Automatic Car wiper using Arduino uno

Creating an automatic car wiper system using an Arduino Uno involves integrating various sensors, components, and programming logic to detect rain and operate the wipers automatically. Below is a detailed explanation of how to design and implement such a system.

Components Needed

1. **Arduino Uno**: The microcontroller that will control the system.
2. **Rain Sensor Module**: Detects moisture on the windshield.
3. **Motor Driver Module (e.g., L298N)**: Controls the wiper motor.
4. **DC Wiper Motor**: The motor that will operate the wiper blade.
5. **Power Supply**: To power the motor (usually a 12V battery).
6. **Jumper Wires**: For connections.
7. **Breadboard**: For prototyping (optional).
8. **Resistors and Diodes**: For circuit protection.
9. **LED (optional)**: For visual indication.

Circuit Connections

1. **Rain Sensor**:
    - The rain sensor typically has three pins: VCC, GND, and an analog output (AO).
    - Connect VCC to Arduino 5V, GND to Arduino GND, and AO to an analog pin on the Arduino (e.g., A0).
2. **Motor Driver**:
    - Connect the wiper motor to the motor driver outputs.
    - Connect the motor driver inputs to Arduino digital pins (e.g., D2 and D3) for controlling the motor's direction.
    - Connect the motor driver’s VCC to the battery positive and GND to battery negative.
3. **Power Connections**:
    - Ensure the Arduino is powered, either via USB or an external power supply.

Basic Logic

1. **Sensor Reading**: Continuously read the value from the rain sensor.
2. **Threshold Level**: Determine a threshold value for moisture detection. If the sensor's reading exceeds this value, it indicates that rain is detected.
3. **Motor Control**: If rain is detected, activate the wiper motor. If no rain is detected, stop the motor.

Sample Code

Here's a basic example of how to implement the logic in Arduino code:

```
// Define pins
const int rainSensorPin = A0; // Rain sensor analog pin
const int motorForwardPin = 2; // Motor driver input pin for forward
const int motorBackwardPin = 3; // Motor driver input pin for backward
// Threshold for rain detection
const int rainThreshold = 600; // Adjust this value based on testing
void setup() {
  pinMode(motorForwardPin, OUTPUT);
  pinMode(motorBackwardPin, OUTPUT);
  Serial.begin(9600); // For debugging
}
void loop() {
  int rainValue = analogRead(rainSensorPin);
  Serial.println(rainValue); // Print the sensor value for debugging
  if (rainValue > rainThreshold) {
    // Rain detected
    digitalWrite(motorForwardPin, HIGH); // Activate wiper motor
    digitalWrite(motorBackwardPin, LOW);
  } else {
    // No rain detected
    digitalWrite(motorForwardPin, LOW); // Stop wiper motor
    digitalWrite(motorBackwardPin, LOW);
  }
```

```
  delay(100); // Read every 100 ms
}
```

Adjustments and Improvements

1. **Debouncing**: Add logic to prevent rapid switching when the sensor fluctuates around the threshold.
2. **Wiper Speed Control**: Implement PWM (Pulse Width Modulation) for variable speed control of the wiper motor.
3. **Manual Override**: Allow the user to manually turn on/off the wiper.
4. **Multi-Speed Wipers**: Use different sensor thresholds to control wiper speed (e.g., slow for light rain, fast for heavy rain).
5. **LED Indicator**: Add an LED that lights up when the wiper is active for user feedback.

Final Thoughts

This project can be a fun way to learn about sensors, motors, and programming with Arduino. Make sure to test the system thoroughly, adjusting the sensor thresholds and motor control logic based on your environment and wiper motor specifications.