15/23	YES
R12	Collect sensor data	Gathering data from sensors will help in optimizing the robot's navigation and identifying any issues.	1	11/15/23	YES
R13	Make a GitHub repository	A repository is required for version control, code collaboration, and tracking changes over the project's lifecycle.	3	11/15/23	YES

Security

Protection

The factors that will protect the system and accidental access or modification, is making sure that only members of our group have access to the robot and its code, and making sure there is constant moderation of the code to make sure that there has been no access by third party users, so we are basically logging when we check for unauthorized access and having a picture of our previously completed code at hand, and encrypting it by making it so that no one else has access.

Authorization and Authentication

The factors of authorizing and authenticating is the 2 members that have the code limit the access to their accounts to just them, and also keep the robot with them at all times as to prevent it from connecting to someone Elses computer.

Portability

In terms of portability the robot itself is very small and easy to carry around, it is also able to connect to other devices through Bluetooth, so it can connect to our groups computers and we can execute code onto it through that, in terms of porting code the robot uses block coding and works on Linux, windows and mac so operating systems through a downloadable application, you can also share your codes with other classmates on sphere although you may not publicly share, you can at least have it so that your fellow group members an access and code the robot as well as yourself.

Requirements Confirmation/Stakeholder sign-off

Meeting Date	Attendees (name	Comments
11/15/23	3 group members (Benedetto, Arnav, Miriam)	Confirmed Benedetto Arnav and Miriam
11/17/23	2 group members (Miriam and Danny)	Worked on Gannt and Flow Chart

System Design

Algorithm

Initialization

Setup: Initialize all necessary hardware components, such as motors, proximity sensors, lights, and speakers.

Start Sequence

Light Signal: Illuminate the green light to indicate the start.

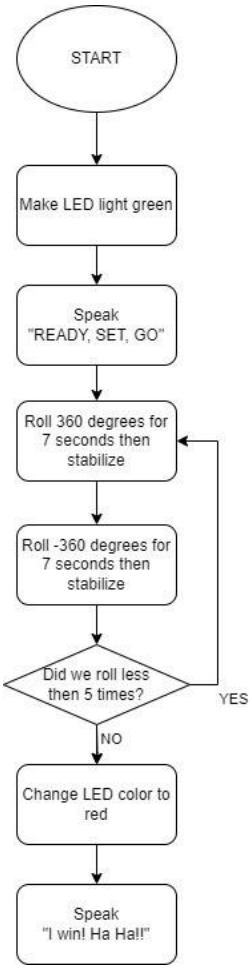
Movement and Navigation

Begin Movement: Activate the motors to move the robot forward from the starting point.
Circular Travel: Travel in a circular line for a pre-determined distance or time to ensure it reaches the periphery of the room.
First Spin: Perform a 360-degree right spin.

Stop Sequence

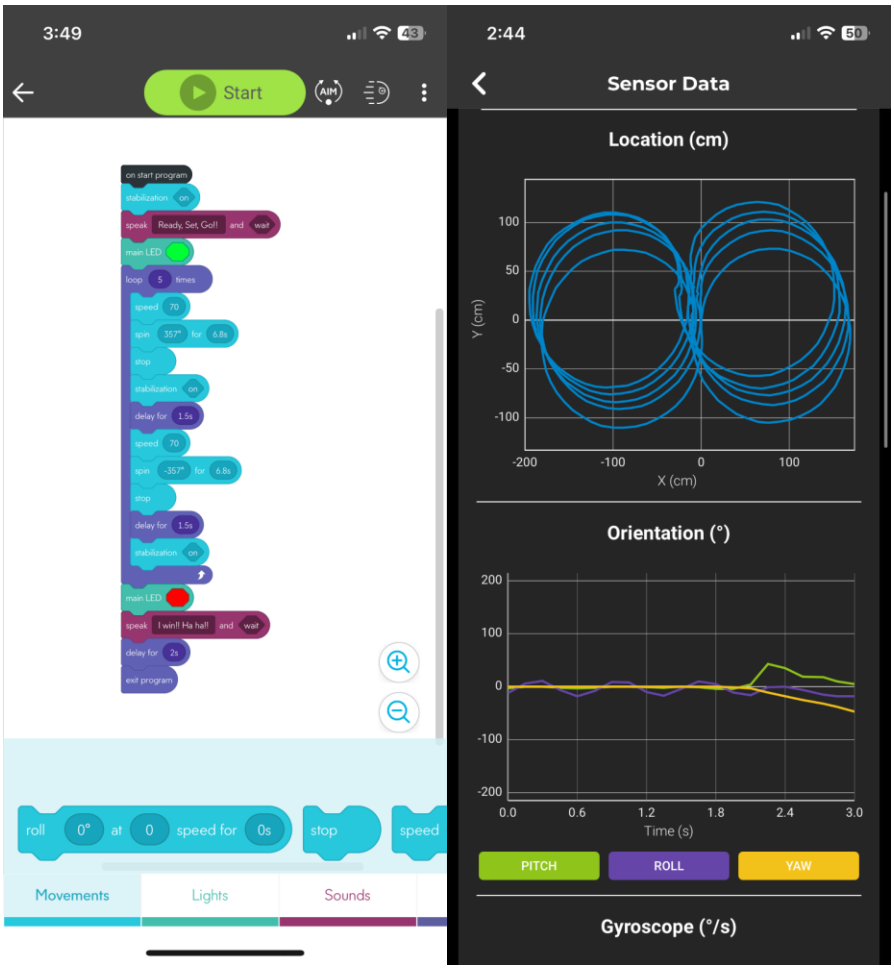
Final Spin: After the first circular travel, make a 360-degree left spin to orient the robot towards the starting position.
Stop Movement: Cease motor activity to bring the robot to a stop in the starting point.
Light Signal: Change the light from green to red.

