ROBOT PROJECT

Group 6:
Ethan, Sami, Gavin

SET UP

- Software- We utilized block coding, the Sphero Edu application platform, and a Sphero Bolt to develop and deploy the application.

- Hardware- The hardware platforms we used to develop the project were laptops that contain CPUs, motherboards, power supplies, SSDs, memory, and the Sphero Robot.

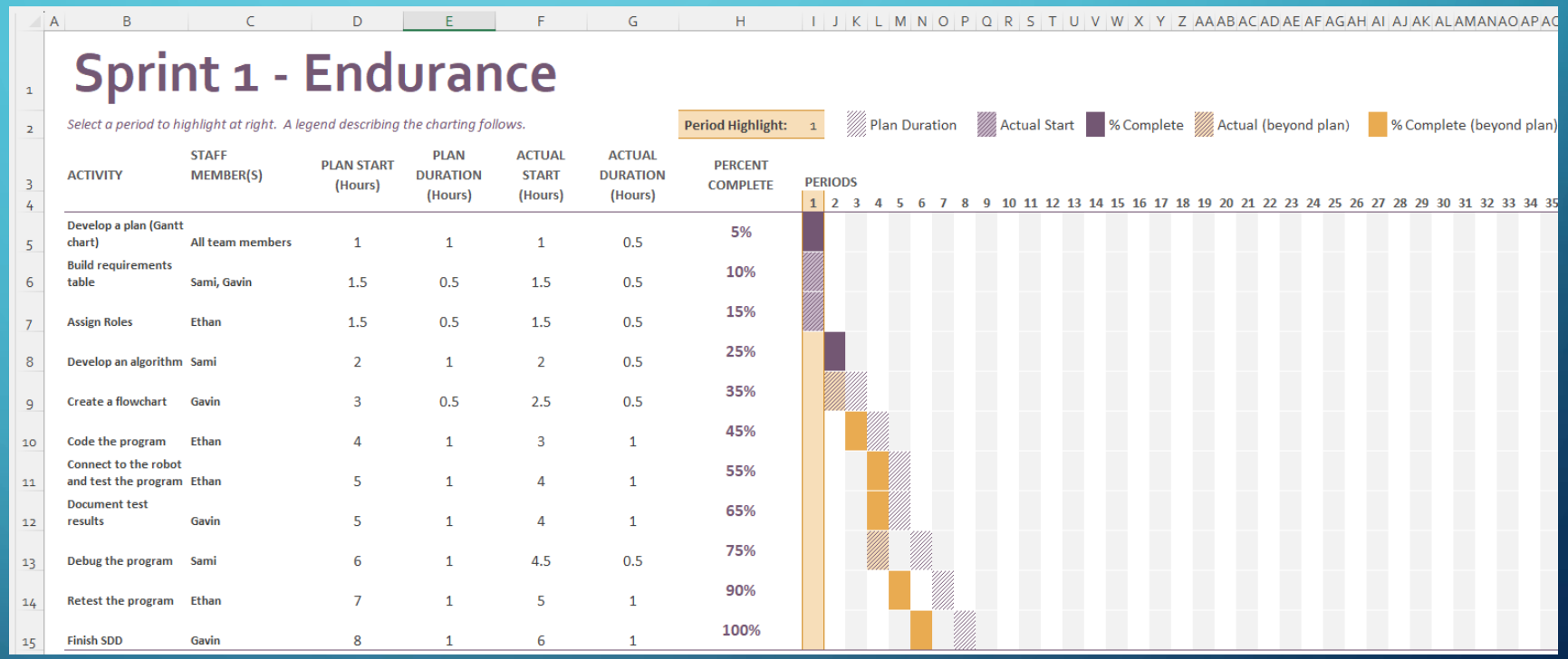
SPRINT 1: ENDURANCE

ethanwillard/endurance

CONDENSED SUMMARY

- Overview- We are piloting a mini robot around a rectangular course set up.
- Purpose- Implement beginner programming, and physically see that code executed through the robot.
- Context- The project is related to a variety of other basic coding projects.
- Dependencies- Basic coding based on the algorithm as well as proper hardware is required. The robot also must calibrate for aim and proper axis orientation.

GANT CHART



Sprint 1 - Endurance

Select a period to highlight at right. A legend describing the charting follows.

