Circuit Documentation

Summary

This document provides a detailed overview of a robotic control circuit designed to operate two gear motors and a servo motor using an Arduino Uno microcontroller. The circuit includes an L298N DC motor driver for controlling the gear motors, a 12V battery for power supply, and an ultrasonic sensor for distance measurement. The Arduino Uno is programmed to control the motors based on serial commands.

Component List

1. **Gear Motor (2 units)**
   - Description: DC motor with gear reduction for increased torque.
   - Pins: +, -
2. **L298N DC Motor Driver**
   - Description: Dual H-Bridge motor driver for controlling two DC motors.
   - Pins: OUT1, OUT2, 12V, GND, 5V, OUT3, OUT4, 5V-ENA-JMP-I, 5V-ENA-JMP-O, +5V-J1, +5V-J2, ENA, IN1, IN2, IN3, IN4, ENB
3. **Battery 12V**
   - Description: Power source for the circuit.
   - Pins: +, -
4. **Arduino Uno**
   - Description: Microcontroller board based on the ATmega328P.
   - Pins: AREF, GND, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, TX->1, 0->RX, A5, A4, A3, A2, A1, A0, Vin, 5V, 3.3V, RESET, IOREF, +, -
5. **Sensor - Ultrasonic HC-SR04**
   - Description: Ultrasonic distance sensor.
   - Pins: Trig, Echo, GND, VCC
6. **Servo Motor**
   - Description: Motor for precise control of angular position.
   - Pins: VCC, GND, SIGNAL

Wiring Details

Gear Motor 1

- **+** connected to L298N DC Motor Driver OUT1
- **-** connected to L298N DC Motor Driver OUT2

Gear Motor 2

- **+** connected to L298N DC Motor Driver OUT3
- **-** connected to L298N DC Motor Driver OUT4

L298N DC Motor Driver

- **5V** connected to Arduino Uno Vin
- **GND** connected to Battery 12V -
- **12V** connected to Battery 12V +
- **ENA** connected to Arduino Uno pin 8
- **IN1** connected to Arduino Uno pin 7
- **IN2** connected to Arduino Uno pin 6
- **IN3** connected to Arduino Uno pin 5
- **IN4** connected to Arduino Uno pin 4
- **ENB** connected to Arduino Uno pin 3

Battery 12V

- **+** connected to L298N DC Motor Driver 12V
- **-** connected to L298N DC Motor Driver GND and Arduino Uno GND

Arduino Uno

- **Pin 9** connected to Servo Motor SIGNAL
- **Pin 12** connected to Ultrasonic Sensor Trig
- **Pin 11** connected to Ultrasonic Sensor Echo
- **5V** connected to Servo Motor VCC and Ultrasonic Sensor VCC
- **GND** connected to Servo Motor GND and Ultrasonic Sensor GND

Sensor - Ultrasonic HC-SR04

- **Trig** connected to Arduino Uno pin 12
- **Echo** connected to Arduino Uno pin 11
- **VCC** connected to Arduino Uno 5V
- **GND** connected to Arduino Uno GND

Servo Motor

- **SIGNAL** connected to Arduino Uno pin 9
- **VCC** connected to Arduino Uno 5V
- **GND** connected to Arduino Uno GND

Documented Code

```cpp
char data;  // Stores incoming serial data
#define INT1 8
#define INT2 9
#define INT3 10
```

```
#define INT4 11

void setup() {
  Serial.begin(9600);          // Start serial communication at 9600
baud rate
  pinMode(INT1, OUTPUT);
  pinMode(INT2, OUTPUT);
  pinMode(INT3, OUTPUT);
  pinMode(INT4, OUTPUT);

  // Initial state: Stop the motors
  stopMotors();
}

void loop() {
  if (Serial.available() > 0) {
    data = Serial.read();   // Read the incoming command
    data = toupper(data);   // Convert to uppercase (makes it more
responsive)

    switch (data) {
      case 'F': forward();  break;  // Move Forward
      case 'B': backward(); break;  // Move Backward
      case 'R': right();    break;  // Turn Right
      case 'L': left();     break;  // Turn Left
      case 'S': stopMotors(); break; // Stop
      default: stopMotors(); break;  // Safety (any invalid input
stops robot)
    }
  }
}

// ===== Motor Control Functions =====
void forward() {
  digitalWrite(INT1, HIGH);
  digitalWrite(INT2, LOW);
  digitalWrite(INT3, HIGH);
  digitalWrite(INT4, LOW);
}

void backward() {
  digitalWrite(INT1, LOW);
  digitalWrite(INT2, HIGH);
  digitalWrite(INT3, LOW);
  digitalWrite(INT4, HIGH);
}

void right() {
```

```
  digitalWrite(INT1, LOW);
  digitalWrite(INT2, HIGH);
  digitalWrite(INT3, HIGH);
  digitalWrite(INT4, LOW);
}

void left() {
  digitalWrite(INT1, HIGH);
  digitalWrite(INT2, LOW);
  digitalWrite(INT3, LOW);
  digitalWrite(INT4, HIGH);
}

void stopMotors() {
  digitalWrite(INT1, LOW);
  digitalWrite(INT2, LOW);
  digitalWrite(INT3, LOW);
  digitalWrite(INT4, LOW);
}
```

This code is designed to control the movement of the robot by sending serial commands to the Arduino Uno. The commands 'F', 'B', 'R', 'L', and 'S' correspond to moving forward, backward, turning right, turning left, and stopping, respectively. The motor control functions adjust the output signals to the L298N motor driver to achieve the desired movement.