REPORTS ON MECHATRONICS SYSTEM INTEGRATION

REPORT 5

PLC INTERFACING

SECTION 1, SEMESTER 2, 23/24

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Team Members:

1. IKMAL FIKRI BIN KHAIRUL KHUBAIDILLAH (2218723)
1. MUHAMMAD IRFAN BIN ROSDIN (2214417)
2. ASYRAAF AIMAN MD HASSAN (2010705)
3. MUHAMMAD IKHWAN BIN MUHAMMAD FAUZI (22188845)

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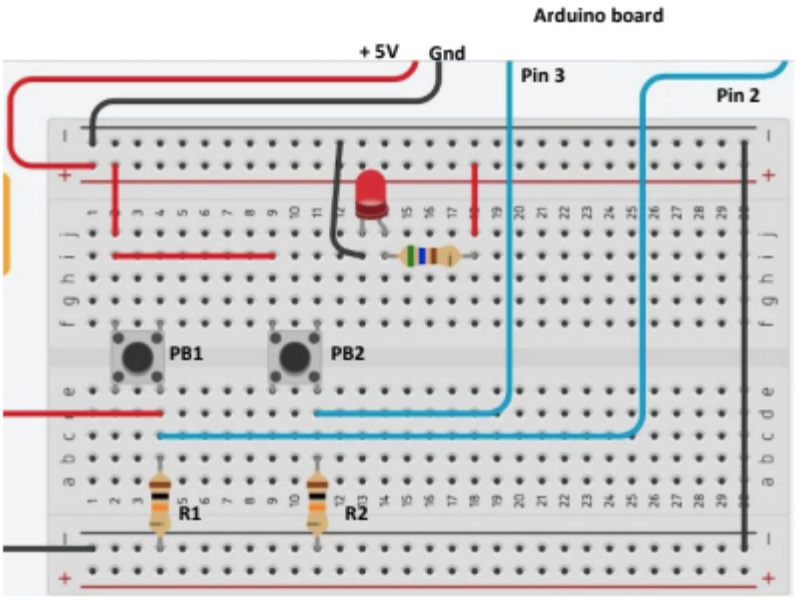
Introduction

The objective of this experiment is to develop a Start-Stop Control Circuit by using a ladder diagram created in OpenPLC, compile, simulate and transfer the ladder diagram program to the Arduino Board. To do so, we need to understand both software and hardware aspects of PLC interfacing with
Microcontrollers.

Materials and Equipment

- OpenPLC Editor software
- Arduino Board
- 2 Push Button Switches
- Jumper Wires
- LED
- Resistors
- Breadboard

Experimental setup



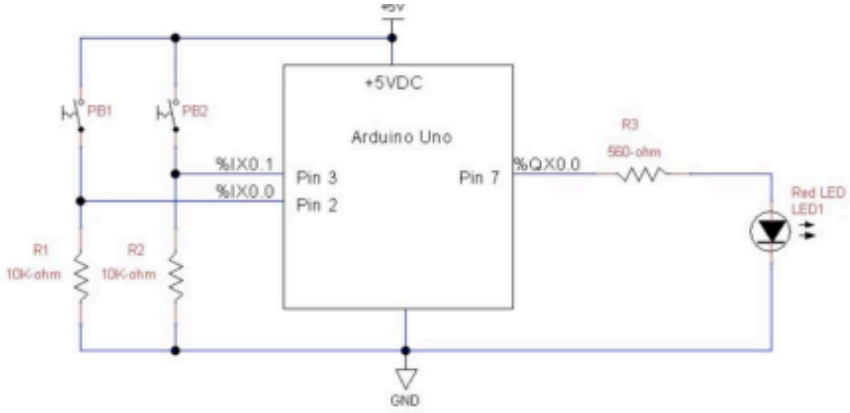


Fig. 4: Start-Stop Control Circuit

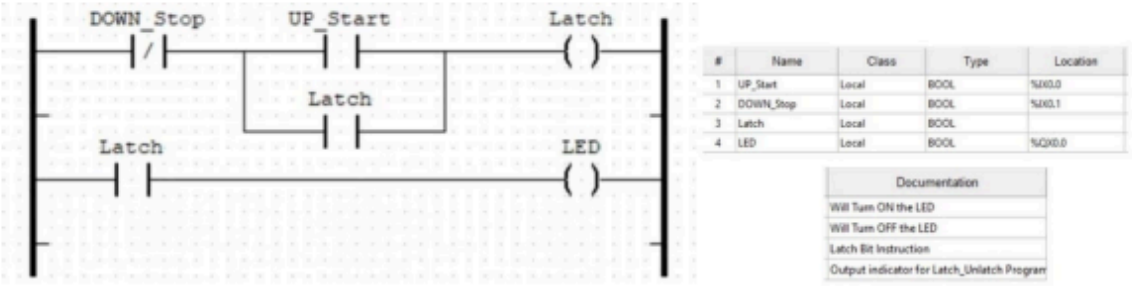


Fig. 5: Ladder Diagram for the Start-Stop Control Circuit

Methodology/Procedures

1. Create the ladder diagram shown in Fig. 5.
2. Specify all variables used in the ladder diagram.
3. Compile and simulate the ladder diagram in OpenPLC Editor.
4. Upload the ladder diagram to the Arduino board.
5. Ensure to select correct COM port number and all pin association between the OpenPLC variables and Arduino board.
6. Build the circuit as shown in Experimental Setup
7. Test the functionality.

