AN INTERNATIONAL AWARD-WINNING INSTITUTION FOR SUSTAINABILITY

KULLIYYAH OF ENGINEERING

DEPARTMENT OF MECHATRONICS ENGINEERING

Lab Report 6:

DAQ INTERFACING WITH MICROCONTROLLERS.

GROUP E

MCTA 3203

Semester 2, 2023/2024

MUHAMAD HAZIQ ISKANDAR BIN HASSAN NORDIN	2119327
MUHAMMAD ALIFF IQMAL BIN ZAINUN@ZAINUDDIN	2114805
MUHAMMAD NAZIM BIN AKHMAR	2114551
MUHAMMAD ARFAN BIN MOHD ZULKIFLI	2112945

ABSTRACT

When an Arduino microcontroller interfaces with PLX-DAQ software, it establishes a seamless communication channel for data transfer between the Arduino and a PC. PLX-DAQ, a user-friendly Excel add-in, facilitates real-time data collection from Arduino-based applications. This setup allows data from sensors or actuators on the Arduino to be collected, visualized, and analyzed through this connection.

PLX-DAQ software creates a serial communication link between the Arduino and the computer. The Arduino is configured to gather data from sensors or other input devices, and PLX-DAQ uses an Excel spreadsheet to prepare and present this data in real time after receiving it via the computer's serial port.

This interface enables researchers, engineers, and enthusiasts to monitor and record data from their Arduino projects easily. By providing an intuitive interface for data collection and analysis, it extends Arduino's capabilities and makes it a valuable tool for a variety of applications, including environmental monitoring, scientific research, and projects that require real-time data feedback. The combination of PLX-DAQ and Arduino simplifies data acquisition and makes it accessible to a broader range of users without extensive programming experience.

TABLE OF CONTENT

INTRODUCTION

This lab report demonstrates how to connect an Arduino microcontroller to PLX-DAQ software for real-time data collection and analysis. PLX-DAQ is an easy-to-use Excel add-in that creates a communication link between Arduino and a PC, allowing data from sensors to be captured and displayed in Excel.

In this experiment, we use an Arduino board along with sensors like an LDR (Light Dependent Resistor) and an LM35 temperature sensor. The Arduino collects data from these sensors, and PLX-DAQ helps us view and analyze this data in real time using an Excel spreadsheet.

The goal of this lab is to show how to set up this interface, collect data, and use Excel to visualize and understand the results. This setup is useful for many applications, including environmental monitoring and educational projects, making it easier to gather and analyze data without extensive programming knowledge.

In this report, we will explain the hardware setup, the software configuration, and how to use the collected data to create meaningful graphs in Excel. This simple and effective method makes data acquisition accessible and practical for a wide range of users.

MATERIAL & EQUIPMENT

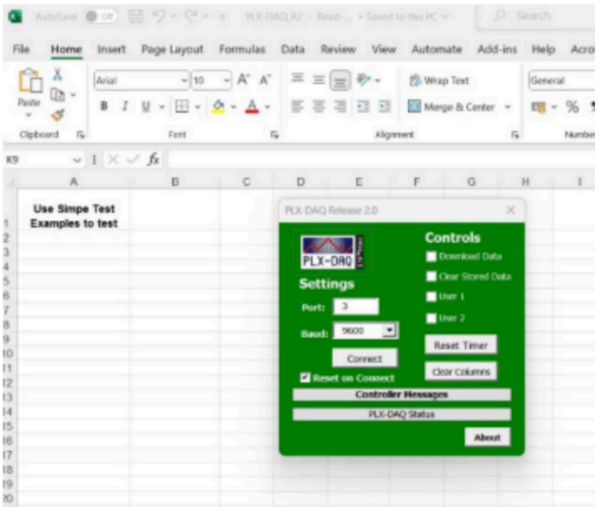
Material needed:

