LABORATORY REPORT

LAB 5: DAQ INTERFACING WITH MICROCONTROLLERS

GROUP B

PROGRAMME: MECHATRONIC ENGINEERING

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DATE OF SUBMISSION:
Wednesday, 22th November 2023

ABSTRACT

The experiment used an Arduino-based system with an LM35 temperature sensor and an LDR (light dependent resistor) for measuring light intensity to monitor the surrounding circumstances. Using the Arduino board, the data from these sensors were sent to a computer where PLX-DAQ data acquisition software was used to display the data in real time. This investigation provides light on the link between temperature and light intensity.

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INTRODUCTION

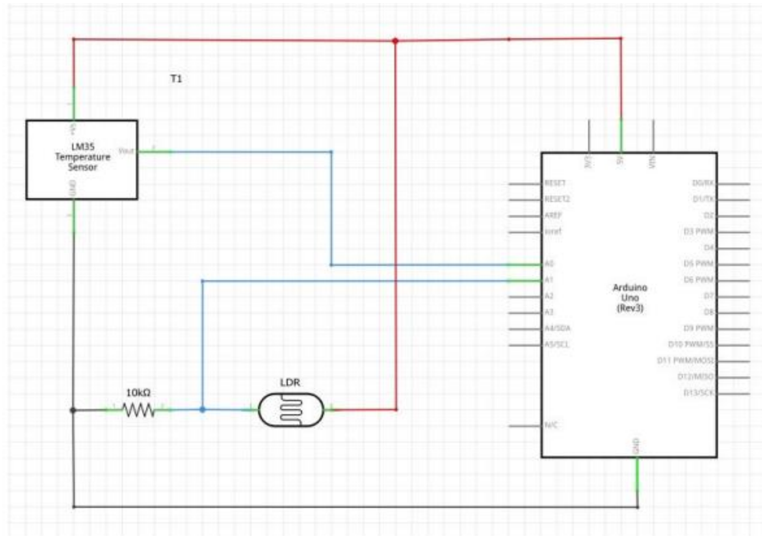
The aim of this project is to use PLX-DAQ software to construct a circuit and programme that can simultaneously capture two data sets. Its goal is to capture two data inputs from two sensors using PLX-DAQ and utilize Arduino for data acquisition, which is then entered into a spreadsheet. The process of measuring an electrical or physical phenomena using a computer is called data acquisition, or PLX- DAQ. Sensors, PLX- DAQ hardware, and computer running programmable software contribute to the entire PLX- DAQ system. The physical phenomena are converted into an electrical signal by the sensor. This signal is then processed by PLX- DAQ hardware, which generates digital numerical values under the direction of a software application written in a variety of general-purpose programming languages. PLX- DAQ software frequently includes data processing, data visualization, and data storage methods in addition to hardware control. This abstract provides a perceptive overview of PLX-DAQ, examining its features, benefits, and uses in many domains. With the help of PLX-DAQ, users are able to collect data from a variety of sources, including sensors, microcontrollers, and external devices, and feed it straight into Excel. Both inexperienced and expert users may easily utilize the programme due to its intuitive interface and straightforward setup procedure, which facilitates rapid deployment for a variety of applications.

