



Marquayvin Humble-Gaines, Alejandro Cornejo, Justin Dees, Alexander Hamilton  
Sponsor: Liam Quinn / Texas State University

## Project Overview

Our project focuses on designing two autonomous, battery-powered robots that navigate and solve mazes within 5 minutes using sensors and algorithms, showcasing their potential for industrial exploration and navigation applications.

## Design Requirements

- Traverse a 5ft x 5ft x 0.5 ft, with a travel space width of 6 inches
- Achieve maze completion while utilizing sensor and routing algorithms to avoid collisions
- Constructed 2 robots featuring PCB chassis designs
- Map a maze within 5 minutes and execute a speed run with the solution
- Maintain a \$40 budget
- Under 15cm x 15cm x 15cm dimensions
- Weigh less than 600g

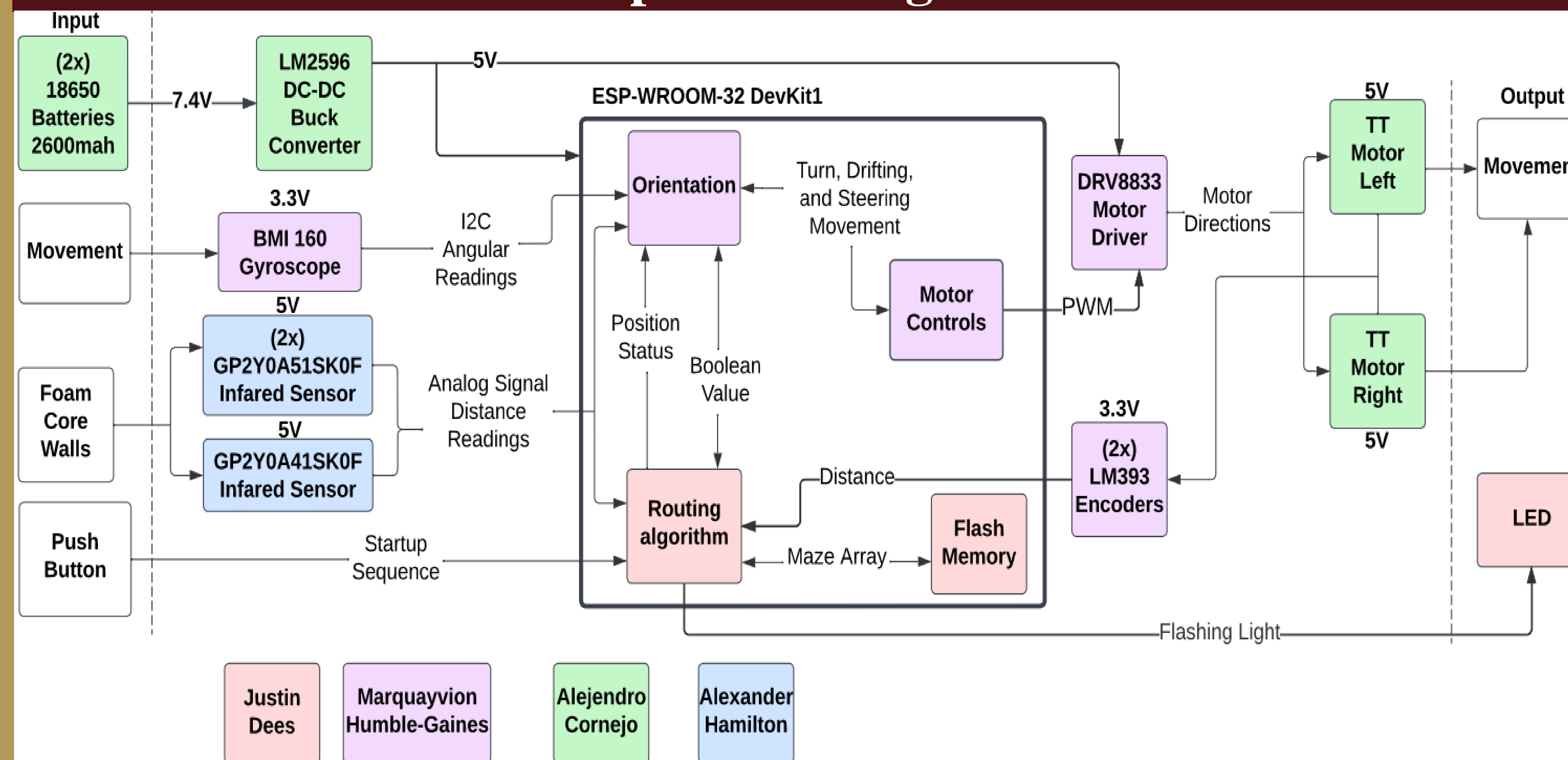
## Dimensions

- Size: 10.9cm (W) x 10.7cm (L) x 12.7cm (H)
- Mass: 385.1g
- Unit Cost: \$37.37

## Acknowledgements

Sponsor: Liam Quinn  
Faculty Advisor: Mark Welker

## Top Level Diagram



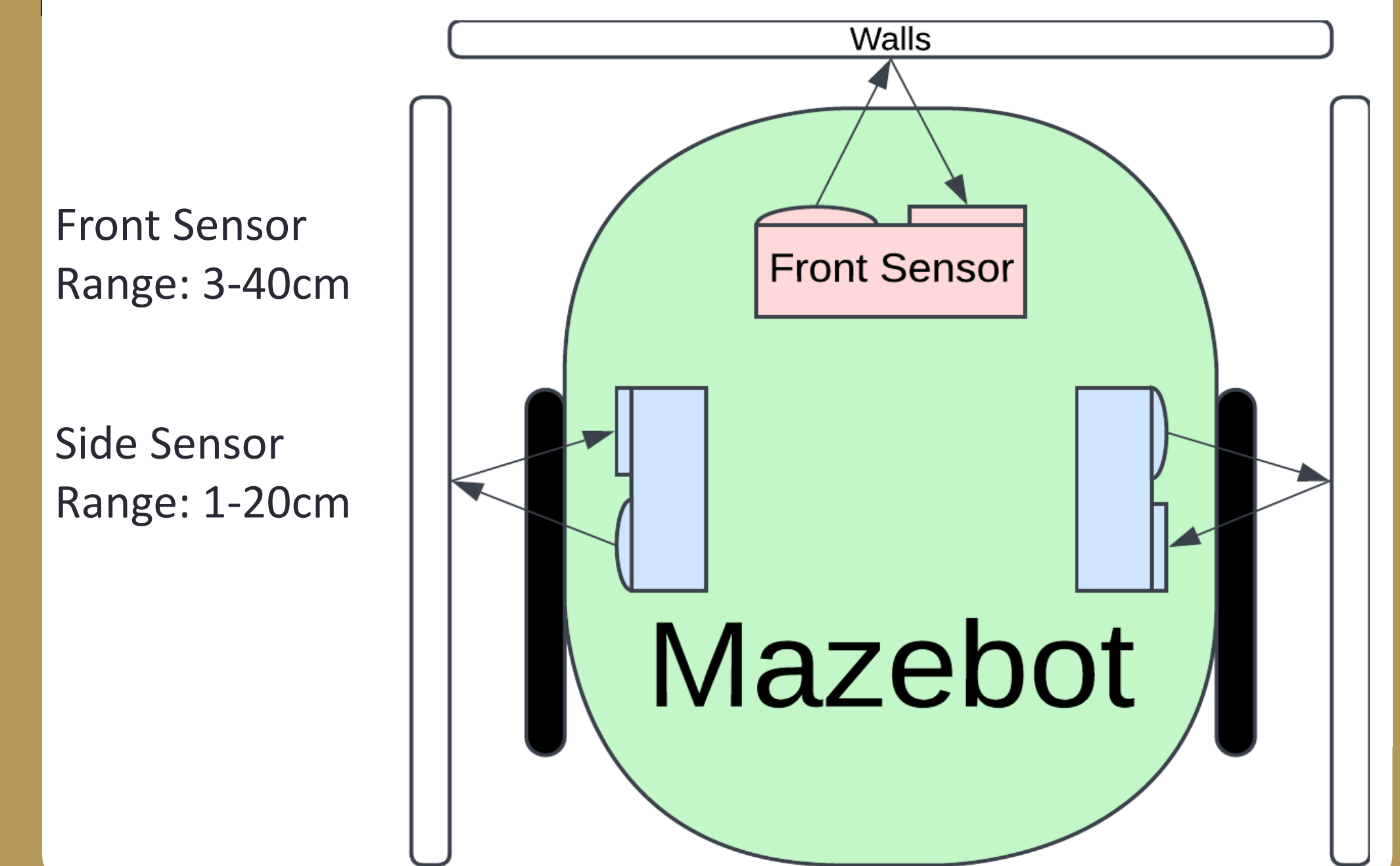
Justin Dees    Marquayvion Humble-Gaines    Alejandro Cornejo    Alexander Hamilton