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

EQUIPMENT SETUP

1. The arduino IDE is to be launched, and the example cde shown below is to be typed and verified.

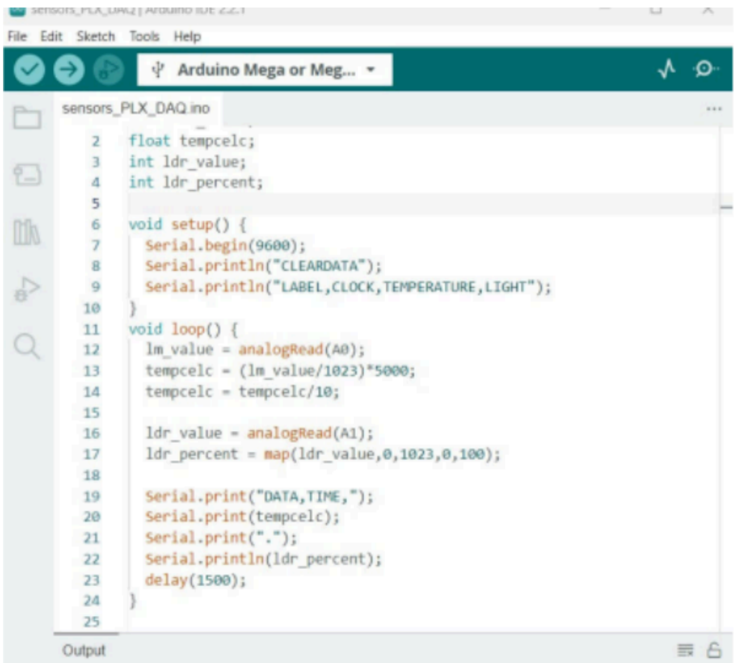
2. PLX-DAQ is to be downloaded and installed.
3. It is to be launched, and there should be an Excel spreadsheet with a pop-out GUI window in the fildor, as shown below.



4. In the GUI, the correct COM port is to be selected, and it is to be ensured that the baud rate is the same as the one written in the code.
5. Once done, the connect tab is to be pressed, and the data from the Arduino will be displayed in the spreadsheet.
6. The received data may now be observed, and all tools available in MS Excel can be used for analysis.

METHODOLOGY

1. Upon the construction of the circuit, Arduino IDE was launched, and code was written to enable Arduino in reading analog signals from the LM35 and LDR, converting them into digital format.
2. The example code below was completed.



```
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);
}
```

3. The code was verified and subsequently uploaded to the Arduino board.
4. The PLX-DAQ spreadsheet was opened, ensuring the correct com port selection, and then, the output from the sensors was generated within the spreadsheet.

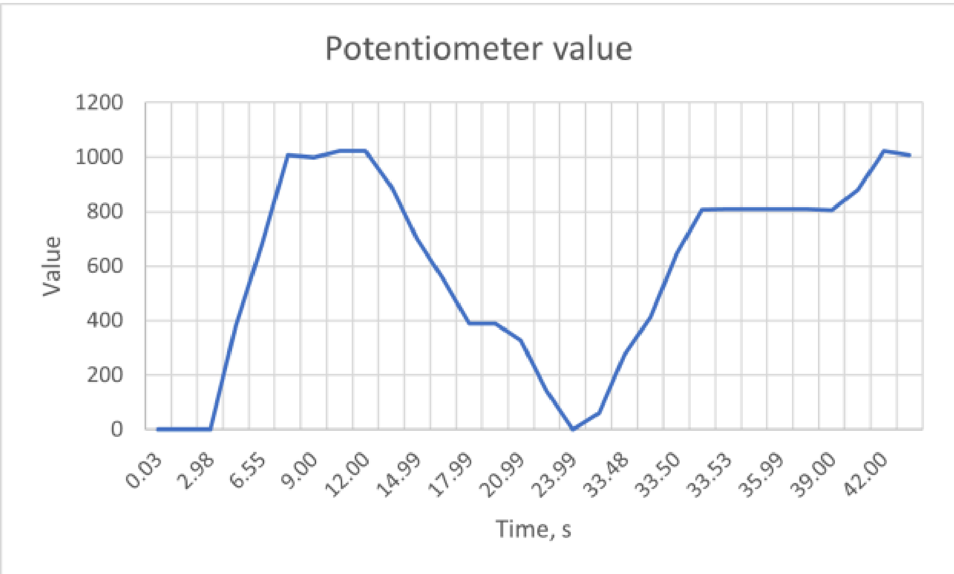
5. Within the report, comprehensive comments were provided to elucidate each line of the code, alongside the creation of meaningful excel plots derived from the sensors' data.

