Autonomous Obstacle Avoiding Robot

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Parts & Components

Part	Quantity
MSP432 Microcontroller	1
HC-SR04 Ultrasonic Sensors	5
ULN2003APG Motor Drivers	2
4.5V DC Motors	2
Plastic Frame	1
Wheels	2
Portable 5V USB Charger	1
Wires	As needed
Electrical Tape	As needed
AA Batteries	6
AA Battery Holders	3

Block Diagram of System

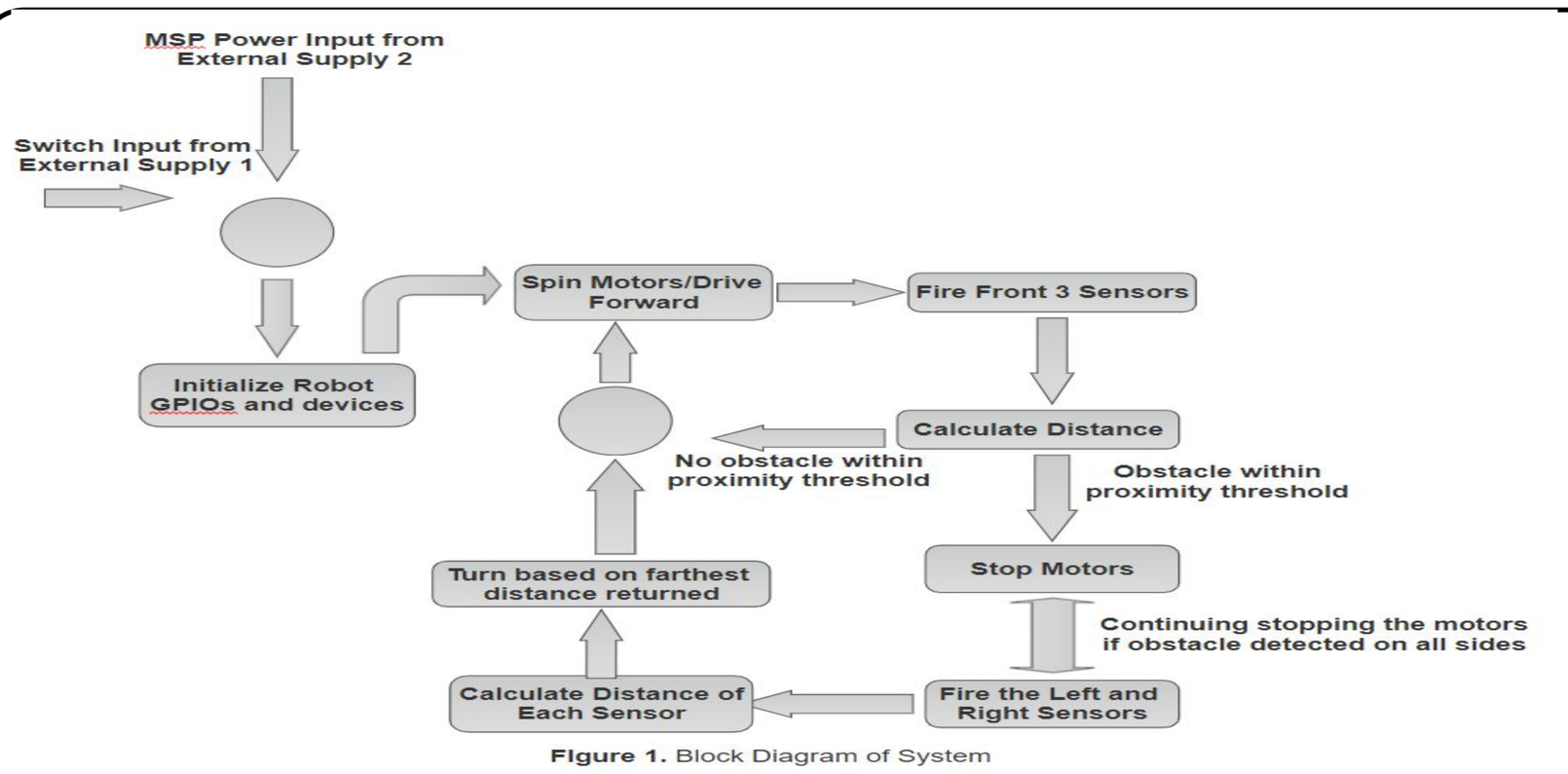


Figure 1. Block Diagram of System

Sonar Schematics

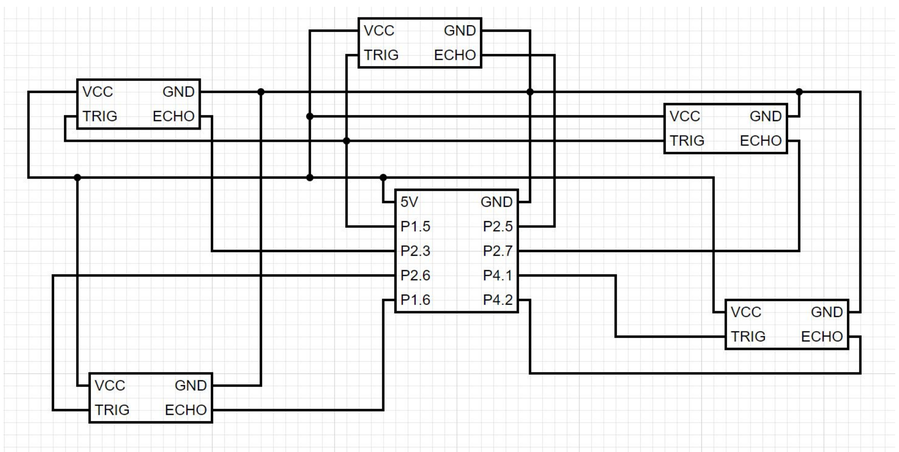


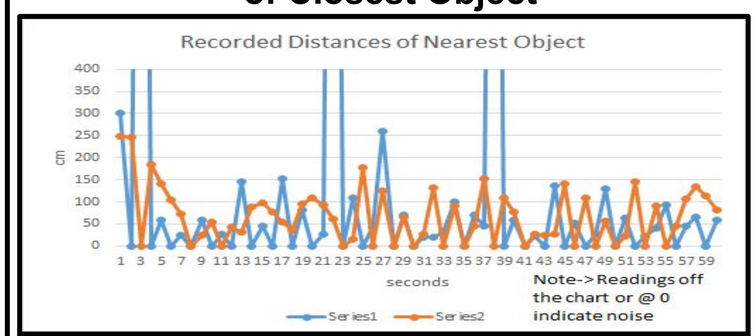
Figure 2. Sonar Circuit Schematic with MSP432

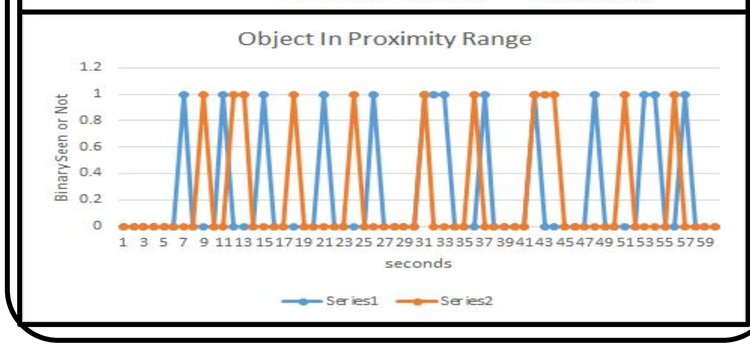
Desired Performance

- Expected the robot to drive straight at a constant speed
- Expected the robot to stop when detecting obstacles within .5 meters of the front frame
- Expected the robot to quickly turn 90 degrees left or right
  - This decision was based on the furthest distance measurement from each sensor
  - Continue driving straight post turn
- Expected robot to stop when all sensors were detecting objects within .5 meter
  - Expected robot to restart moving after a sensor detected a free path
- Expected robot to adjust speeds when turning
- Expected robot to turn correctly when forced into certain situations

