Sprint 3- Agility Design Document
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systems such as the Sphero Edu app which can be accessed from several different software brands.

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.

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	Robot should start in the indicated square.	This is the starting area of the robot, it will be places here before the test begins	1	11/29/23	YES
R2	Have the robot encounter 3 objects.	There are some glass bottles around the course, along with a binder and lastly a few markers	1	11/29/23	YES
R3	Have the robot avoid all 3 objects.	The robot must zig zag between the glass bottles	1	11/29/23	YES

		in order to get to the binder			
R4	The robot must go over the ramp.	The robot must be at a proper speed to go over a binder that is similar to a ramp and then make a turn to the right	1	11/29/23	YES
R5	The robot must knock down as many pins as possible.	The robot must make a turn after the ramp and then hit a bunch of markers down after this the sprint will be complete	1	11/29/23	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**
11/29/23	All group members	Confirmed Benedetto, Arnav, Miriam, and Daniel

System Design

Algorithm

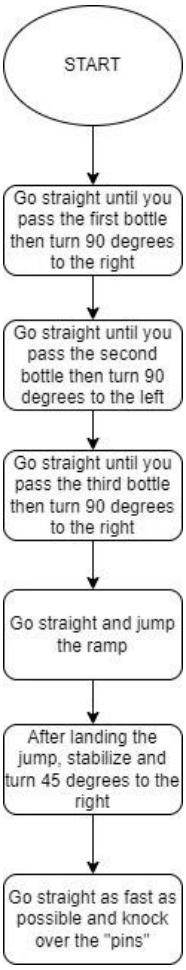
Initialization

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

Movement and Navigation

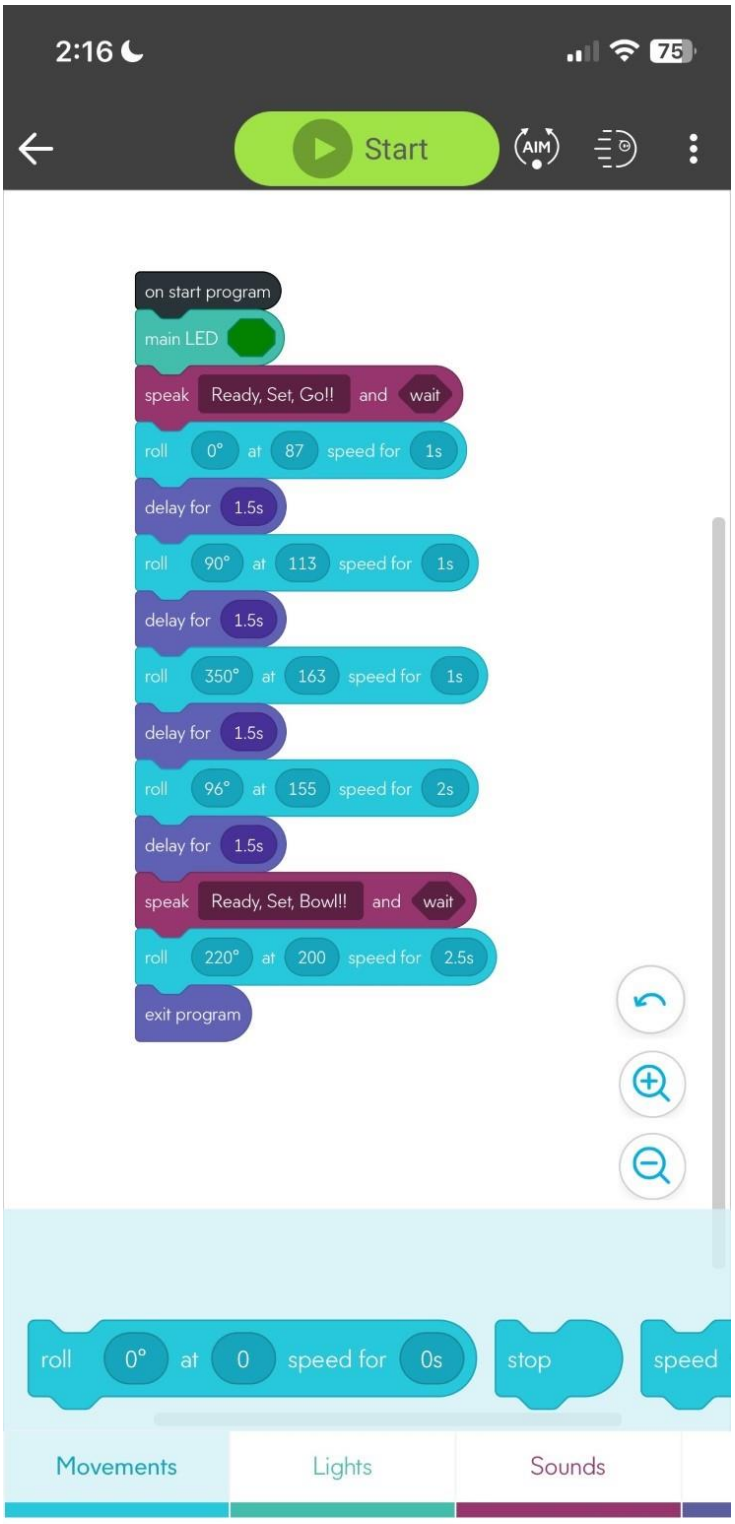
Begin Movement: Activate the motors to move the robot forward from the starting point.
Straight Travel: Travel in a straight line for a pre-determined distance or time to ensure it reaches the first glass bottle.
First Turn: Perform a 90-degree right turn.
Straight Travel: Travel in a straight line for a pre-determined distance or time to ensure it reaches the second glass bottle.
Second Turn: Perform a 90-degree left turn.
Straight Travel: Travel in a straight line for a pre-determined distance or time to ensure it reaches the third glass bottle.
Third Turn: Perform a 90-degree right turn.
Straight Travel: Travel in a straight line for a pre-determined distance or time to ensure it reaches and goes over the ramp.
Fourth Turn: Perform a 45-degree right turn.
Straight Travel: Travel in a straight line for a pre-determined distance or time to ensure it reaches and knocks over all the pins