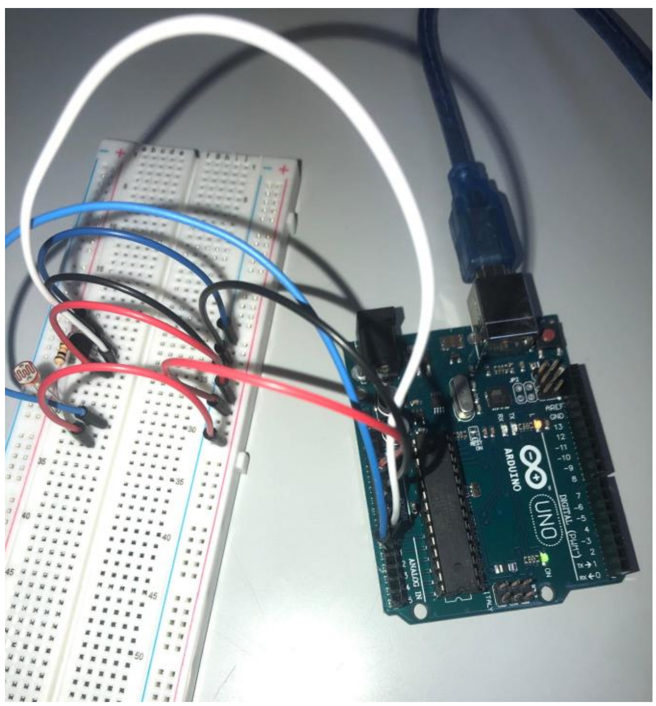
PROCEDURE

Materials And Equipment

1. PLX-DAQ
2. Arduino Board
3. LDR
4. LM35
5. Jumper Wires
6. Resistor
7. Breadboard

Connection:





Experimental Setup and Methodology:

1. We constructed the circuit using the materials and based on the circuitry above. Connecting the two sensor pins to Arduino analog pins (A0 and A1)
2. After that we uploaded the code from the Arduino IDE to the Arduino.
3. Before we used the excel sheet, we checked if the sensor values work by observing the serial monitor
4. If the serial monitors Outputted a logical value read from the sensor, we proceeded to using the PLX-DAQ sheet
5. From the excel sheet we connected to our port and can see the real time live data from our sensors
6. To put into a live graph chart, we used dynamic table function in excel to create a real time graph

Arduino Code:

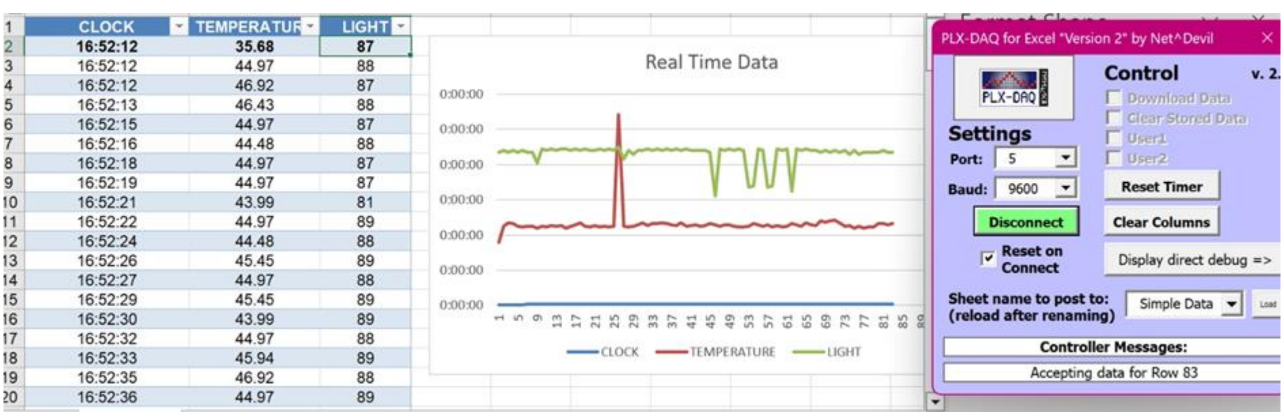
```
float lm_value;
float tempcelc;
int ldr_value;
int ldr_percent;
void setup()
{
  Serial.begin(9600);
  Serial.println("CLEARDATA");
  Serial.println("LABEL, CLOCK, TEMPERATURE, LIGHT");
}
void loop()
{
  lm_value = analogRead(A0);
  tempcelc = ((lm_value / 1023) * 5000);
  tempcelc = tempcelc / 10;


  ldr_value = analogRead(A1);
  ldr_percent = map(ldr_value, 0, 1023, 0, 100);
  Serial.print("DATA, TIME,");
  Serial.print(tempcelc);
  Serial.print(" , ");
  Serial.println(ldr_percent);
  delay(1500);
}
```