Period Highlight: 1

Plan Duration | Actual Start | % Complete | Actual (beyond plan) | % Complete (beyond plan)

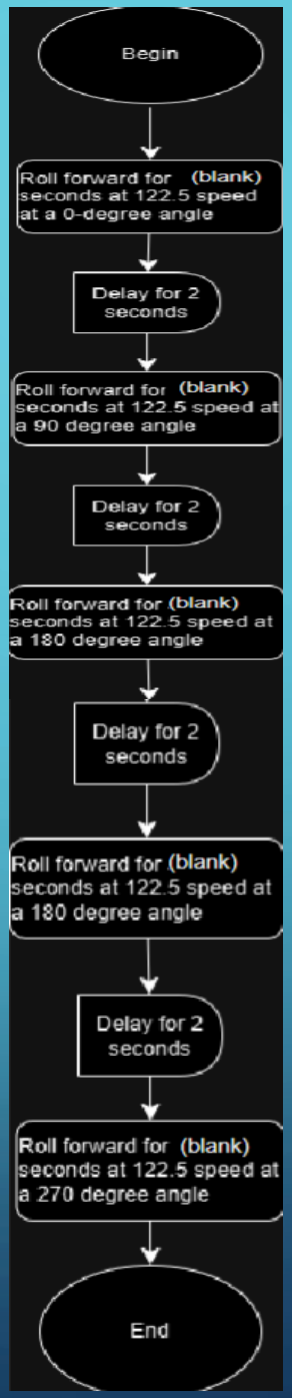
ACTIVITY	STAFF MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATION (Hours)	PERCENT COMPLETE
Develop a plan (Gantt chart)	All team members	1	1	1	0.5	5%
Build requirements table	Sami, Gavin	1.5	0.5	1.5	0.5	10%
Assign Roles	Ethan	1.5	0.5	1.5	0.5	15%
Develop an algorithm	Sami	2	1	2	0.5	25%
Create a flowchart	Gavin	3	0.5	2.5	0.5	35%
Code the program	Ethan	4	1	3	1	45%
Connect to the robot and test the program	Ethan	5	1	4	1	55%
Document test results	Gavin	5	1	4	1	65%
Debug the program	Sami	6	1	4.5	0.5	75%
Retest the program	Ethan	7	1	5	1	90%
Finish SDD	Gavin	8	1	6	1	100%

