

Design Choices

Batteries & Holder

- Smaller batteries reduce weight and increase speed.
- Custom-fabricated holder minimizes additional mass.
- Capacity sized to maze run duration — no excess needed.

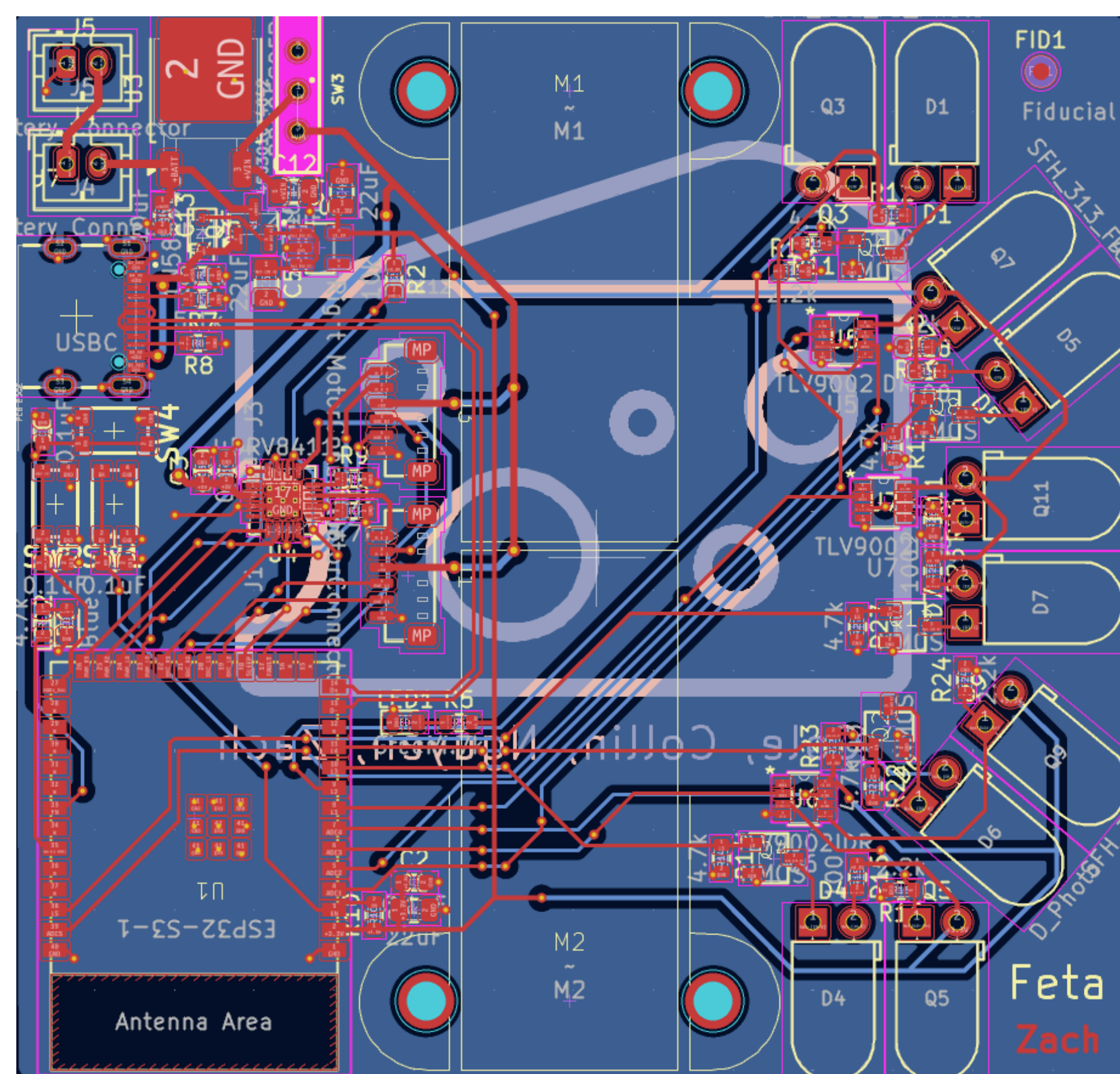
Sensor Array

- Diagonal IR pairs enable corner detection beyond basic front, side, and rear wall sensing.
- Angle correction algorithm to compensate for drift and misalignment mid-run.