Result

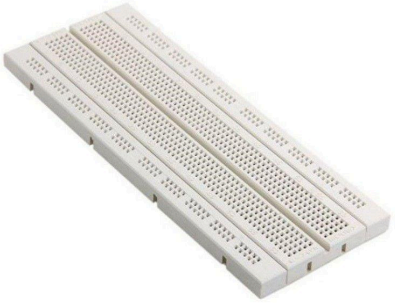
The result of this experiment was acquired by

PICTURES

Discussion

Hardware Discussion

1) **Breadboard**



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

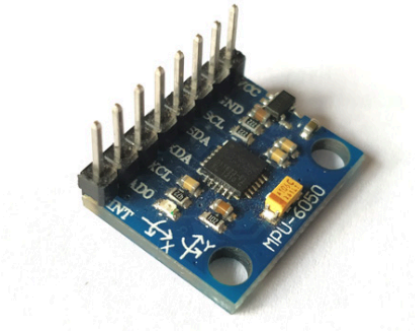
2) **Arduino Mega 2560**

Microcontroller used for our experiment is Arduino Mega 2560.

3) **Male to male jumper wires**

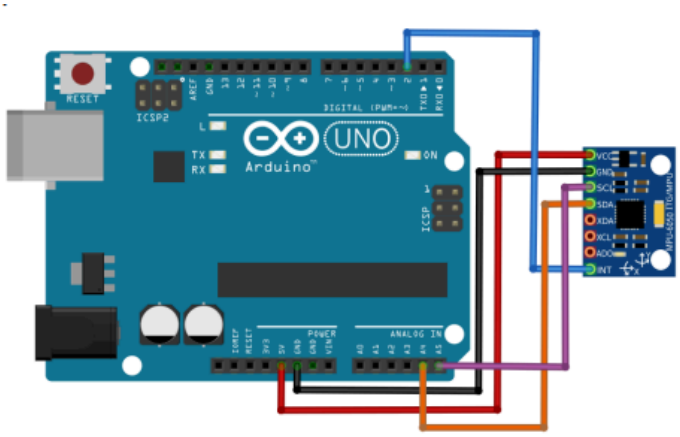
Male to male jumper wires are used to connect all of the components on the breadboard with Arduino Mega.

4) **MPU6050 sensor**



To measure the acceleration and the gyration of an object using the accelerometer and gyroscope.

Electrical Discussion



Male to male jumper is used to connect the MPU6050 sensor to Arduino Mega using a breadboard. VCC of the sensor is connected to 5V port on the arduino. The ground pin of the sensor is connected to the ground port of arduino. For SCL and SDA pin of the sensor, instead of connecting it to the analog port, we changed it to the communication port of the arduino since the analog port are unable to read the input produced from the sensor. So, SCL pin of the sensor is connected to SCL port of the communication port while SDA pin is connected to SDA port of the communication port on the Arduino Mega. XDA, XCL and ADO pin of the sensor is ignored and are not connected to any port since this experiment is not using them. And lastly, INT pin of the MPU6050 sensor is connected to one of the PWM port of the arduino which is port number 2

Software Discussion

Attached below is the coding of the project. The software part of this mechatronic system project involves programming an Arduino Uno to interface with the PMU6050 sensor. There two codes from different of type computer languages which is arduino and python

Arduino code

```
#include <Wire.h>
#include <MPU6050.h>
MPU6050 mpu;
void setup() {
 Serial.begin(9600);
 Wire.begin();
 mpu.initialize();
}
void loop()
 {
 mpu.getMotion6(&ax, &ay, &az, &gx, &gy, &gz);
 Serial.print("Accel: ");
 Serial.print(ax);
 Serial.print(", ");
 Serial.print(ay);
Serial.print(", ");
 Serial.print(az);
 Serial.print(" Gyro: ");
 Serial.print(gx);
 Serial.print(", ");
 Serial.print(gy);
 Serial.print(", ");
 Serial.println(gz);
 delay(100);
}
```

Python Code

```
import serial
ser = serial.Serial('COM4', 9600)
while True:
 data = ser.readline().decode('utf-8').strip()
 print(data)
```

Conclusion

In conclusion, the MPU6050 sensor is a very useful and commonly used electronic component used to detect motion and the movement of the object it is attached to. With the right python and arduino coding and connection, this tiny electronic component is able to detect and measure the acceleration and the gyration of a certain moving machine or object this sensor is attached to. Once the machine is in motion, the MPU6050 sensor will automatically read and display the value recorded through the serial communication of the software.