PERIODS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

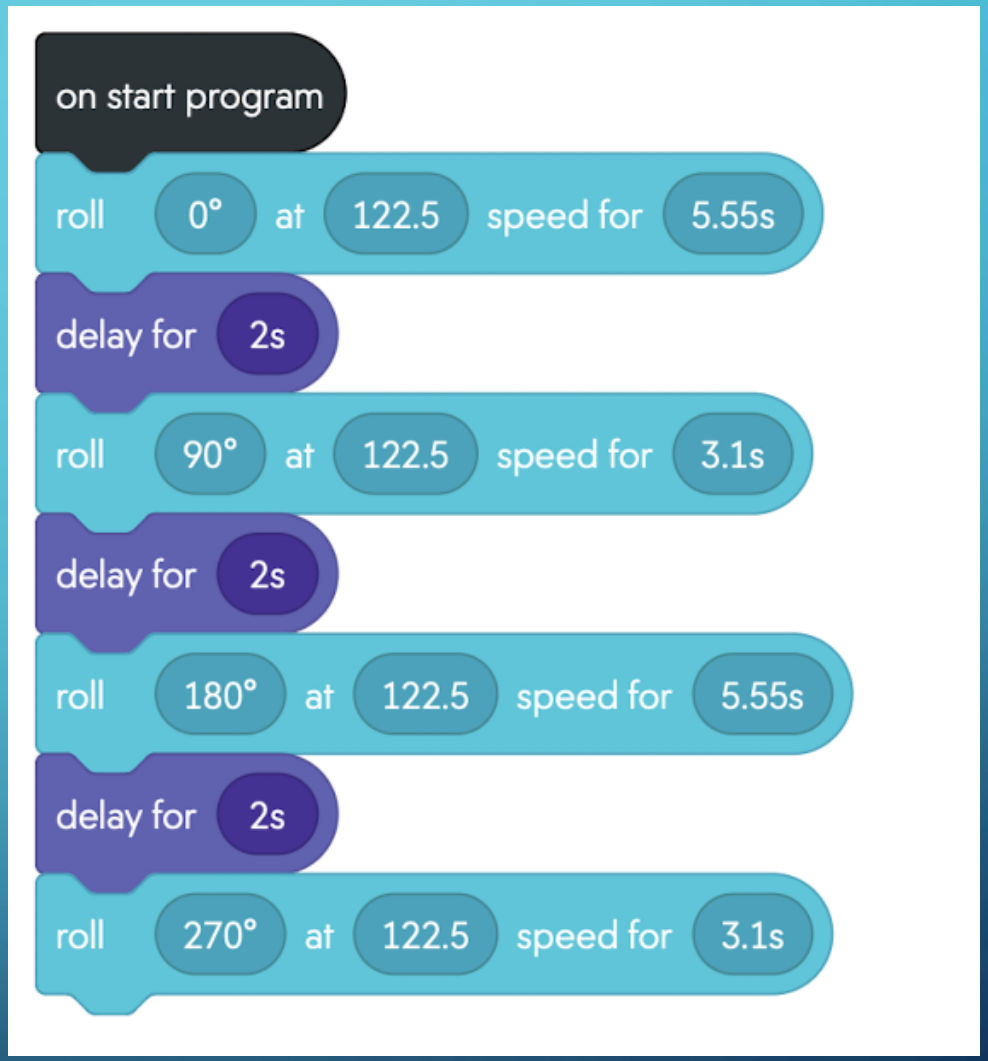
ALGORITHM

- On the start of the program, Roll forward at 122.5 speed for (X) seconds at a 0-degree angle
    - Delay for 2 seconds
- Roll forward at 122.5 speed for (X) seconds at a 90-degree angle
    - Delay for 2 seconds
- Roll forward at 122.5 speed for (X) seconds at a 180-degree angle
    - Delay for 2 seconds
- Roll forward at 122.5 speed for (X) seconds at a 270-degree angle
- End

SYSTEM FLOW


Begin
Roll forward for (blank) seconds at 122.5 speed at a 0-degree angle
Delay for 2 seconds
Roll forward for (blank) seconds at 122.5 speed at a 90 degree angle
Delay for 2 seconds
Roll forward for (blank) seconds at 122.5 speed at a 180 degree angle
Delay for 2 seconds
Roll forward for (blank) seconds at 122.5 speed at a 180 degree angle
Delay for 2 seconds
Roll forward for (blank) seconds at 122.5 speed at a 270 degree angle
End

BLOCK CODE


on start program
roll 0° at 122.5 speed for 5.55s
delay for 2s
roll 90° at 122.5 speed for 3.1s
delay for 2s
roll 180° at 122.5 speed for 5.55s
delay for 2s
roll 270° at 122.5 speed for 3.1s

TEST PLAN

Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
11/1	Slight overshot of the end point	Slight overshot of the end point	Ethan	Fail
11/1	Slight overshot of the endpoint	Slight overshot of the end point	Sami	Fail
11/1	Accurate length achieved	The robot undershot the length of the path	Ethan	Fail
11/1	Accurate length achieved	The robot undershot the length of the path	Sami	Fail
11/1	Accurate length achieved	The robot rolled the proper distance	Ethan	Pass
11/1	Accurate length achieved	The robot rolled the proper distance	Sami	Pass
11/1	Accurate path taken	The robot stayed on path and reached the end goal	Ethan	Pass

Sprint 1 Data:

Video:
file:///C:/Users/super/Downloads/EnduranceVideo%20(1).mp4

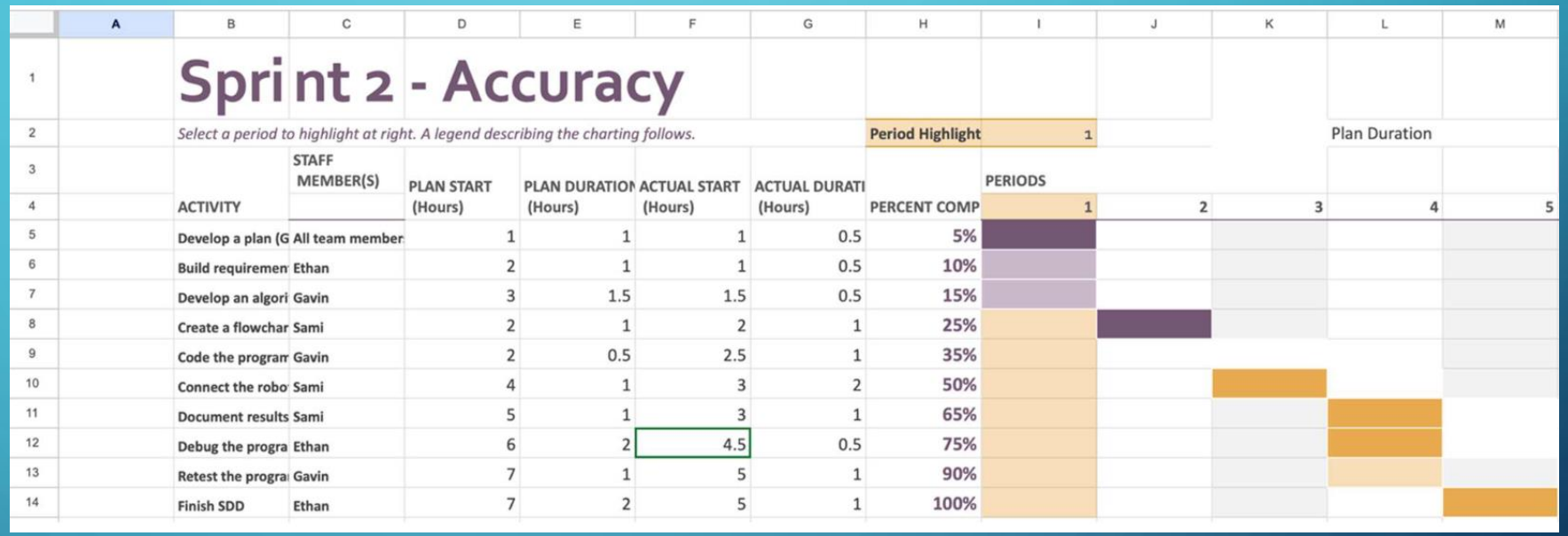
SPRINT 2: ACCURACY

ethanwillard/Accuracy

CONDENSED SUMMARY

- Overview- We are piloting a mini robot around a figure-eight loop.
- Purpose- Implement beginner programming, stick to the loop accurately, and ensure proper axis orientation.
- Context- The project is related to a variety of other basic coding projects such as having the robot move in a rectangular shape in the prior Sprint.
- Dependencies- Basic coding based on the algorithm as well as proper hardware is required. The robot also must calibrate for aim and proper axis orientation.

