Sprint 1 - Endurance Design Document
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User Characteristics

- Customer profile: Monmouth University computer science student
- 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.
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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 cant 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.

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.	3	10/18/23	YES
R2	Complete by 11/8/2023 at 11:59 PM	This deadline is set to ensure the project aligns with the overall	3	10/18/23	YES

		timeline for deployment.			
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.	3	10/18/23	YES
R4	Complete the system design document	A comprehensive design document is needed for development and testing teams to understand the system's architecture.	3	10/18/23	YES
R5	Take a video of the robot going around the room	Video documentation is necessary for marketing and stakeholder review.	3	10/18/23	YES
R6	Collect sensor data	Gathering data from sensors will help in optimizing the robot's navigation and identifying any issues.	3	10/18/23	YES
R7	Make a GitHub repository	A repository is required for version control, code collaboration, and tracking changes over the project's lifecycle	3	10/18/23	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 their 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
11/01/23	All group members (Benedetto, Daniel, Arnav, Miriam)	Confirmed all
11/08/23	Miriam, Daniel, and Arnav	Confirmed Miriam, Daniel, and Arnav

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.

Audio Signal: Output "ready set go" using the text-to-speech module.

Movement and Navigation

Begin Movement: Activate the motors to move the robot forward from the starting point.

Straight Travel: Travel in a straight line for a pre-determined distance or time to ensure it reaches the periphery of the room.

First Turn: Perform a 90-degree right turn.

Loop Continuation

Repetition: Repeat steps 4 and 6 three more times to navigate around the room. The assumption here is that the room is a rectangle or square, and four right turns will bring the robot back to its starting location.

Stop Sequence

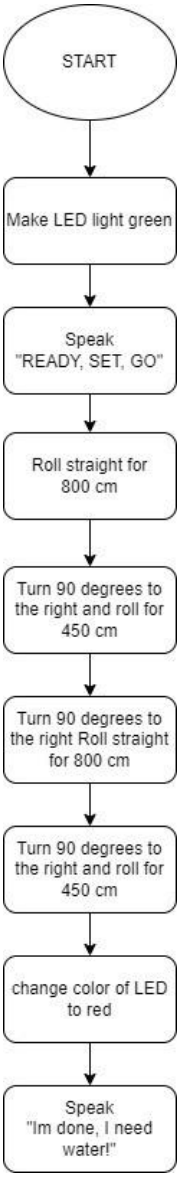
Final Turn: After the fourth segment of straight travel, make a final 90-degree turn to orient the robot towards the starting position.

Stop Movement: Cease motor activity to bring the robot to a stop in the starting square.

Light Signal: Change the light from green to red.

Audio Signal: Announce "I'm done and I need water" using the text-to-speech module.

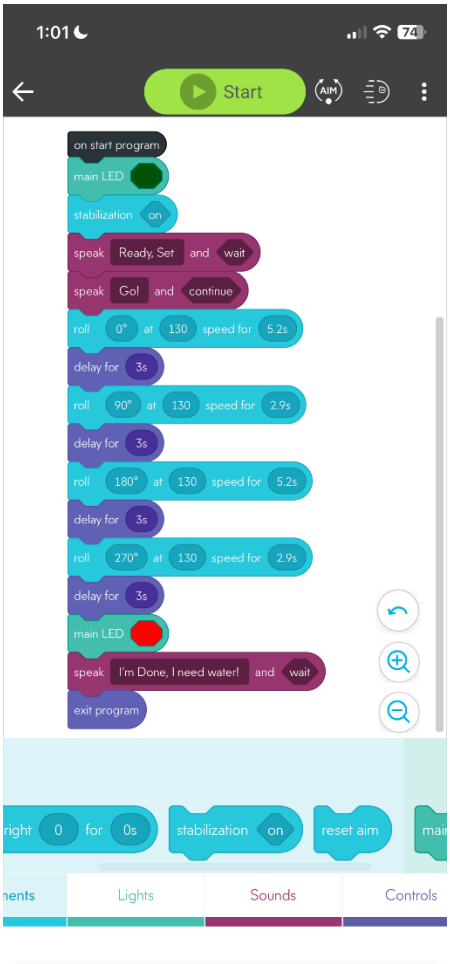
System Flow


START
Make LED light green
Speak "READY, SET, GO"
Roll straight for 800 cm
Turn 90 degrees to the right and roll for 450 cm
Turn 90 degrees to the right Roll straight for 800 cm
Turn 90 degrees to the right and roll for 450 cm
change color of LED to red
Speak "Im done, I need water!"

Software

We used Sphero Edu application

Block Code:



Hardware

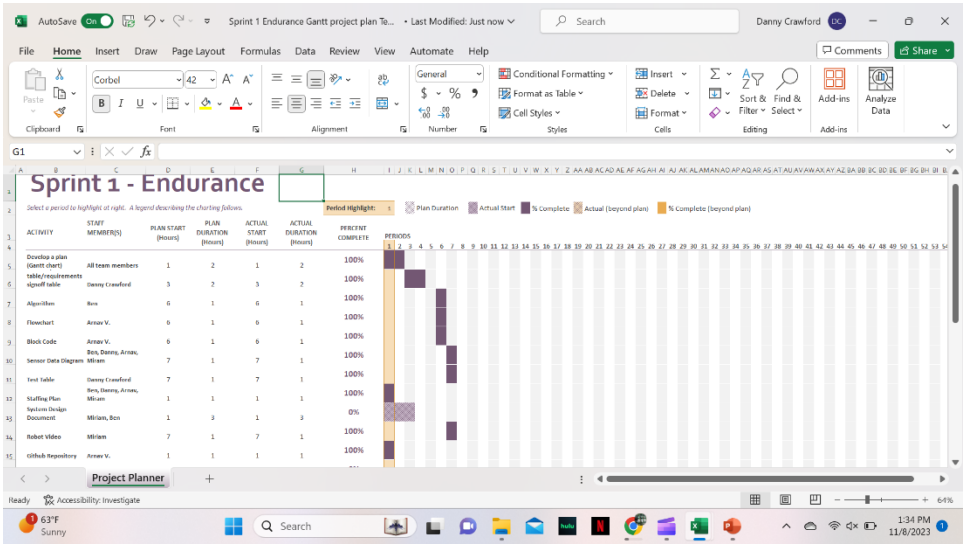
We used the sphero robot, our mobile phones and laptops to help us with our project

Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fai
Initial Direction Test	11/6/2023	Robot moves in the specified start direction	Robot moved in the wrong direction	ALL	Fail

Distance Measurement Test 1	11/6/2023	Robot travels the correct distance before turning	Robot turned too early	ALL	Fail
Straight Line Post-Turn Test	11/6/2023	Robot maintains a straight line after turning	Robot deviated from straight line	ALL	Fail
Distance Adjustment for Rectangle Test	11/6/2023	Robot accounts for rectangle shape and adjusts distance accordingly	Incorrect distance on the second turn	ALL	Fail
First Test Run	11/6/2023	Robot navigates the course	Robot successfully navigates course	ALL	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	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 -Organize group meetings	Arnav Vasa
Daniel Crawford	Quality Control	-Develop the block code -Fill out the requirements -troubleshoot code -Organize the Gantt chart	Arnav Vasa