Integrated Design Project: Software Documentation

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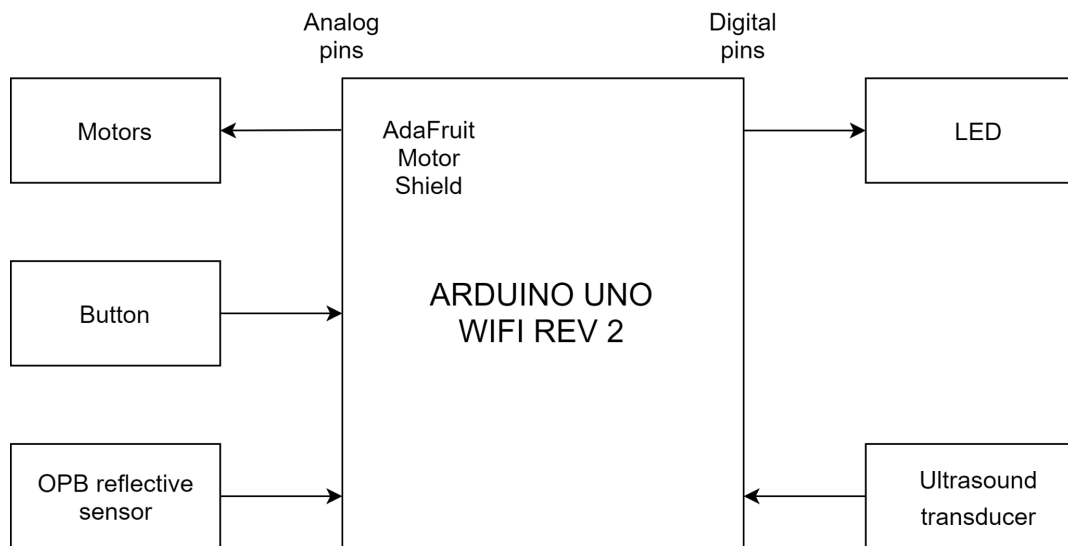## Overall System Diagram

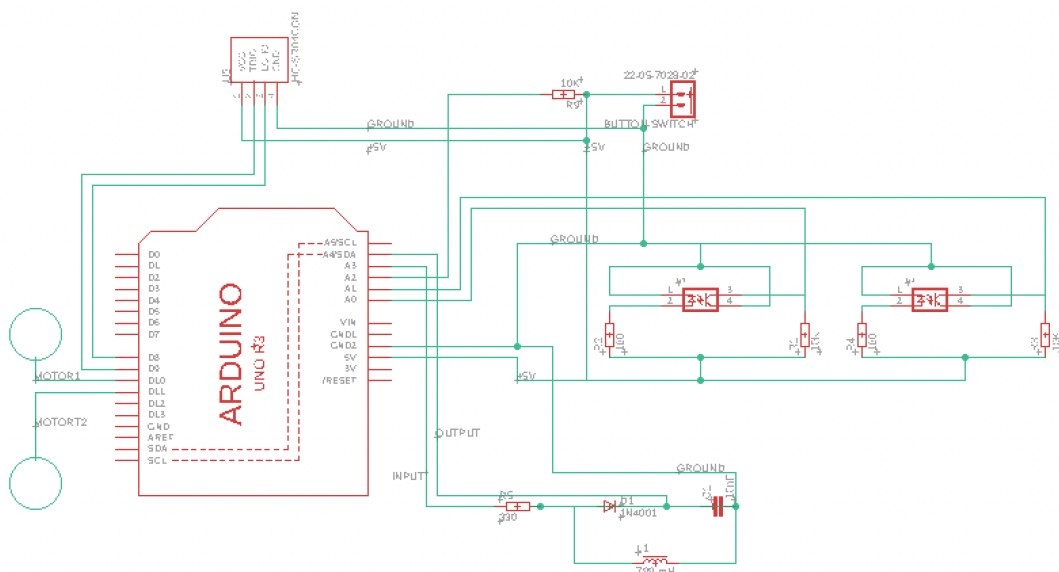**Fig. 1a.** Hardware components of the robot.

Fig. 1b. Circuitry of Arduino and its I/O devices, designed with ECAD.