Compact Board Design

- Low-profile chassis keeps CoM close to ground for stability
- Sensors mounted at diagonal angles to maximize wall coverage without increasing form factor
- Compact to navigate maze cells with clearance to spare

Board Design

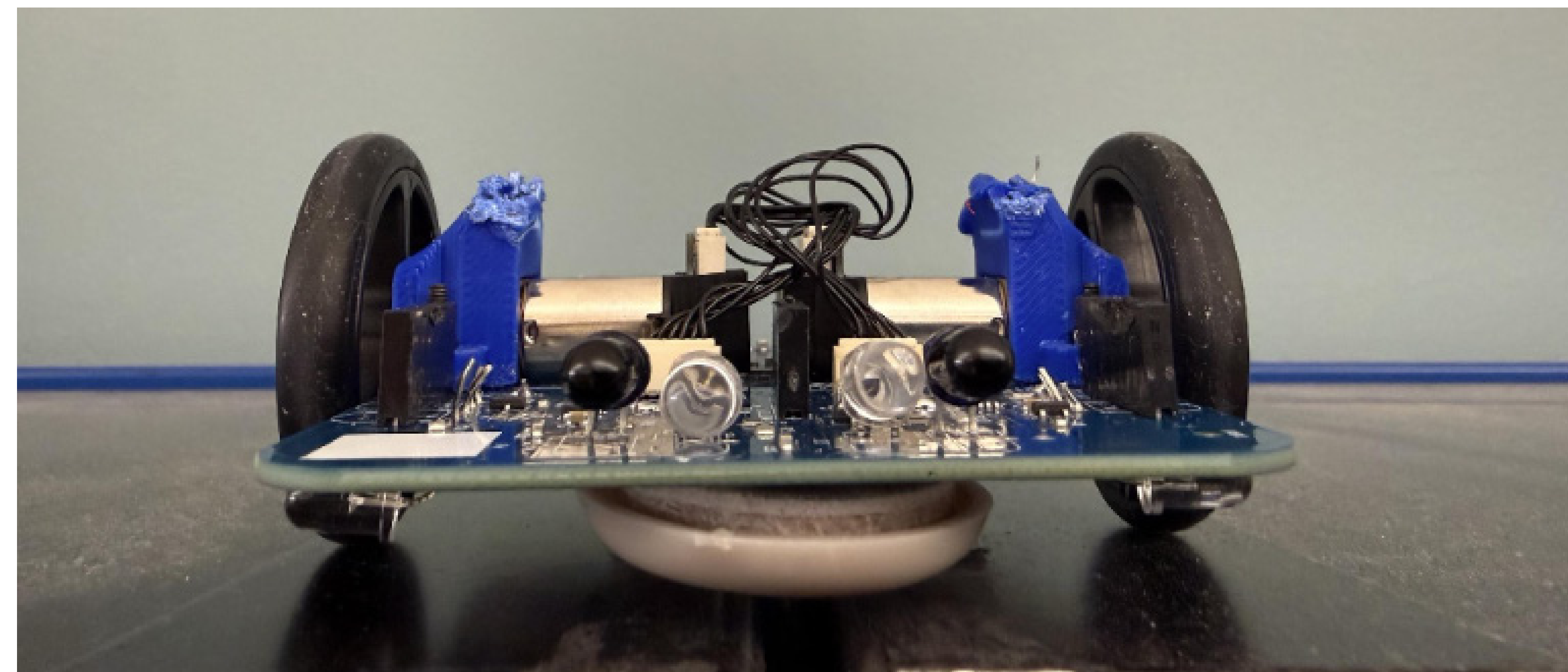


Features

- 2-layer PCB for cost-effective production
- ESP32-C6 as main MCU (Wi-Fi / BT capable)
- DRV8411 dual H-bridge motor driver
- AP2112 3.3V LDO + 5V boost for dual-rail power supply
- 5 IR LED/photodiode pairs switched via NMOS MOSFETs
- TLV9002 op-amps for IR signal amplification
- USB-C for programming and debug

