TEXAS STATE
INGRAM SCHOOL OF ENGINEERING

E1.06 - NaviBot

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Overview

NaviBots are fully autonomous battery-powered robots capable of navigating a maze and utilizing different solution algorithms to complete the maze in the shortest time possible.

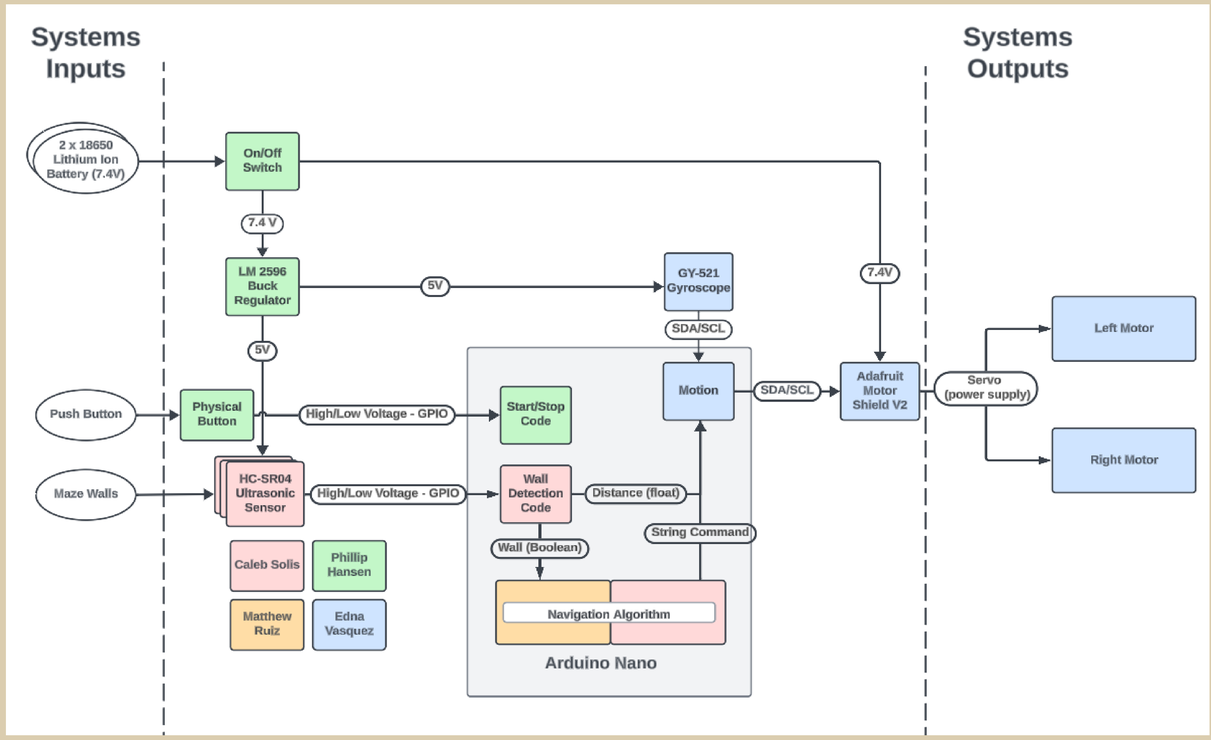
Requirements

- Autonomously navigate an unknown maze environment
- Complete Design 1 (D1) maze within 3 minutes
- Capable of wall detection and avoidance
- Start button
- Size and weight restrictions
- Battery life > 40 minutes
- Budget < $40
- Schematics and printed circuit board (PCB) design for NaviBot V2

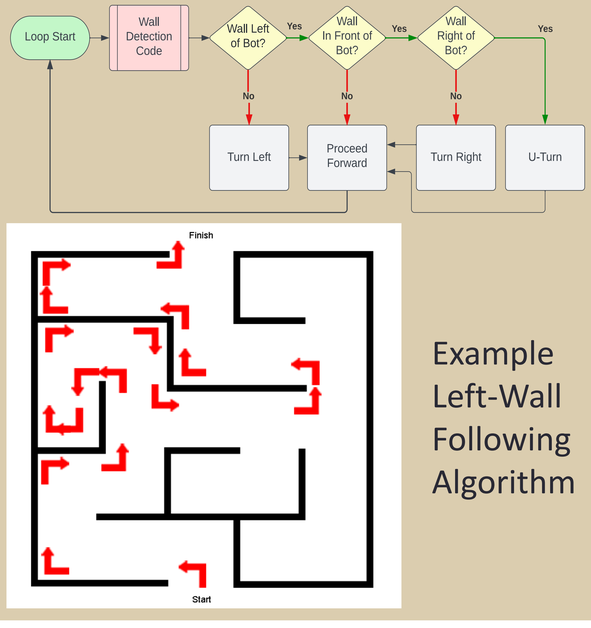
Power Budget

PWM	Duty Cycle	Motor Driver	Wall Detection & Processing	Total Output Current	Estimated Run Time
20	8%	42mA	25.8mA	67.8mA	16.5hrs
40	16%	66mA	25.8mA	91.8mA	11.5hrs
60	24%	110mA	25.8mA	135.8mA	7.2hrs
80	32%	157mA	25.8mA	182.8mA	5hrs
100	40%	200mA	25.8mA	225.8mA	3.9hrs
120	48%	240mA	25.8mA	265.8mA	3.2hrs
140	56%	271mA	25.8mA	296.8mA	2.8hrs
160	64%	298mA	25.8mA	323.8mA	2.5hrs
220	88%	345mA	25.8mA	370.8mA	2.14hrs

Top Level Block Diagram

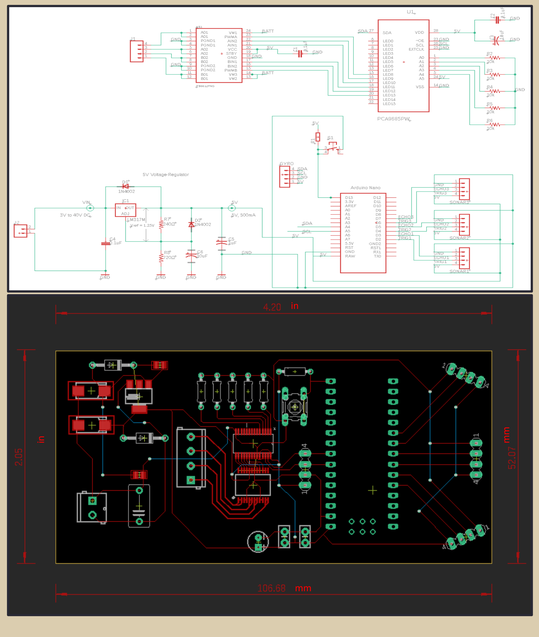


Navigational Algorithm



Example Left-Wall Following Algorithm

PCB Layout and Schematics



Meet the Team

Matthew Ruiz | Caleb Solis | Phillip Hansen | Edna Vasquez

D1 Accomplishments

- PID-based motor correction for parallel wall travel
- Wall detection and proximity awareness
- Left and right wall-following navigation
- Accurate turns through gyroscope measurements
- Battery life > 90 minutes

Design 2 Plans

- Swap to a smaller PCB-based chassis
- Switch to lithium polymer battery to reduce weight
- Implement maze mapping software to utilize known environment solution algorithms
- Switch motors
- Experiment with infrared obstacle avoidance sensors for faster wall-detection

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