LABORATORY REPORT

LAB 6: DAQ INTERFACING WITH MICROCONTROLLERS

GROUP H

PROGRAMME: MECHATRONICS ENGINEERING

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ABSTRACT

This lab report describes how to use a Data Acquisition system (DAQ) with an Arduino microcontroller to collect and analyse sensor data. The DAQ system includes the basic components such as sensors, DAQ device and computer. Here is an example using Arduino, potentiometers and PLX-DAQ software to collect and analyse analog sensor data. The data is converted to digital data and recorded in an excel spreadsheet for analysis.

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INTRODUCTION

Data acquisition systems (DAQs) play an important role in various fields of science and engineering. DAQ systems allow for the quantification and recording of electronic or physical properties for further analysis. In this lab report, we will look at the integration of DAQ with microcontrollers, specifically the use of an Arduino for the acquisition of sensor data. Data acquisition is the process of digitising data from the world around us so it can be displayed, analysed, and stored in a computer. For instance, measuring the temperature of a room using a thermocouple is considered data acquisition. Modern data acquisition systems can include the addition of data analysis and reporting software, network connectivity, and remote control and monitoring options. Moreover, a DAQ device is the device that connects the sensors to the computer. A good example would be an Arduino. Furthermore, a sensor is (according to the merriam-webster dictionary): “a device that responds to a physical stimulus (such as heat, light, sound, pressure, magnetism, or a particular motion) and transmits a resulting impulse (as for measurement or operating a control)”. In other words, a sensor collects data in analog form then a

DAQ device that is connected to this sensor converts the data to digital form then sends it to a computer for storing purposes or others.

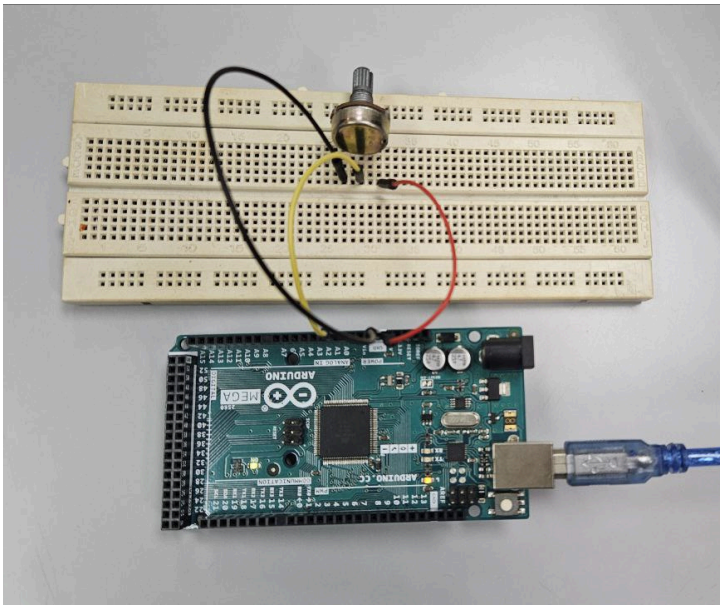
PROCEDURE

Materials And Equipment:

- PLX‑DAQ
- Arduino Board
- LDR
- LM35
- Jumper Wires
- Resistor
- Breadboard
- Potentiometer

Experimental Setup:

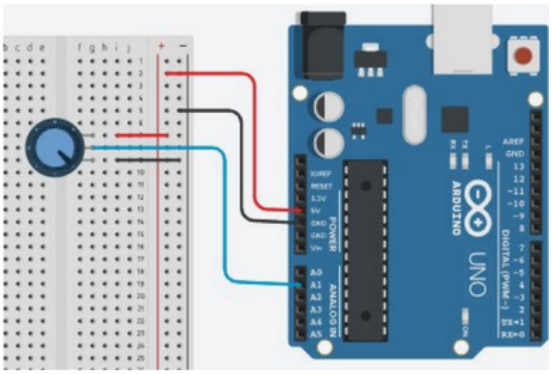
- Connect the middle pin of the potentiometer to the analog in pin (e.g. A1)
- Connect one of the side pins of the potentiometer to the GND.
- Connect the other pin of the potentiometer to the 5V.



Methodology:

1. Construct a simple circuit shown in Fig.2.
2. Launch the Arduino IDE and type and verify the example code shown below.
3. Download and install the PLX‑DAQ.

4. Launch it and there should be an Excel Spreadsheet with a pop-out GUI window in the folder as shown below.
5. In the GUI, select the correct com port number and the ensure the baud rate is the
6. same as the one written in the code.
7. Once done, press the connect tab and the data from the Arduino will be displayed in the spreadsheet.
8. You may now observe the received data and use all tools available in the MS Excel for analysis.