Feta Than the Rest

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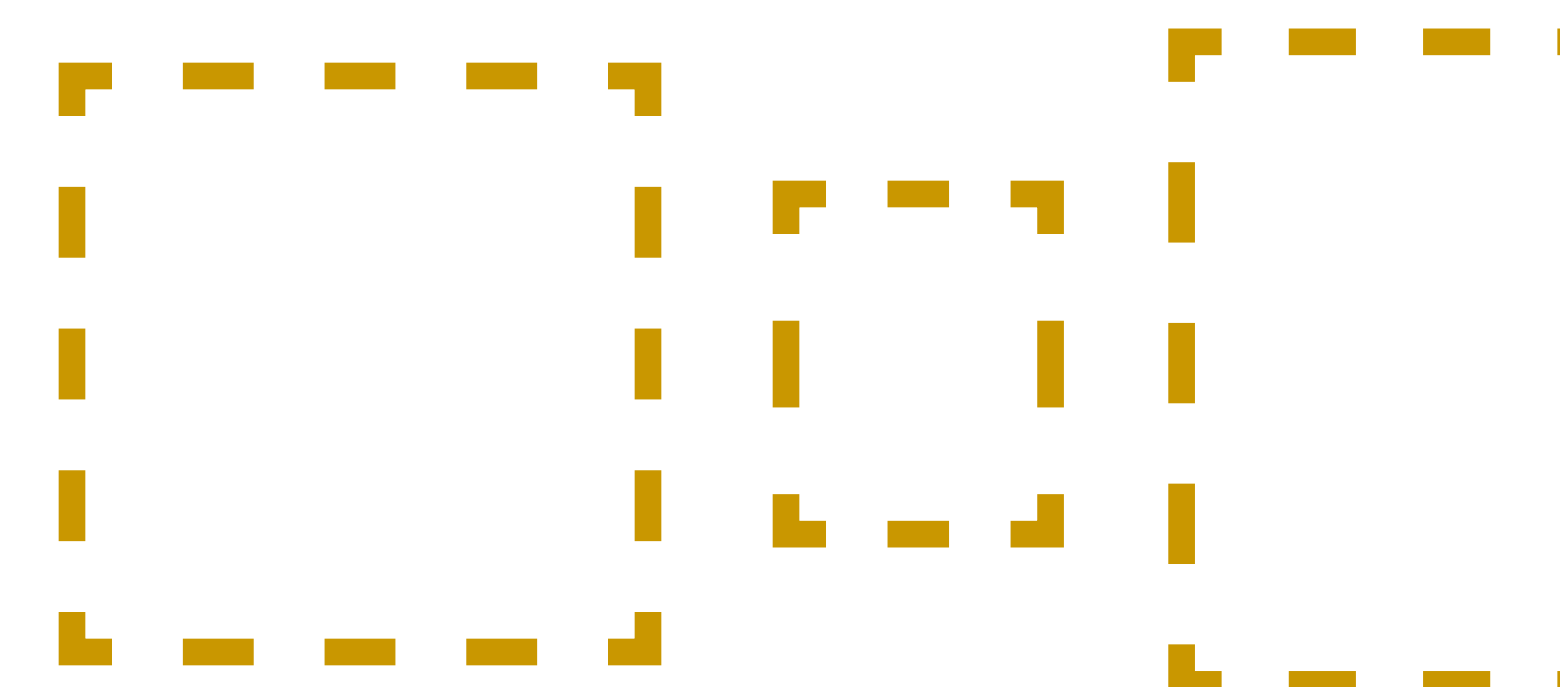
MicroMouse Competition



Goal

Build a fully autonomous robot capable of mapping and solving an unknown maze in the shortest possible time.

Board Showcase



Note: Custom PCB designed but not used for competition — known issues identified; component/board shipping times prevented final integration. Practice mouse used instead.

