REPORTS ON MECHATRONICS SYSTEM INTEGRATION

REPORT 10

DIGITAL SIGNAL PROCESSING (DSP) INTERFACING

SECTION 1, SEMESTER 2, 23/24

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Introduction

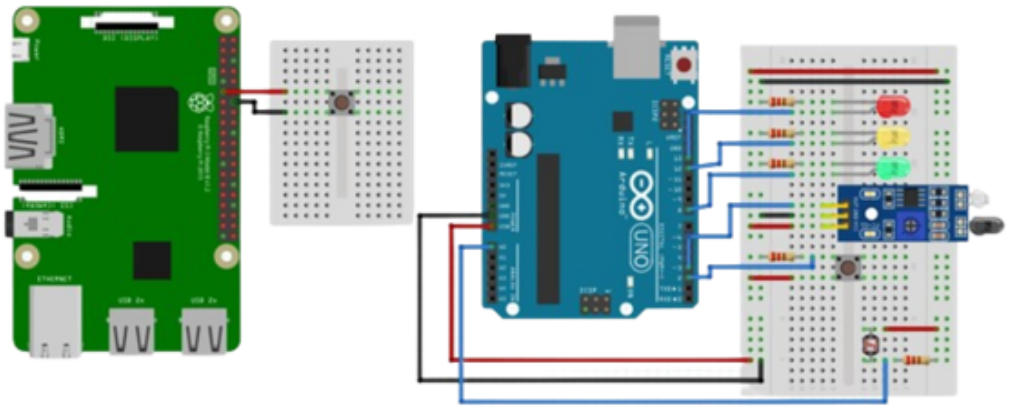
The objective of this project is to create an intelligent lighting control system by utilizing a PLC (programmable logic controller) to integrate many sensors. The lighting settings are

automatically adjusted by the system in response to user involvement and external variables. Modbus is the main communication protocol used to integrate sensors, microcontrollers, and computers seamlessly. The system comprises three key sensors: a daylight sensor utilizing a Light Dependent Resistor (LDR) for ambient light measurement and a manual switch for user interaction. The PLC acts as the central processing unit, orchestrating the interaction between these sensors and the output device, which, in this case, is a light source. The Raspberry Pi, which serves as the Modbus Master in the system design, communicates with the Arduino, which is the Modbus Slave and oversees gathering sensor data. As an additional Modbus Slave, OpenPLC is set up to accept data from the Raspberry Pi and then use that data to carry out control logic. Real-time monitoring and control of the lighting system is made possible by this organized design. The PLC's ladder logic integrates data from all sensors to allow for automatic light activation in response to darkness or user input. Effective data interchange between the system's components is ensured by the adoption of Modbus as the communication protocol.

Materials and Equipment

- · 3 types of sensors.
- · Raspberry Pi as Modbus Master
- · Arduino as Modbus Slave
- · Open PLC as Modbus Slave
- · Modbus (radzio/node-red, etc.)
- · jumper wire
- · Light Dependent Resistor LDR

Experimental setup



Methodology/Procedures

1. · Link the Arduino and Raspberry Pi together using Modbus to create a master-slave connection.
2. · Attach the touch sensors, IR sensor, and LDR to the breadboard.
3. · An LED is attached to show the input's feedback.
4. · Create a ladder diagram with Open PLC so that the program may run.
5. · Run the program and test the inputs whether the connection is successful or not

Result

The result of this experiment was acquired by

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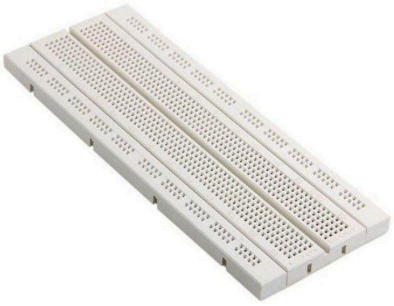
Discussion

Hardware Discussion

1) Breadboard



Breadboard is used to connect components with arduino through wire connection.

2) Arduino Mega 2560

Microcontroller used for our experiment is Arduino Mega 2560. Act as Modbus Slave

3) Male to male jumper wires

Male to male jumper wires are used to connect all of the components on the breadboard with Arduino Mega.

4) **Raspberry Pi 3**

Raspberry Pi used for our experiment is Raspberry Pi 3 model B+. Act as Modbus Master

5) **IR Sensor and LDR**

Sensors used in the experiment to act on lighting cues

Conclusion

In summary, the incorporation of sensors, microcontrollers, and a Programmable Logic Controller (PLC) in creating an automatic lighting control system illustrates a flexible and responsive solution for smart environments. Utilizing Modbus as the communication protocol, the system efficiently facilitates data exchange between components, allowing for real-time monitoring and control. The incorporation of a touch sensor, Light Dependent

Resistor (LDR), and Infrared (IR) sensor ensures that lighting conditions adjust according to environmental cues and user interactions.