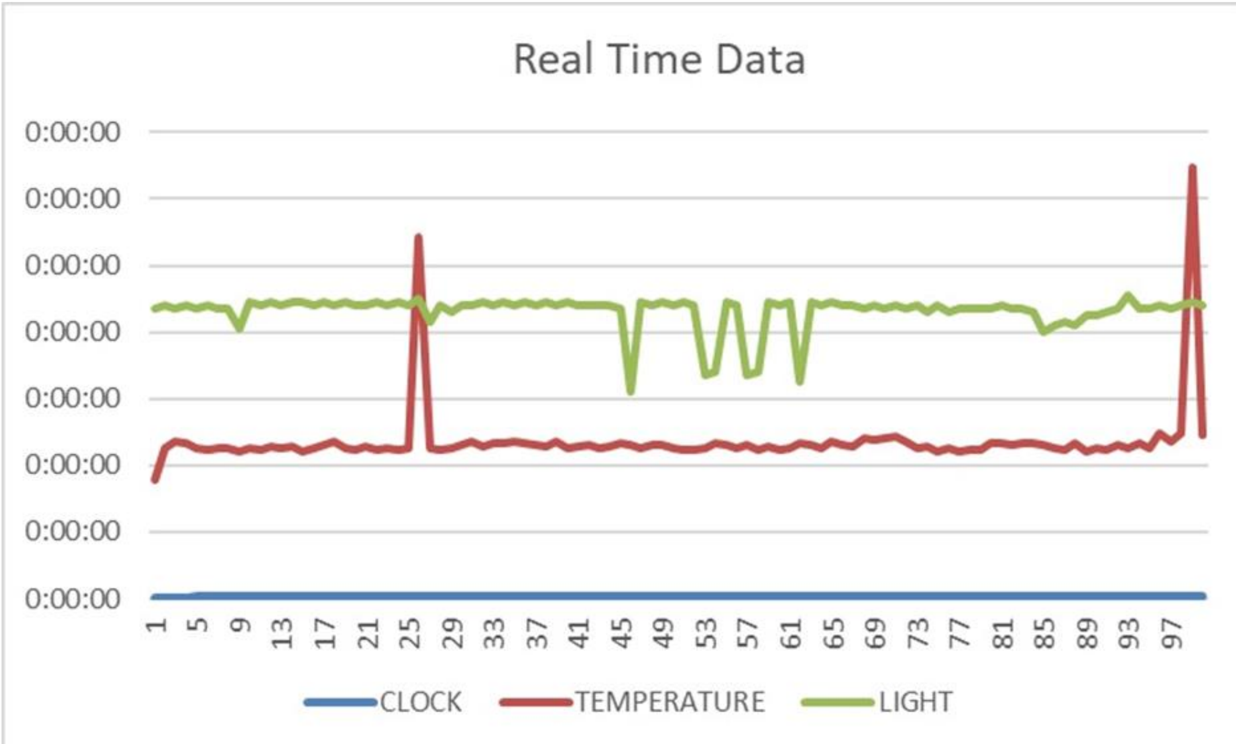
RESULTS

These are the data that we gathered from LM35 and LDR sensors:

Clock	Temperature (C°)	Light
16:52:12	36.68	87
16:52:12	44.97	88
16:52:12	46.92	87
16:52:13	46.43	88
16:52:15	44.97	87
16:52:16	44.48	88
16:52:18	44.97	87
16:52:19	44.97	87
16:52:21	44.99	81
16:52:22	44.97	89
16:52:24	44.48	88
16:52:26	44.45	89
16:52:27	44.97	88
16:52:29	44.45	89
16:52:30	44.99	89
16:52:32	44.97	88
16:52:33	44.94	89
16:52:35	44.92	88
16:52:36	44.97	89

We also have visualized these real time data into graph by using PLX-DAQ for Excel:





This is the video's link for the real time data graph:

https://youtube.com/shorts/RgxVyNBwV4Q

DISCUSSION

The LDR sensor is responsive to the presence of light as shown from the fluctuations of the graph with the change in light exposure. When there is light the slope of graph increases while when the environment becomes dark, the slope decreases. As for the LM35 sensor, the sensor is responsive to the change in ambient temperature.