GANT CHART

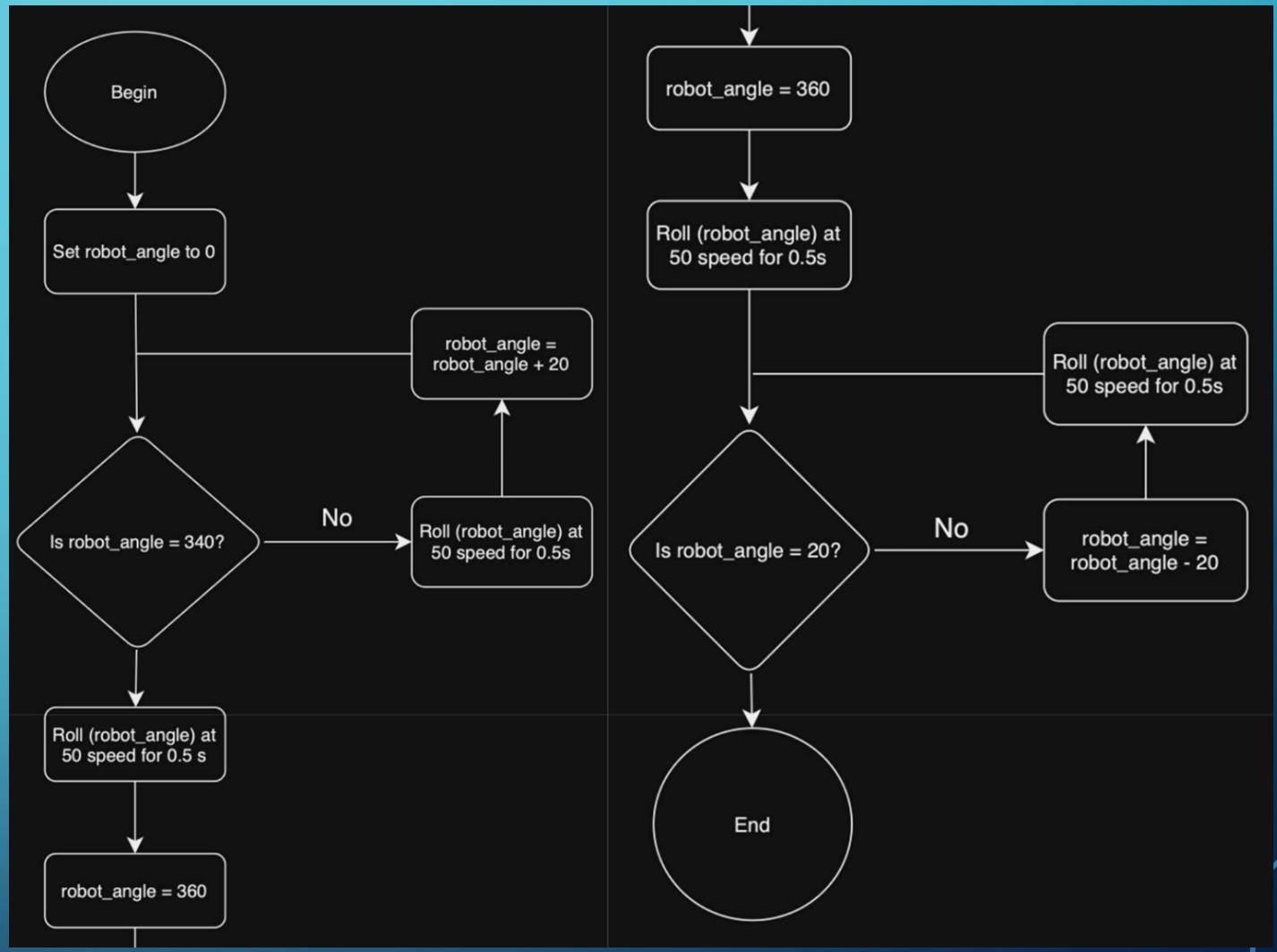


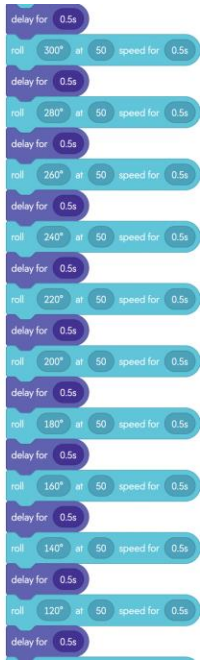
	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Sprint 2 - Accuracy											
2		*Select a period to highlight at right. A legend describing the charting follows.*						Period Highlight	1			Plan Duration	
3			STAFF						PERIODS				
4		ACTIVITY	MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATI (Hours)	PERCENT COMP	1	2	3	4	5
5		Develop a plan (G	All team member	1	1	1	0.5	5%					
6		Build requiremen	Ethan	2	1	1	0.5	10%					
7		Develop an algori	Gavin	3	1.5	1.5	0.5	15%					
8		Create a flowchar	Sami	2	1	2	1	25%					
9		Code the program	Gavin	2	0.5	2.5	1	35%					
10		Connect the robo	Sami	4	1	3	2	50%					
11		Document results	Sami	5	1	3	1	65%					
12		Debug the progra	Ethan	6	2	4.5	0.5	75%					
13		Retest the progra	Gavin	7	1	5	1	90%					
14		Finish SDD	Ethan	7	2	5	1	100%					

ALGORITHM

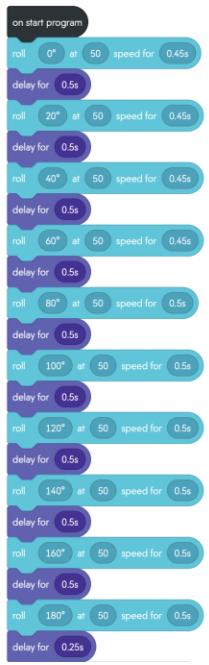
- On the start of the program, Set Robot angle to 0
- While robot_angle does not equal 340
    - Roll as (robot_angle) at 50 speed for 0.5s
    - Robot_angle = robot_angle + 20
- Roll at (robot_angle) at 50 speed for 0.5s
- Robot_angle = 360
- Roll at (robot_angle) at 50 speed for 0.5s
- While robot_angle does not equal 20
    - Robot_angle = robot_angle – 20
    - Roll at (robot_angle) at 50 speed for 0.5s
- End

