E2.06 - Wayfinder

Shivani Mruthyunjaya, Eignar Cienfuegos, David Tavarez, Darryl Murray III

Sponsor Names: Mr.Brown & Mr.Welker

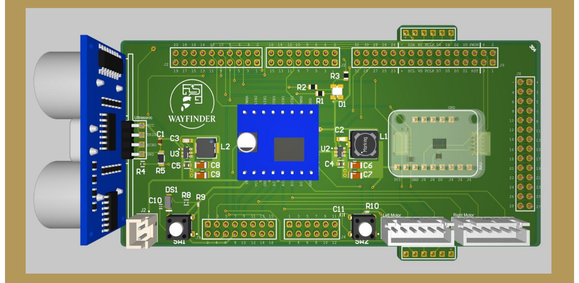
Overview

Our product is an autonomous robot engineered to navigate and map complex mazes using real-time sensor and localization data

D2 Objectives

- Map maze in less than 5 minutes followed by 3 speed runs.
- Functional PCB based design.
- Integrate camera module.
- Validate Subsystem Integration

PCB Design

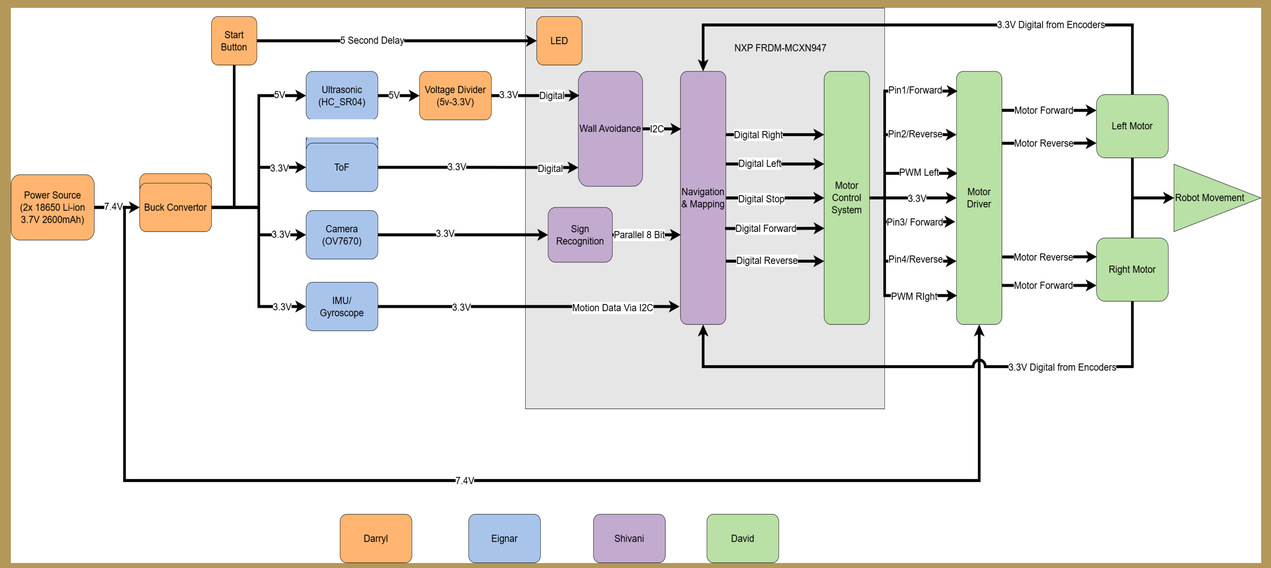


- Detailed view of shield PCB with all surface mounted components.