RESULTS

i) Potentiometer:

TIME	STARTED TIME	POTENTIOMETER VALUE
4:26:35 PM	0.03	0
4:26:37 PM	1.49	0
4:26:38 PM	2.98	0
4:26:40 PM	4.49	380
4:26:42 PM	6.55	679
4:26:43 PM	7.49	1007
4:26:44 PM	9.00	999
4:26:46 PM	10.48	1023
4:26:47 PM	12.00	1023
4:26:49 PM	13.49	890
4:26:50 PM	14.99	700
4:26:52 PM	16.48	552
4:26:53 PM	17.99	388
4:26:55 PM	19.48	389
4:26:56 PM	20.99	140
4:26:58 PM	22.50	0
4:26:59 PM	23.99	59
4:27:01 PM	25.50	274
4:27:01 PM	33.48	413
4:27:09 PM	33.48	644
4:27:09 PM	33.50	807

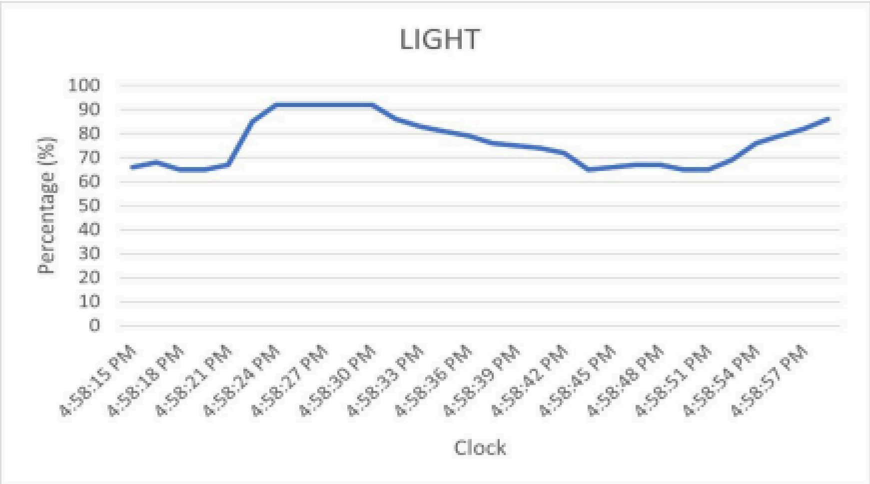
4:27:09 PM	33.51	810
4:27:09 PM	33.53	810
4:27:10 PM	34.50	810
4:27:11 PM	35.99	810
4:27:13 PM	37.99	810
4:27:14 PM	39.00	806
4:27:16 PM	40.50	880
4:27:17 PM	42.00	1023
4:27:19 PM	43.50	1007

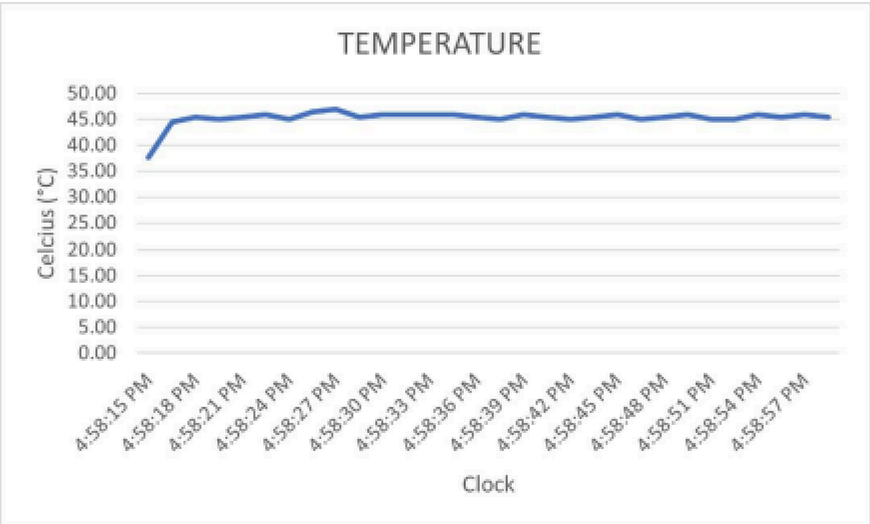


ii) LM35 & LDR

Clock	Temperature (℃)	Light (%)
4:58:15 PM	23.06	88
4:58:17 PM	31.85	87
4:58:18 PM	32.82	87
4:58:20 PM	32.82	87
4:58:21 PM	32.34	87
4:58:23 PM	32.34	86
4:58:24 PM	32.34	86
4:58:26 PM	32.82	87
4:58:27 PM	32.34	88
4:58:29 PM	32.34	87
4:58:30 PM	33.31	86
4:58:32 PM	33.80	86
4:58:33 PM	31.85	87
4:58:35 PM	32.34	87
4:58:36 PM	32.82	88
4:58:38 PM	32.34	92
4:58:39 PM	32.34	75
4:58:41 PM	32.82	69
4:58:42 PM	32.82	68
4:58:44 PM	32.34	57
4:58:45 PM	41.61	91
4:58:47 PM	42.10	90
4:58:48 PM	42.10	86