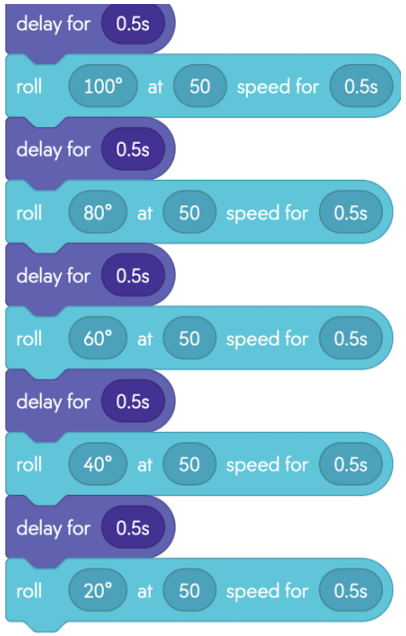
SYSTEM FLOW


Begin
Set robot_angle to 0
robot_angle = robot_angle + 20
Is robot_angle = 340?
No
Roll (robot_angle) at 50 speed for 0.5s
Roll (robot_angle) at 50 speed for 0.5 s
robot_angle = 360
robot_angle = 360
Roll (robot_angle) at 50 speed for 0.5s
Roll (robot_angle) at 50 speed for 0.5s
Is robot_angle = 20?
No
robot_angle = robot_angle - 20
End


delay for 0.5s
roll 300° at 50 speed for 0.5s
delay for 0.5s
roll 280° at 50 speed for 0.5s
delay for 0.5s
roll 260° at 50 speed for 0.5s
delay for 0.5s
roll 240° at 50 speed for 0.5s
delay for 0.5s
roll 220° at 50 speed for 0.5s
delay for 0.5s
roll 200° at 50 speed for 0.5s
delay for 0.5s
roll 180° at 50 speed for 0.5s
delay for 0.5s
roll 160° at 50 speed for 0.5s
delay for 0.5s
roll 140° at 50 speed for 0.5s
delay for 0.5s
roll 120° at 50 speed for 0.5s
delay for 0.5s


roll 200° at 50 speed for 0.5s
delay for 0.5s
roll 220° at 50 speed for 0.5s
delay for 0.5s
roll 240° at 50 speed for 0.5s
delay for 0.5s
roll 260° at 50 speed for 0.5s
delay for 0.5s
roll 280° at 50 speed for 0.5s
delay for 0.5s
roll 300° at 50 speed for 0.5s
delay for 0.5s
roll 320° at 50 speed for 0.5s
delay for 0.5s
roll 340° at 50 speed for 0.5s
delay for 0.5s
roll 0° at 50 speed for 0.5s
delay for 0.25s
roll 340° at 50 speed for 0.5s
delay for 0.5s
roll 320° at 50 speed for 0.5s


on start program
roll 0° at 50 speed for 0.45s
delay for 0.5s
roll 20° at 50 speed for 0.45s
delay for 0.5s
roll 40° at 50 speed for 0.45s
delay for 0.5s
roll 60° at 50 speed for 0.45s
delay for 0.5s
roll 80° at 50 speed for 0.5s
delay for 0.5s
roll 100° at 50 speed for 0.5s
delay for 0.5s
roll 120° at 50 speed for 0.5s
delay for 0.5s
roll 140° at 50 speed for 0.5s
delay for 0.5s
roll 160° at 50 speed for 0.5s
delay for 0.5s
roll 180° at 50 speed for 0.5s
delay for 0.25s


delay for 0.5s
roll 100° at 50 speed for 0.5s
delay for 0.5s
roll 80° at 50 speed for 0.5s
delay for 0.5s
roll 60° at 50 speed for 0.5s
delay for 0.5s
roll 40° at 50 speed for 0.5s
delay for 0.5s
roll 20° at 50 speed for 0.5s