Actual Performance

Data of Each Sensor Returning Distance of Closest Object





Motor Schematics

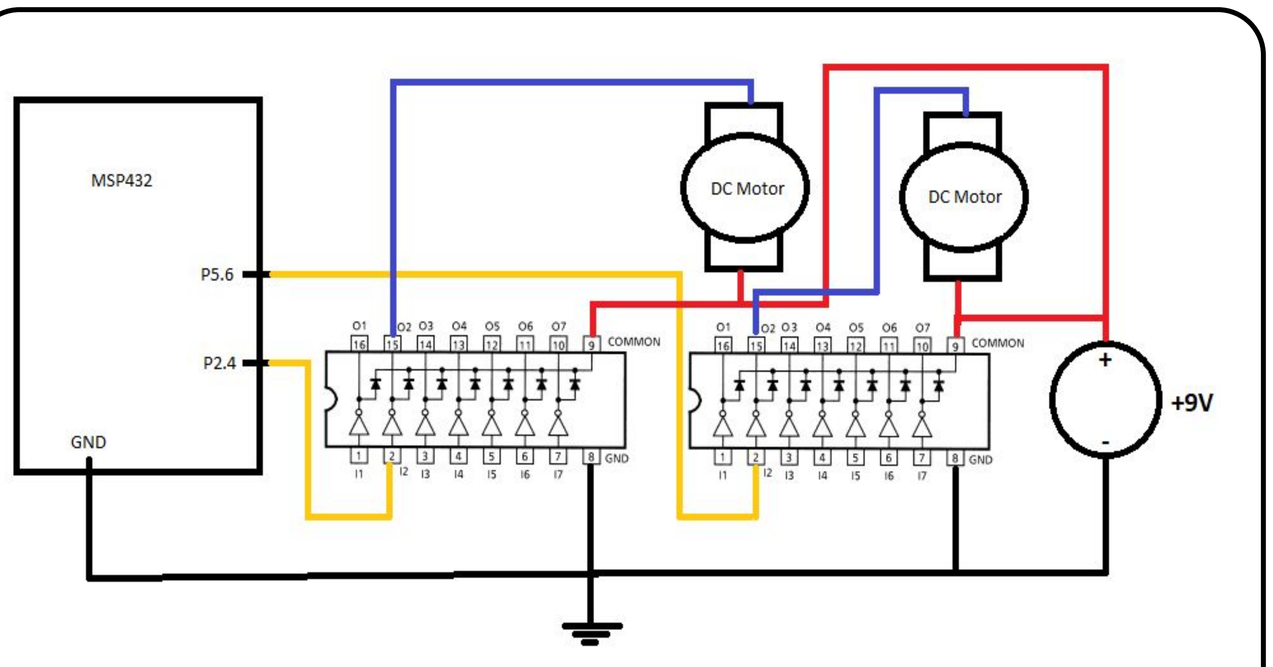


Figure 3. Motor Circuit Schematic with MSP432 with ULN2003APG integrated circuits

Conclusions/Future Work

- Driving straight
  - Believe that one of the motor axles kept shifting cause an imbalance
  - A software fix applied was reducing the duty cycle of the overpowering motor
- Returning accurate sensor data to the millimeter
  - Utilized a bigger proximity range due to slight variations in sensor noise
  - In the future, the robot should be equipped with higher quality sensors
- Power supply
  - The team had to increase the power supply to account for increased load.
  - A future improvement would be to use a stronger, lighter power supply.
- Equipping wheel encoders to help with turning would be another improvement on the design.
- Equipping a line follower to help with driving straight by using software to adjust the duty cycles is another improvement.