## Team

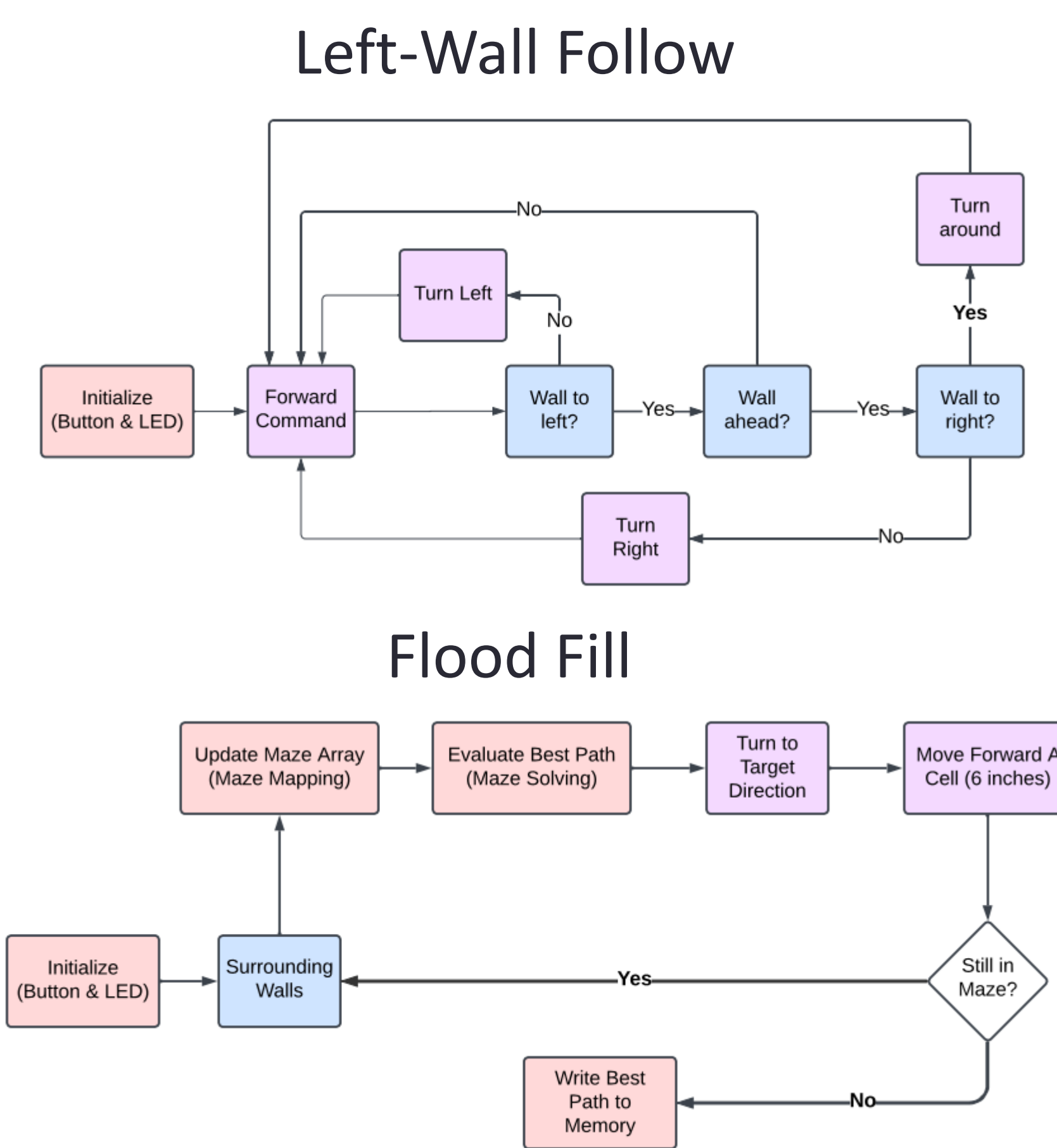


**Justin** -Navigation  
**Alejandro** - Power  
- PCB Chassis  
**Marquayvin** -Orientation  
-Motor Control  
**Alexander** -Wall Detection