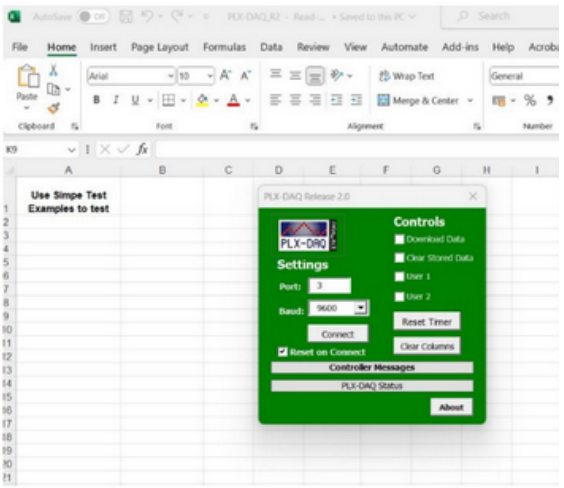


Fig.2

Arduino Code:

```
int sensorPin = A1;

void setup() {

  Serial.begin(9600);

  Serial.println("CLEARDATA");

  Serial.println("LABEL,Time, Started Time, Register value");

  Serial.println("RESETTIMER");

}

void loop() {

  int sensorValue = analogRead(sensorPin);

  Serial.print("DATA, TIME, TIMER, ");

  Serial.println(sensorValue);

  delay(1500);

}
```

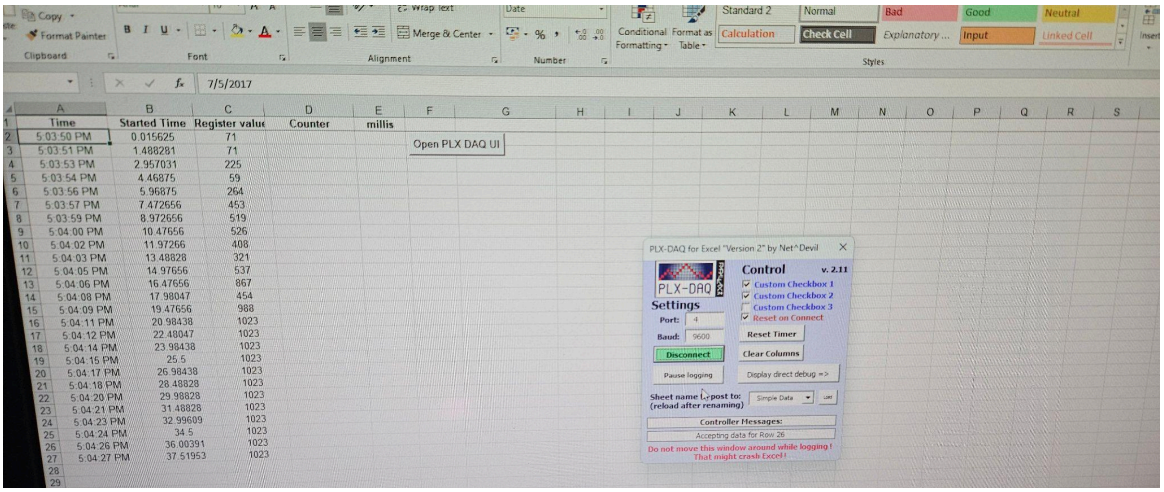
Arduino Code For Task:

```
float lm_value;
```