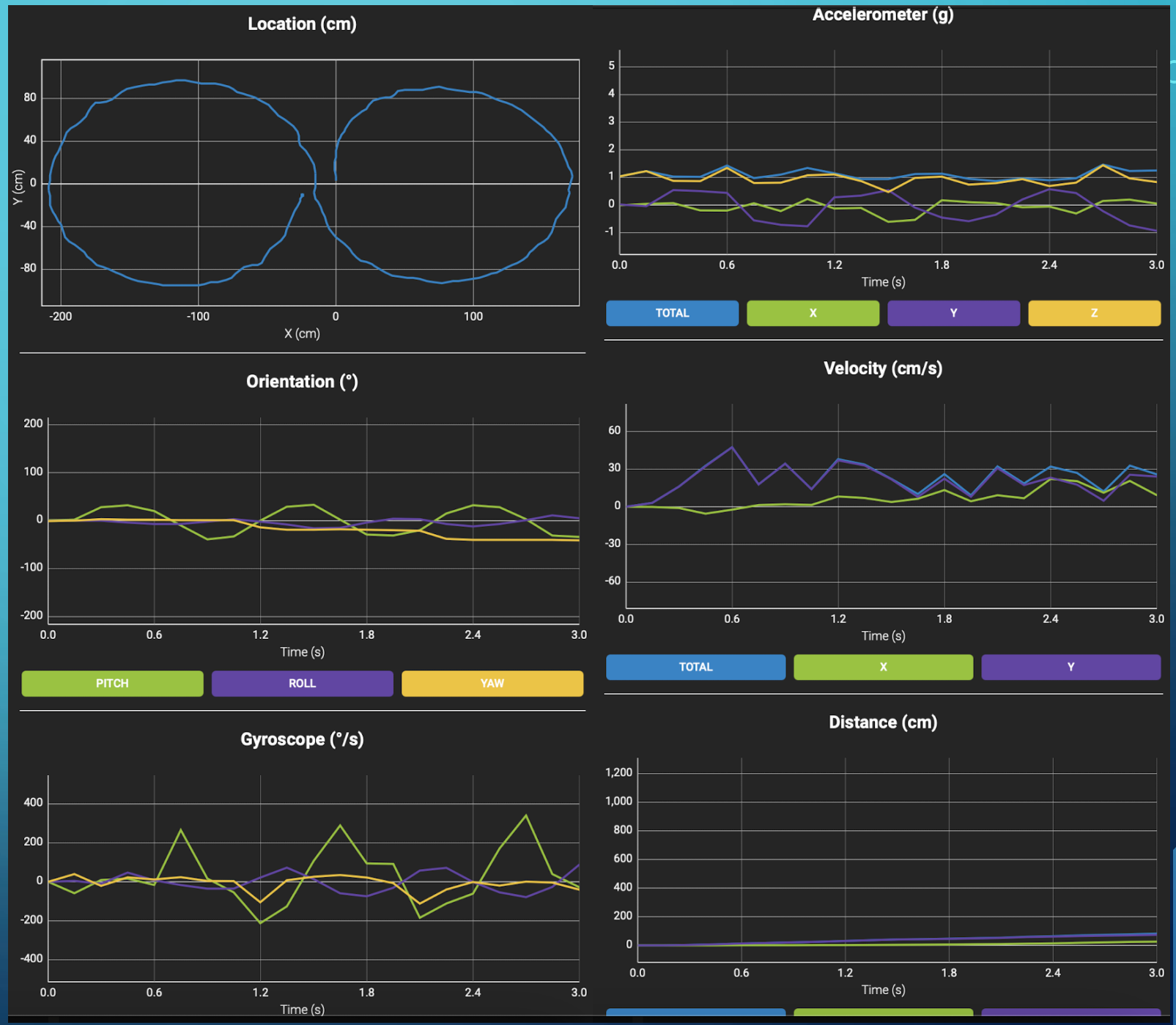
BLOCK CODE

TEST PLAN

Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
11/13	Slight overshot on each leg of the loop	Slight overshot on each leg of the loop	Sami	Fail
11/13	Slight undershot on each leg of the loop	Slight overshot on each leg of the loop	Ethan	Fail
11/3	Accurate length achieved for each leg of the loops	The robot undershot the length of each leg	Ethan	Fail
11/3	Accurate length achieved	The robot hit the correct length of each loop, but was inaccurate	Sami	Fail
11/3	Accurate path achieved	The robot rolled the proper distance on course after an adjustment of the delay time	Gavin	Pass

Sprint 2 Data:

Video:
file:///C:/Users/super/OneDrive/Documents/Accuracy%20video.mp4



SPRINT 3: AGILITY

ethanwillard/Agility

CONDENSED SUMMARY

- Overview- We are piloting the robot around the obstacle course to avoid objects, move up a ramp, and knock down pins.
- Purpose- Implement beginner programming and effectively guide the robot through that programming.
- Context- We have built off prior projects such as guiding the robot around in a figure eight loop using simple coding.
- Dependencies- Basic coding based on the algorithm as well as proper hardware is required. Sensors within the robot are necessary for proper collaboration and control.

GANT CHART

Sprint 3 - Agility

Select a period to highlight at right. A legend describing the charting follows.