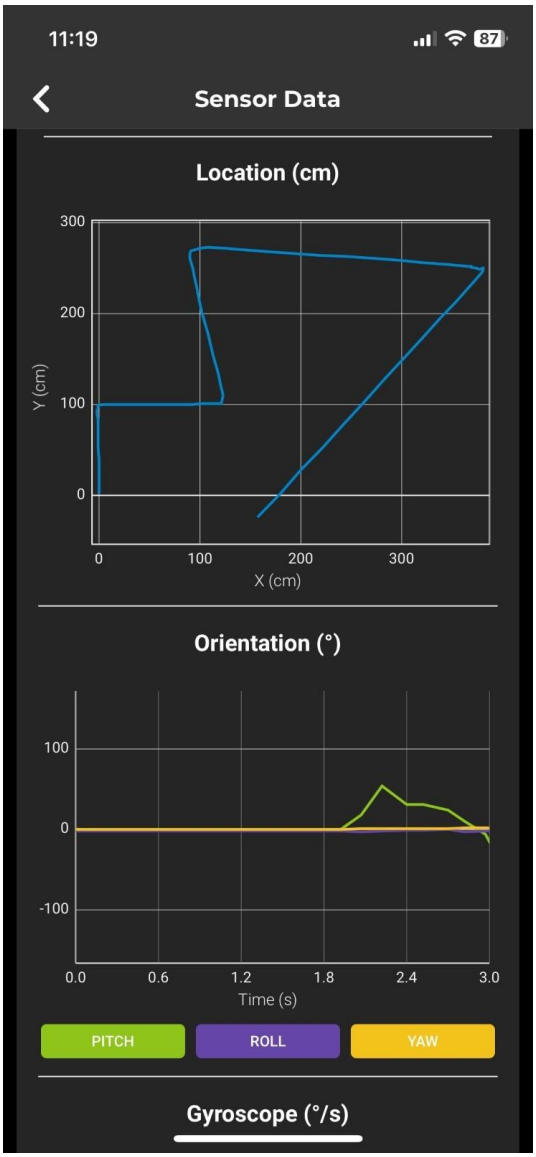
System Flow

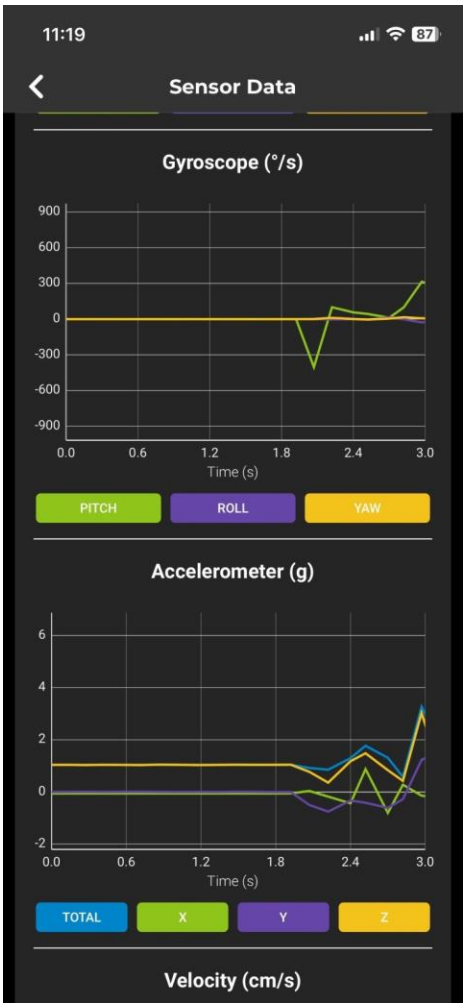


Software

We used Sphero Edu application
Block Code:


2:16
75
Start
AIM
on start program
main LED
speak Ready, Set, Go!! and wait
roll 0° at 87 speed for 1s
delay for 1.5s
roll 90° at 113 speed for 1s
delay for 1.5s
roll 350° at 163 speed for 1s
delay for 1.5s
roll 96° at 155 speed for 2s
delay for 1.5s
speak Ready, Set, Bowl!! and wait
roll 220° at 200 speed for 2.5s
exit program
roll 0° at 0 speed for 0s
stop
speed
Movements
Lights
Sounds


11:19
87
Sensor Data
Location (cm)
300
200
100
0
Y (cm)
0
100
200
300
X (cm)
Orientation (°)
100
0
-100
0.0
0.6
1.2
1.8
2.4
3.0
Time (s)
PITCH
ROLL
YAW
Gyroscope (°/s)


11:19
87
Sensor Data
Gyroscope (°/s)
900
600
300
0
-300
-600
-900
0.0
0.6
1.2
1.8
2.4
3.0
Time (s)
PITCH
ROLL
YAW
Accelerometer (g)
6
4
2
0
-2
0.0
0.6
1.2
1.8
2.4
3.0
Time (s)
TOTAL
X
Y
Z
Velocity (cm/s)

Hardware

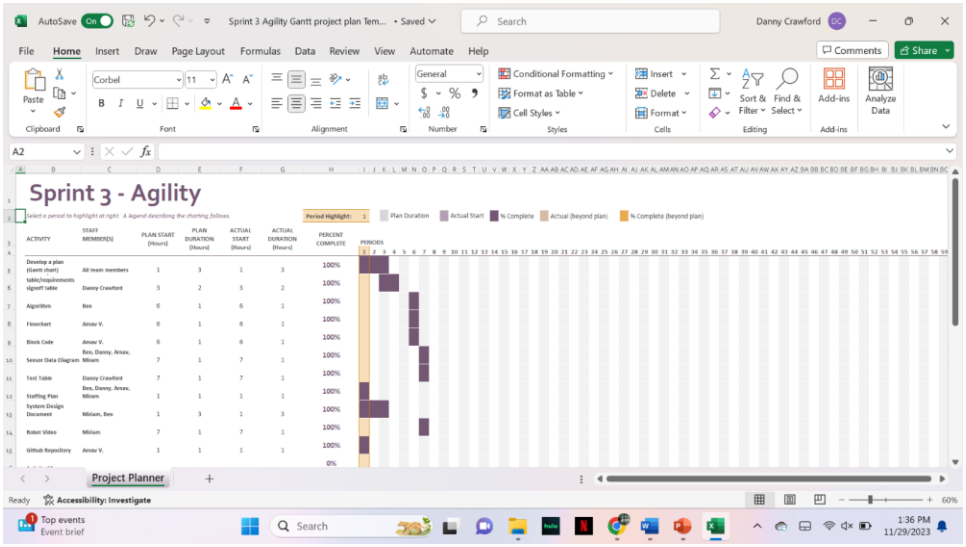
We used the Sphero robot, our mobile phones and laptops to help us with our project.

Test Plan

Reason for Test Case	Test Date	Expected Output	Observed Output	Staff Name	Pass/Fai
Initial Direction Test	12/1/23	Matching the trails	Went off the trails	Danny Crawford	Fail
Turning the Corner	12/1/23	Make 90 degree turn past bottle	Made turn before the bottle	Danny Crawford	Fail
Distance	12/1/23	Have sphero go past bottles	Sphero went past bottles	Danny Crawford	Pass
Second turn	12/1/23	Sphero completes two 90 degree turns, each past the glass bottle	Sphero made the second turn to early	Danny Crawford	Fail
Increase the Distance before second turn	12/1/23	Sphero turns 90 degrees past second bottle	Sphero turned 90 degrees past second bottle	Danny Crawford	Pass
Make the third turn	12/1/23	Sphero makes the third turn	Sphero made the third turn	Danny Crawford	Pass

Line up and jump the ramp	12/1/23	Sphero now turns 45 degrees and goes straight to jump the ramp	Sphero missed the ramp (got the angle wrong)	Danny Crawford	Fail
Adjustment for jumping the ramp	12/1/23	Fix the angle so sphero jumps ramp	Sphero made the ramp	Danny Crawford	Pass
Last Run	12/1/23	After the jump have sphero turn 90 degrees and knock down pins	Sphero executes the turn and knocks down pins	Danny Crawford	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 -Organize group meetings	Arnav Vasa

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