PLX-DAQ is a software that are able to acquire data from microcontrollers and send them to excel sheet. PLX-DAQ is used in this experiment to produce live data. One advantage in using PLX-DAQ is that the data from sensors can be stored and tabulated automatically in an excel sheet which is convenient for any analysis work.

Arduino Code Explanation

This command clears only logged data on the ActiveSheet (starting at row 2)

```
Serial.println("CLEAR DATA");
```

With this command you can set the labels for the topmost row of the ActiveSheet

```
Serial.println("LABEL,CLOCK, TEMPERATURE, LIGHT");
```

This command will set the Timer to 0. The Timer can be used to measure how long Excel is already logging.

```
Serial.println("RESETTIMER");
```

The ADC value ('Im_value') for temperature sensor LM35 is obtained from analogRead() function. And then, in the second line, the ADC value is converted to voltage in millivolt. In the third line, the voltage is converted to the temperature in Celsius.

```
Im_value = analogRead(A0);
  float voltage = Im_value* (5000.0/1024.0);
  tempcelc = voltage/10.0;
```

The following code is to get the value of the LDR. The map function re-maps a number from one range to another. This means the range of the LDR value changes from 0 – 1023 range to 0 – 100 range.

```
ldr_value = analogRead(A1);
 ldr_percent = map(ldr_value, 0, 1023, 0, 100);
```

The following code will display "DATA, TIME, tempcelc, ldr_percent" in Serial monitor where tempcelc and ldr_percent is the value from LM35 and LDR sensors respectively. In PLX-DAQ, the sensors values will be tabulated accordingly. DATE will be switched to the current Windows computer's date. The comma signifies the separation of columns in the excel sheet.

```
Serial.print("DATA, TIME,");
Serial.print(tempcelc);
Serial.print(",");
Serial.println(ldr_percent);
```

CONCLUSION

In conclusion, we have effectively established a data acquisition (DAQ) system that utilises Arduino as a basic DAQ device to gather information from LM35 and LDR sensors. Following acquisition, the data was moved to the PLX-DAQ application in Microsoft Excel for logging and analysis. This experiment's effective execution shows how mechatronics concepts such as sensor interfacing, data collecting, and real-time data analysis can be applied in real-world settings. A flexible platform for upcoming research and projects in the fields of mechatronics and data gathering systems is made possible by the combination of Arduino and PLX-DAQ.

RECOMMENDATIONS

REFERENCES

ArduinoGetStarted.com (n.d.). *Arduino LM35 Temperature Sensor*. Arduino Get Started. Retrieved November 19, 2023, from https://arduinogetstarted.com/tutorials/arduino-lm35-temperature-sensor

Arduino (n.d.). *Map() - Arduino Reference*. Retrieved November 19, 2023, from https://www.arduino.cc/reference/en/language/functions/math/map/

APPENDICES

ACKNOWLEDGEMENT

We would like to express our gratitude to Dr. Nadzril Bin Sulaiman, one of the lecturers of this course, mechatronic system integration 1 (MCTA 3203) for his guidance while the experiment is being carried out.

STUDENT'S DECLARATION

This is to certify that we are responsible for the work submitted in this report, that the original work is our own except as specified in the references and acknowledgement, and that the original work contained herein have not been untaken or done by unspecified sources or person.

We hereby certify that this report has not been done by only one individual and all of us have contributed to the report. The length of contribution to the reports by everyone is noted within this certificate.

We also hereby certify that we have read and understand the content of the total report and no further improvement on the reports is needed from any of the individual's contributors to the report.

We, therefore, agreed unanimously that this report shall be submitted for marking and this final printed report have been verified by us.

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