System Flow



Software

We used Sphero Edu application
Block Code:


3:49
Start
on start program
stabilization on
speak Ready, Set, Go! and wait
main LED
loop 5 times
speed 70
spin 357° for 6.8s
stop
stabilization on
delay for 1.5s
speed 70
spin -357° for 6.8s
stop
delay for 1.5s
stabilization on
main LED
speak I win!! Ha ha!! and wait
delay for 2s
exit program
roll 0° at 0 speed for 0s
stop
speed
Movements
Lights
Sounds
2:44
Sensor Data
Location (cm)
100
50
0
-50
-100
Y (cm)
-200
-100
0
100
X (cm)
Orientation (°)
200
100
0
-100
-200
0.0
0.6
1.2
1.8
2.4
3.0
Time (s)
PITCH
ROLL
YAW
Gyroscope (°/s)

Hardware

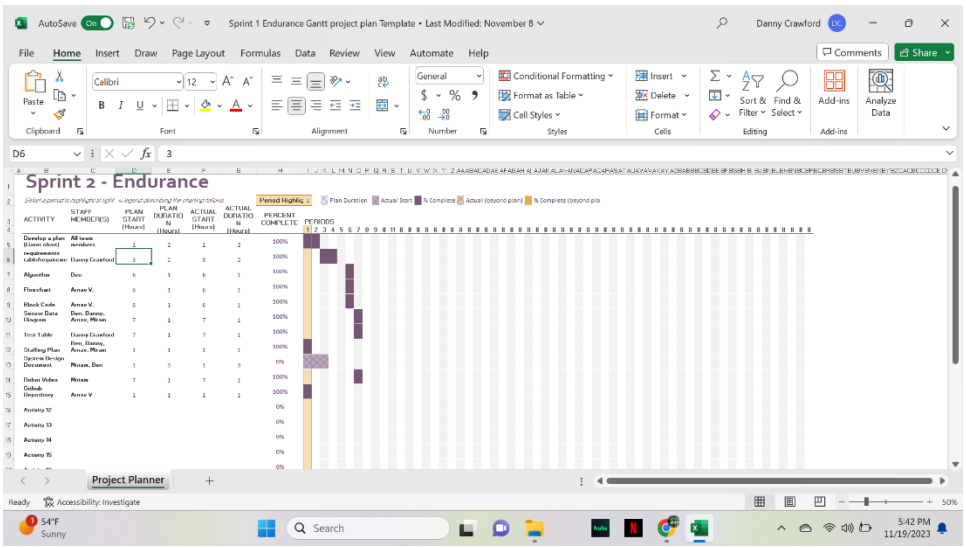
We used the Sphero robot, our mobile phones and laptops to help us with our project.

Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fai
Initial Direction Test	11/15/23	Matching the trails	Went off the trails	Arnav Vasa	Fail
Circumference Measurement Test Trials 1	11/15/23	Matching the circle trails	Went off course	Arnav Vasa	Fail
Circle Post-Spin Test Trials 1	11/15/23	Matching the displacement	Displacement went off	Arnav Vasa	Fail
Circumference Adjustment for Circle Test Trials 1	11/15/23	Matching the circumference	Circumference was uneven at the slightest	Arnav Vasa	Pass
First Test Run	11/15/23	Matching the course path	Went off course and displacement went off after it	Arnav Vasa	Pass

			was programmed		
Circumference Measurement Test Trials 2	11/15/23	Matching the circle trails	Went off course	Arnav Vasa	Pass
Circle Post-Spin Test Trials 2	11/15/23	Matching the displacement	Displacement went off	Arnav Vasa	Pass
Adjustment for Circle Test Trials 2	11/15/23	Matching the circumference	Still uneven circumference	Arnav Vasa	Pass
Second/Last Test Run	11/15/23	Matching the course path	Still off course but improvement adjusted	Arnav Vasa	Pass

Task List/Gantt Chart



Staffing Plan

Name	Role	Responsibility	Reports To
Arnav Vasa	Repository Manager	-Manage the repository -Develop the block code -Troubleshoot code -fill out section 5 of the System Design Document	Miriam Abecasis
Benedetto Aiello	Document Designer	-Fill out the design document -Develop the algorithm	Miriam Abecasis
Miriam Abecasis	Group Leader	-Fill out the design document -Video the robot	Arnav Vasa

		-Organize group meetings	
Daniel Crawford	Quality Control	-Make the flowchart -Make the gantt chart	Arnav Vasa