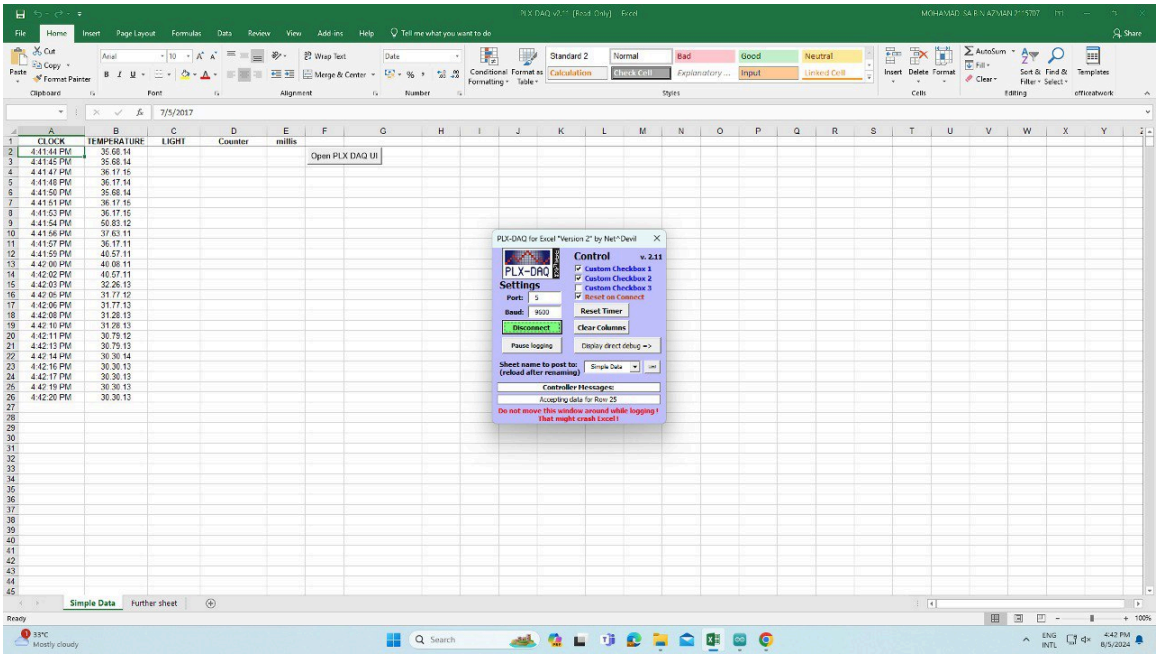
```
float tempcelc;
int ldr_value;
int ldr_percent;

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

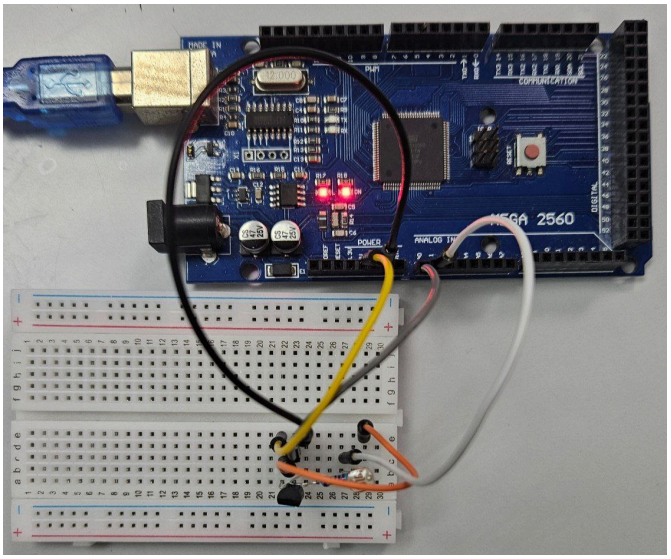
Upon implementation, the circuit successfully measured both light intensity and temperature. The microcontroller accurately processed the sensor outputs, allowing for real-time monitoring of environmental conditions.



For task:



DISCUSSION



The side pin of the LM35 was connected to the 5V on the Arduino and the middle pin to the A0 pin then the other side pin to the GRD. As for the LDR, one side was connected to the A1 pin and the other to the 5V pin. A resistor was used in between to limit the current and protect the components.

The arduino code was uploaded and the result of the temperature was shown in the excel sheet. When the surrounding temperature was hot, the number showed high and vice versa.

CONCLUSION

In conclusion, the designed sensor circuit incorporating both an LDR and an LM35 temperature sensor proved to be highly effective in monitoring environmental conditions. The circuit's accurate sensing capabilities, coupled with the microcontroller's data processing prowess, enable real-time monitoring and analysis of light intensity and temperature variations.

The successful implementation of the circuit underscores the importance of sensor technology in modern engineering applications, offering valuable insights into the dynamic nature of our surroundings. Moving forward, continued research and development in sensor technology hold immense potential for addressing complex challenges across various domains, from climate monitoring to smart infrastructure development.

RECOMMENDATIONS

It is recommended to be extra careful with the connections of the LM35 and LDR since it can be confusing and waste a lot of time if done wrong. Furthermore, for the code to work on excel, installing the latest version of PLX-DAQ is needed.

REFERENCES

Data Acquisition (DAQ) - The Ultimate Guide. (n.d.). Data Acquisition | Test and Measurement Solutions. https://dewesoft.com/blog/what-is-data-acquisition

Definition of SENSOR. (2019). Merriam-Webster.com. https://www.merriam-webster.com/dictionary/sensor

APPENDICES

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to the team for their invaluable guidance and support throughout the execution of this experiment. Their expertise and insightful feedback greatly enhanced my understanding of the principles underlying Arduino-based electronics. Additionally, for their assistance in troubleshooting technical challenges and providing constructive suggestions for improvement. Furthermore, I am thankful to my peers for their collaborative spirit and exchange of ideas, which enriched the overall learning experience and fostered a collaborative learning environment.

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 persons.

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 each individual 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 has been verified by us.

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	Understand	✓
	Agree	✓