Process Flow Chart

The robot is programmed to follow the white line across the table and detect whether it is close to the opposite end. Metal detection and object collection were not implemented with any practical accuracy.
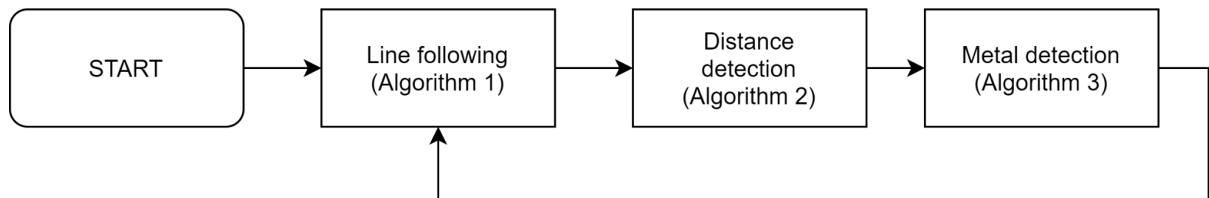
```
START → Line following      → Distance        → Metal detection
         (Algorithm 1)         detection          (Algorithm 3)
              ↑                 (Algorithm 2)
              └─────────────────────────────────────────────┘
```

Fig. 2. Sequence of algorithms followed by the robot

Algorithms

The source code for the robot can be found at:
https://github.com/lorcan2440/IDP-Software-Dev-Team-110

```
                                              Too far right:
                                              reduce speed of
                                              left motor
                                                   ↑
                                          L > T and R < T
START          Read values from   Compute moving   Compare values        Else   Continue straight:
(Line following) → OPB reflective IR → 10-point average → (L and R) to    →    set both motors to
                 sensors            of values        threshold (T)              equal speed
                                                   ↓
                                          R > T and L < T
                                              Too far left:
                                              reduce speed of
                                              right motor
```
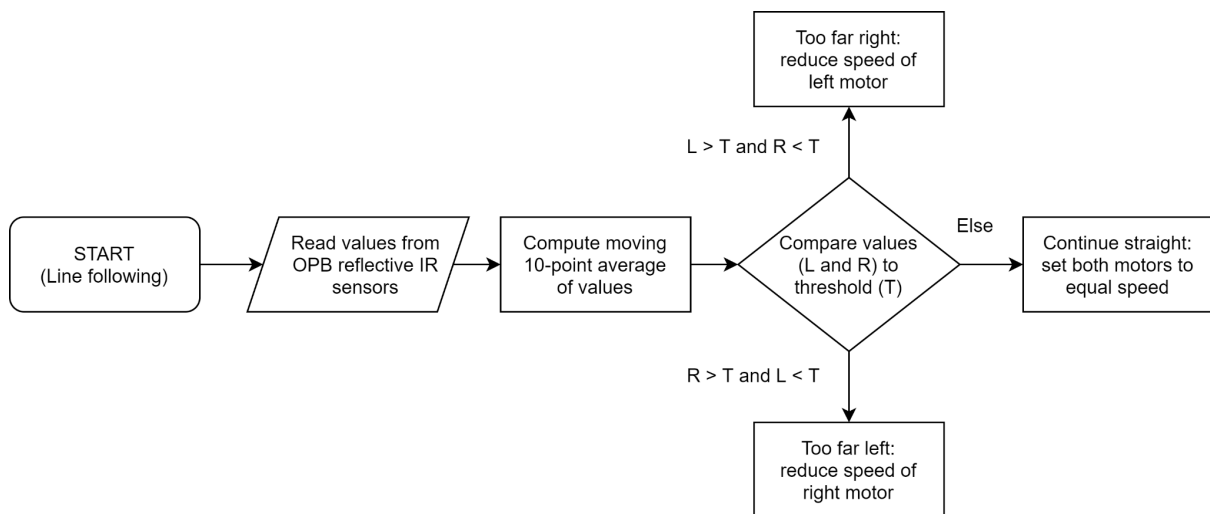
Fig 3a. Flowchart for Algorithm 1. This procedure loops until an interrupt from Algorithm 2 is received, and restarts after the robot turns around.
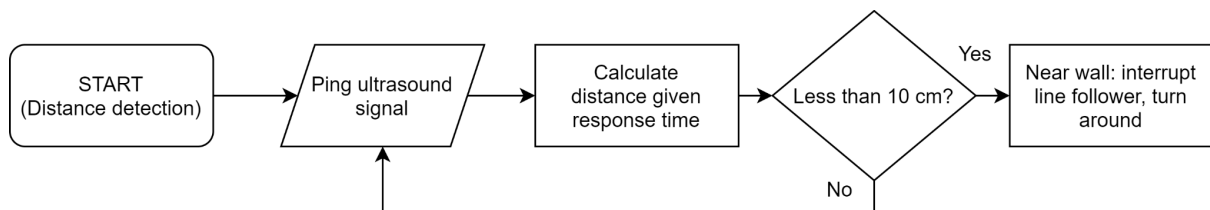
```
START             Ping ultrasound   Calculate                         Yes   Near wall: interrupt
(Distance detection) → signal      → distance given → Less than 10 cm? →   line follower, turn
                         ↑            response time                         around
                         └──────────────────────────── No
```

Fig 3b. Flowchart for Algorithm 2. The procedure loops unconditionally.