4:58:50 PM	42.10	88
4:58:51 PM	42.10	87
4:58:53 PM	39.17	69
4:58:54 PM	39.66	68
4:58:56 PM	43.07	87
4:58:57 PM	36.73	88
4:58:59 PM	35.75	87
4:59:00 PM	35.75	86





DISCUSSION

The Voltage Divider Circuit was used in our project to change the resistance value of the LDR dynamically in response to changes in the amount of light in the room. The constant changes shown on the serial monitor during the experiment showed that this adjustment had been made. This showed how sensitive the LDR was to its light surroundings. We used the PLX-DAQ software, which worked well with Excel to organize and store sensor data and make data collection and processing faster. The project combined basic ideas, like the Voltage Divider Circuit, to change the LDR's resistance flexibly based on the amount of light. The LM35 temperature monitor also helped by keeping track of changes in its steady voltage output that were caused by temperature, with a 10mV shift for every 1 degree Celsius change. PLX-DAQ software was used to carefully record and plot this temperature data as well as readings of the light level.

During the test, there were times when the recorded data wasn't correct, especially when reports of temperature in Celsius ranged from 60 - 120 degrees. After more research, it was found that the sensor's strange behavior was caused by bad connections and an unexpected component touching the breadboard. This interrupted the flow of current and ruined the output data. Taking care of these problems became necessary to make sure that our sensor reports were reliable and correct.

CONCLUSION

In conclusion, there are various applications that can be done by interfacing DAQ with a microcontroller. Also, it is really important to connect DAQ with a microcontroller(Arduino) to make the electronics smarter.

In this report, we learn how to interface DAQ with Arduino and link the data with Excel so that we can tabulate and plot graphs for a better understanding of the result. In this report, we create a circuit that contains potentiometers, Arduino, LM35, and LDR. Then we upload the code from the Arduino IDE to the microcontroller. By doing that, we enable Arduino to read analog signals from the LM35 and LDR, converting them into digital format. From that, we can distinguish how to store the results from all the sensors in Excel. After a few calculations and a discussion about the results and whether it's relevant or not, we agreed and were satisfied with the data and started plotting the graph in Excel.

In short, this lab report provides us with the importance of interfacing DAQ with the microcontroller. Also, it gave us a wide view of how people work with DAQ and microcontrollers at the industrial level and use this technology in different projects and applications.

RECOMMENDATION

One of the recommendations that we think really important to this lab report is to choose the appropriate hardware to use during the experiment. We found that it is much easier to use Arduino UNO R3 rather than Arduino MEGA due to unexplainable reasons.

Next, we strongly agreed that it is really important to double-check and make sure all of the sensors such as the potentiometer, LDR, and LM35 works perfectly because in certain circumstances the value or the output from the reading are quite weird because of the problems with sensors. For example, the value of LM35 is quite high even though we are at room temperature. But after replacing it with the new LM35, the results are normal.

Lastly, we highly recommend using the correct formula in order to calculate the results for the sensor reading. Make sure we use the formula to calculate the temperature in Celcius, not Kelvin or Fahrenheit. If we use the wrong formula, the result for our experiment might be quite different in terms of number and the graphs that we plot will have different patterns and shapes from the normal graphs.

STUDENT'S DECLARATION

Certificate of Originality and Authenticity
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 acknowledgment, and that the original work contained herein has 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 contributor 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

Signature: haziq	Read
Name: Muhammad Haziq Iskandar bin Hassan Nordin	Understand
Matric Number: 2119327	Agree

Signature: aliff	Read
Name: Muhammad Aliff Iqmal bin Zainun @Zainuddin	Understand
Matric Number:2114805	Agree

Signature: nazim	Read
Name: Muhammad Nazim bin Akhmar	Understand
Matric Number: 2114551	Agree

Signature: arfan	Read
Name: Muhammad Arfan Bin Mohd Zulkifli	Understand
Matric Number: 2112945	Agree