Period Highlight 1

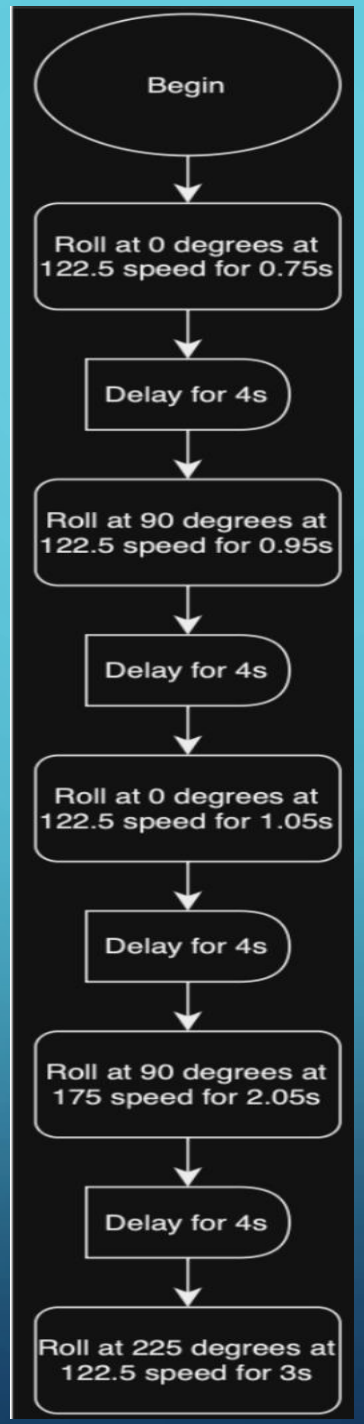
Plan Duration

ACTIVITY	STAFF MEMBER(S)	PLAN START (Hours)	PLAN DURATION (Hours)	ACTUAL START (Hours)	ACTUAL DURATION (Hours)	PERCENT COMP	PERIODS 1	2	3	4	5
Develop a plan (Gantt chart)	All team members	2	1.5	1	0.5	5%					
Build requirements table	Ethan	3	1	1	1	10%					
Develop an algorithm	Gavin	2	0.5	1.5	2	15%					
Create a flowchart	Sami	2	1	1.5	1	25%					
Code the program	Gavin	2	0.5	2	1	35%					
Connect the robot and test the program	Sami	4	1	2.5	2	50%					
Document results	Sami	5	1	3	1	65%					
Debug the program	Ethan	6	2	4.5	0.5	75%					
Retest the program	Gavin	7	1	5	1	90%					
Finish SDD	Ethan	7	2	5	1	100%					

ALGORITHM

- On the start of the program, Roll forward at 0 degrees at 122.5 speed for 0.75 seconds
    - Delay for 4 seconds
- Roll forward at 90 degrees at 122.5 speed for 0.95 seconds
    - Delay for 4 seconds
- Roll forward at 0 degrees at 122.5 speed for 1.05 seconds
    - Delay for 4 seconds
- Roll forward at 90 degrees at 175 speed for 2.05 seconds
    - Delay for 4 seconds
- Roll forward at 225 degrees at 122.5 speed for 3 seconds
- End

SYSTEM FLOW


Begin
Roll at 0 degrees at 122.5 speed for 0.75s
Delay for 4s
Roll at 90 degrees at 122.5 speed for 0.95s
Delay for 4s
Roll at 0 degrees at 122.5 speed for 1.05s
Delay for 4s
Roll at 90 degrees at 175 speed for 2.05s
Delay for 4s
Roll at 225 degrees at 122.5 speed for 3s

TEST PLAN

Test Date	Expected Output	Observed Output	Staff Name	Pass/Fail
12/4	Slight overshot on each of the first 3 rolls	Slight overshot on each of the first 3 rolls	Sami	Fail
12/4	Slight undershot on each of the first 3 rolls	Slight undershot on each of the first 3 rolls	Sami	Fail
12/4	Reach the end of the course	Robot did not make it up binder due to lack of speed	Ethan	Fail
12/4	Robot makes it up the binder and hits the pins	The robot made it up the binder, but didn't go far enough to stay on the path to hit the pins	Ethan	Fail
12/4	Accurate path achieved	The robot rolled the proper length on each leg in order to reach the end	Gavin	Pass

Sprint 3 Data:

CONCLUSION

In these sprint projects, we got to hone our coding and problem-solving skills as well as getting real-world experience using other skills we learned in class such as flowcharting and algorithm making. Most coding projects never work initially, and require corrections, so the troubleshooting practice we gained will be critical to our success in future courses.