## IR Sensor Layout



## Navigation Routing Algorithms



## Drift Correction Testing

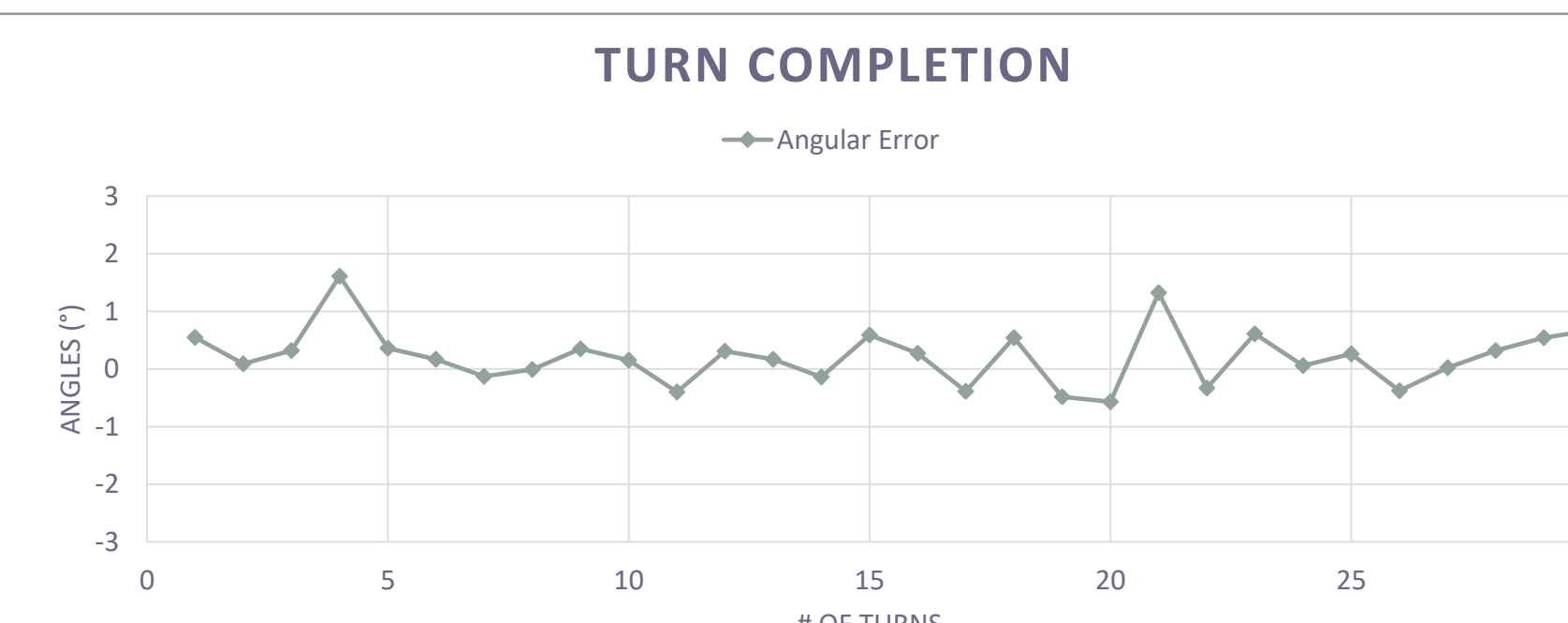
To test drift correction, have the robot travel 5 feet along one wall or 2 feet between walls, counting a failure if it hits a wall twice or fails to recover steering

Left wall steering	PASS	– 20/20 Results
Right wall steering	PASS	– 20/20 Results
Between walls steering	PASS	– 9/10 Results

## Turning Accuracy

Testing Left and Right turns at 90 degrees and Dead End turns at 180 degrees with a +/- 3 degrees margin of error.

Left turns	PASS	– 30/30 Results
Right turns	PASS	– 30/30 Results
Dead end turns	PASS	– 15/15 Results



## Run Time Testing

Run Time Testing	Comments
5/5	PASS - 40-minute runs without going below 8V

## Full Integration Test Results

Our full integration testing will evaluate the left wall-following algorithm's performance, including successful completions, speed before failure, allowable wall contacts, and remains untested for speed runs. Testing size: 3ft x 2ft x 0.5ft

Requirement	Results	Outcome
Maze Completion	9/10	PASS
Speed of Completions: Less than 3 minutes	Time: 1min 4secs	PASS
Wall Contacted: Less than 3 times	Contact Avg: 1.11	PASS
Speed Run Optimization	Untested	Fail