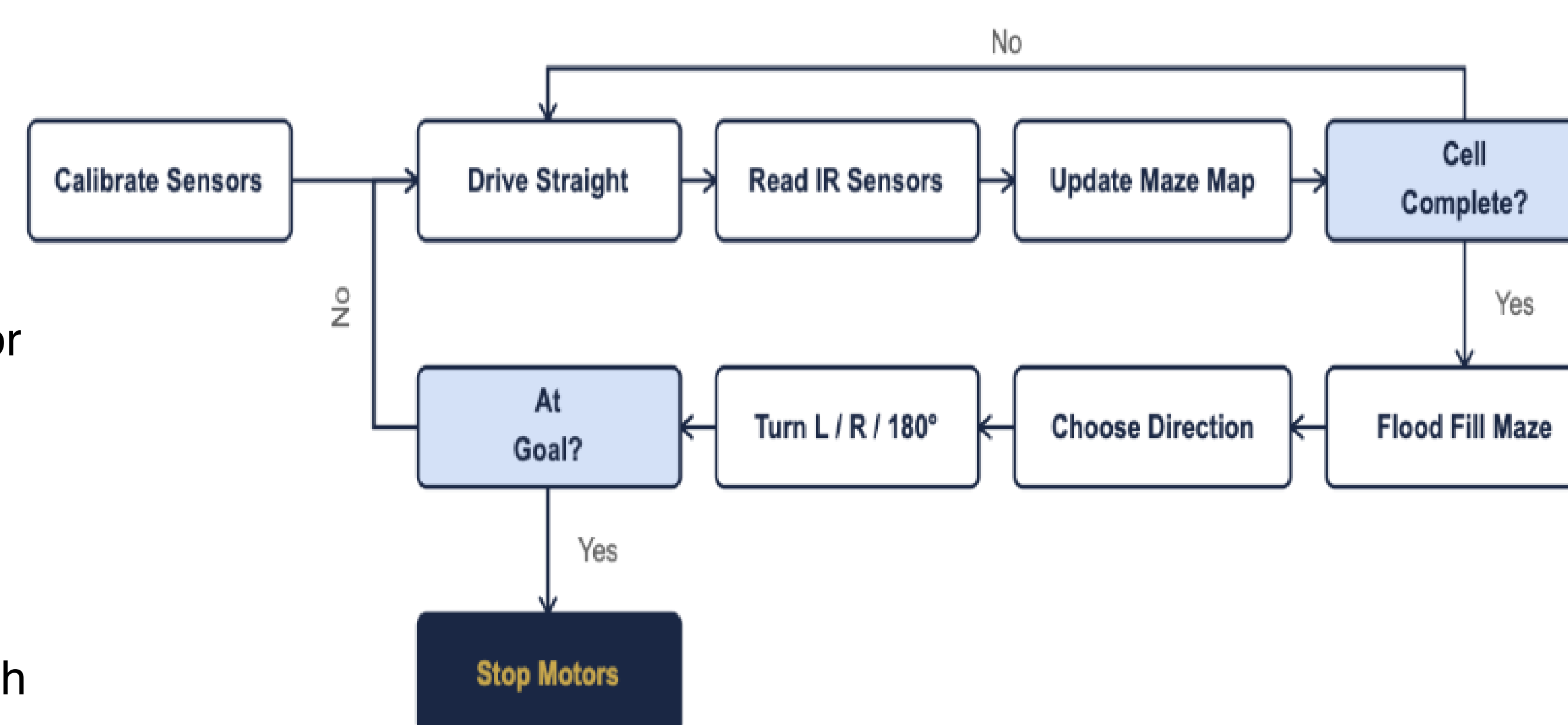
Control & Maze

Maze

- Refined control to hardcode encoder count for cell traversal
- Implemented Flood Fill/DFS Maze Search Algorithm

Control

- Parametrized several control parameters such as K_p and K_d values for PD control



Lessons Learned

Issue: H-Bridge Footprint Mismatch

- DRV8411 is a 3x3mm motor driver but the footprint on the PCB was for a 4x4mm driver.
- Fixed in updated PCB

Learned: To triple check footprints

Issue: 3.3V Regulator Overheat

- Supplied the 3.3V regulator with the battery voltage which was above rating. This eventually broke the part
- We soldered jumper wires to supply the 3.3V regulator with a 5V.
- However current was sinking somewhere causing the regulator to overheat.

Learned: To triple check the schematic

Issue: Board Form Factor Too Large

- First iteration was too long which would cause collisions on turns.

Learned: To triple check dimensions of the PCB

Issue: NMOS with Wrong Pinout

- NMOS transistors for sensor setup had the wrong pinout

Learned: Again, to triple check footprints

Repair Attempts

H-Bridge

- Assembled breakout breadboard using through-hole H-Bridge part from Arduino Kit.
- Used tiny wires to directly solder on JST pins among others.
- This actually worked for a bit until we found an issue with the power circuitry

3.3V Regulator

- Removed power switching circuitry to supply the regulator with 5V using a jumper wire.

Unique Features

Bluetooth

- Live control parameter tuning via Bluetooth.
- Maze cell tracking via Bluetooth
- Remote start/stop/reset via Bluetooth
- Everything ever via Bluetooth

Active Braking

- Instead of letting motors coast, our motors use Active Braking mechanism specified in the datasheet
- The active braking increased our overall speed and decreased any drifting from motor imbalance