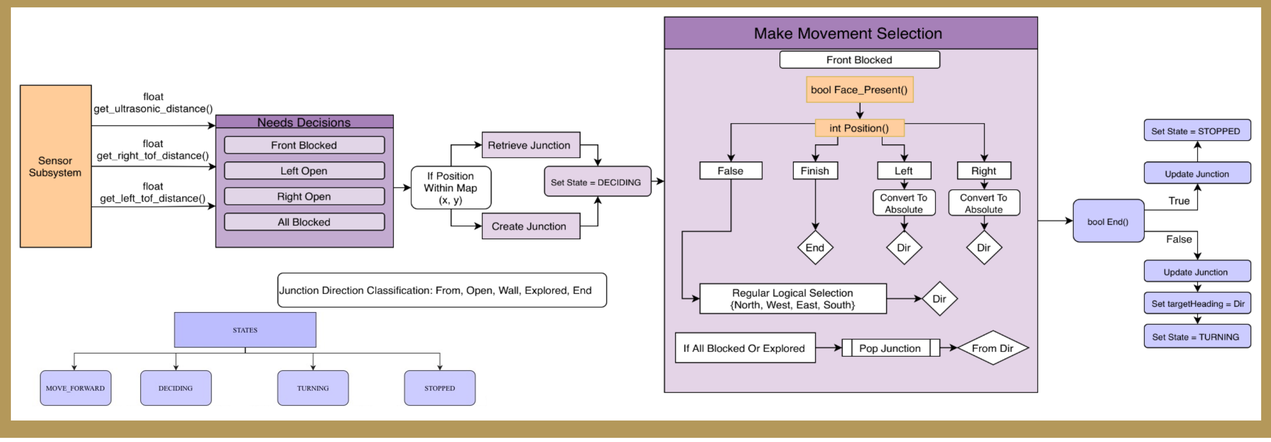
Cost & Budget

Component	Quantity	Price Each	Subtotal Cost
NXP FRDM-MCXN947	1	$25	$25
Dual DC Motor Driver (TB6612FNG)	1	$2.61	$2.61
PCB	1	$70	$70
Motors (Geared 7 VDC with Magnetic Encoders)	2	$13.5	$27
Battery (Li-ion 18650 3.7V 2600mA)	2	$5.99	$11.98
Battery Mount	1	$1.99	$1.99
Camera (OV7670)	1	$2.30	$2.30
Time of Flight (VL53L0X)	2	$14.95	$29.90
Ultrasonic (HC-SR04)	1	$1.30	$1.30
IMU (LSM6DS3)	1	$11.95	$11.95
		Total Unit Cost	$184.03

Overall Block Diagram



System Architecture



Meet The Team

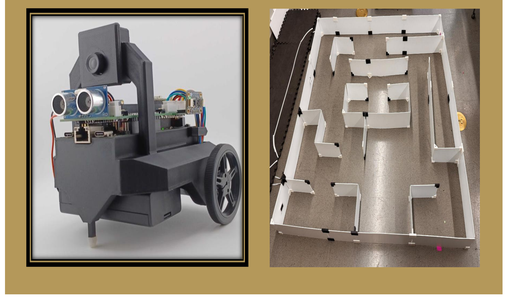
David Tavarez Motor Lead

Darryl Murray Power & Hardware Lead

Shivani Mruthyunjaya Navigation Lead

Eignar Cienfuegos Sensor Lead

The Bot and The Maze



D2 Accomplishments

- Maze Traversal
- Mapping Functionality
- Wall avoidance
- Integrated PCB shield
- Camera functioning with 97% accuracy image detection
- Tested individual subsystems to validate their functionality
- Tested integrated subsystems

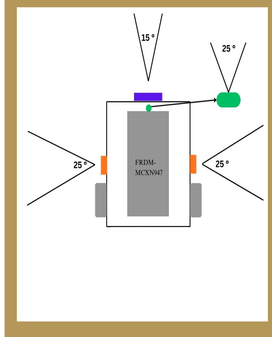
Camera Detection

False Finish Right Left

- Finish – Signals end of maze
- False – Ignore image (do nothing)
- Right – Make a right turn
- Left – Make a left turn

TinyCNN - Trained Classification model
Confidence Level of **97%** within **[10 cm to 76 cm]**

Sensors



The sensors are oriented around the Mazebot for visual input

- Ultrasonic (front)
- Time of Flights (left, right)
- IMU (inside)
- Camera (front)

Acknowledgements

Sponsor:
- Chris Brown & Mark Welker

Faculty Advisor:
- Mark Welker