KULLIYYAH OF ENGINEERING (KOE)

MECHATRONICS SYSTEM INTEGRATION (MCTA3203)

SEMESTER 1, 24/25

SECTION 1

PROJECT REPORT WEEK 6

TITLE : DAQ-MC INTERFACING

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ABSTRACT

This lab report focuses on interfacing Data Acquisition (DAQ) systems with microcontrollers, Arduino Uno. The DAQ systems enable the measurement and analysis and physical characteristics by collecting data using sensors and transferring it to the computer for further processing. The integration process involves constructing circuits to collect data from LDRs and LM35 temperature sensors which convert analog signals into digital signals that can be read by the computer, and logging the data into an excel-based software tool, PLX-DAQ.

TABLE OF CONTENTS

INTRODUCTION

This experiment uses Arduino IDE interfacing with Data acquisition (DAQ). Data Acquisition consists of a measurement setup and a computer capable of capturing electrical characteristics and storing them for subsequent analysis. A fundamental DAQ system comprises several parts. Firstly, sensors or transducers that are measured through direct contact or without contact. These sensors or transducers change physical values into electrical signals that will be sent via usb to the computer. Secondly, the Data Acquisition device (DAQ) serves as a connection between the computer and the sensors. It can be connected to the computer through a USB port or PCI-Express slots on the motherboard. The hardware receives analog signals from the sensors and translates them into digital signals that the computer can read. Lastly, the computer which collects all the data received from the DAQ hardware to subsequently analyze the data.

MATERIALS AND EQUIPMENTS

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

EXPERIMENTS SETUP

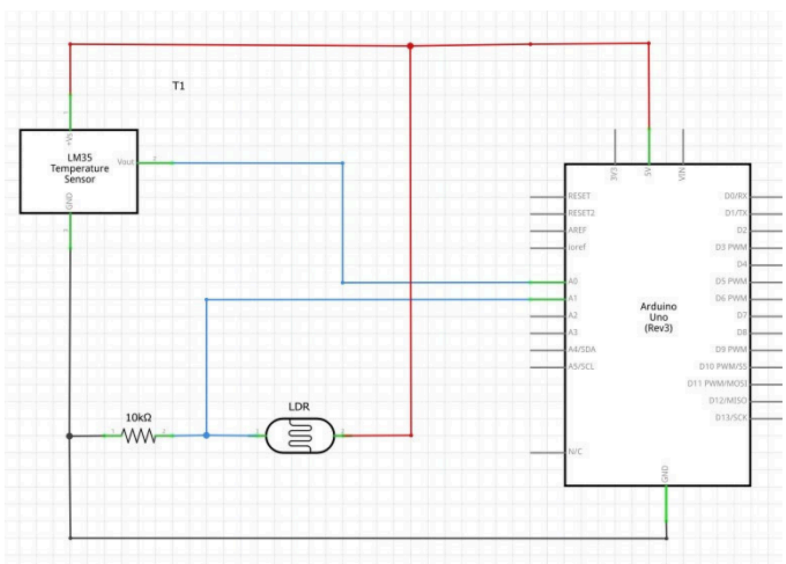


Fig. 3

Fig. 3: The connections of Arduino Uno, LDR, resistor and LM35 temperature sensor.

METHODOLOGY

The experiment is done by constructing a simple circuit as shown in Fig. 3 and uploading the Arduino code as shown in Fig 4. To the Arduino Uno R3 microcontroller. The Parallax Data Acquisition (PLX-DAQ) software is used to collect and record received data from Arduino Uno. The data will then be displayed in a form of Excel spreadsheet.

CODING

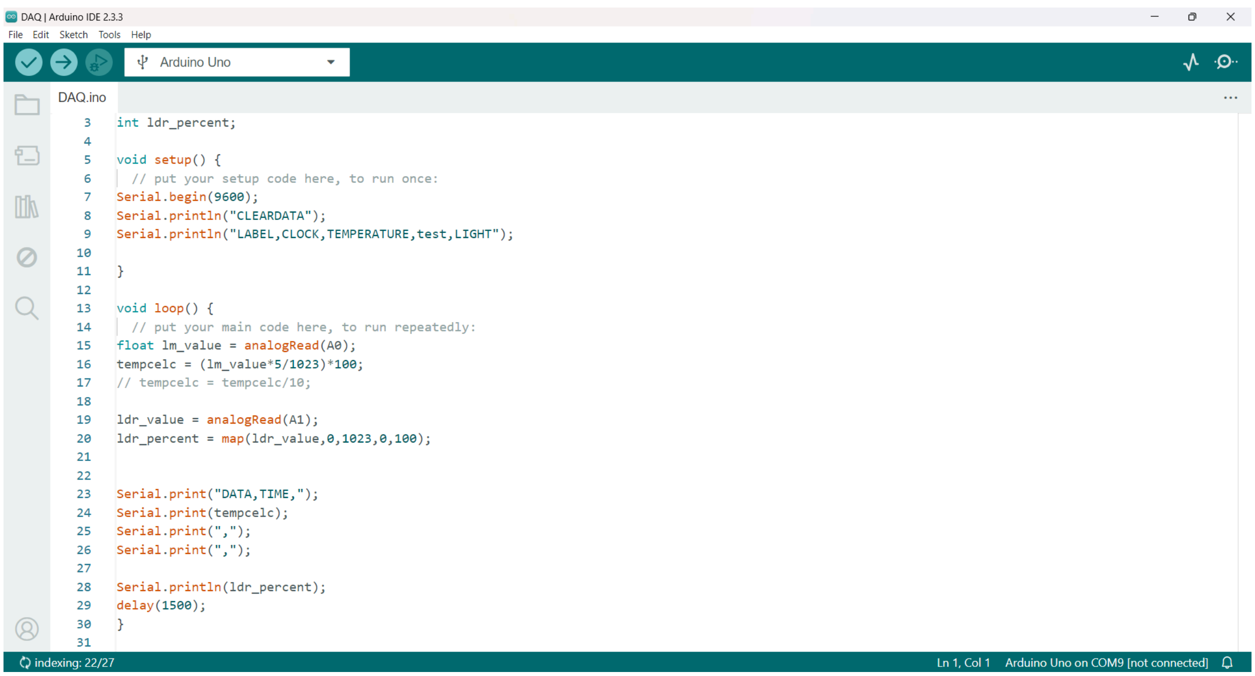


Fig. 4: Arduino code.

PROCEDURES

1. The circuit is constructed as shown in Fig. 3
2. Arduino code is written as shown in Fig. 4 to allow the Arduino to read analog signals from the LM35 and LDR and convert it to digital.
3. Arduino code is then verified and uploaded to the Arduino Uno.
4. The PLX-DAQ spreadsheet is launched and an Excel spreadsheet with a pop-out GUI window is then displayed.
5. Correct COM port and baud rate were selected and the “Connect” button was pressed.
6. The result is observed and recorded.

RESULTS

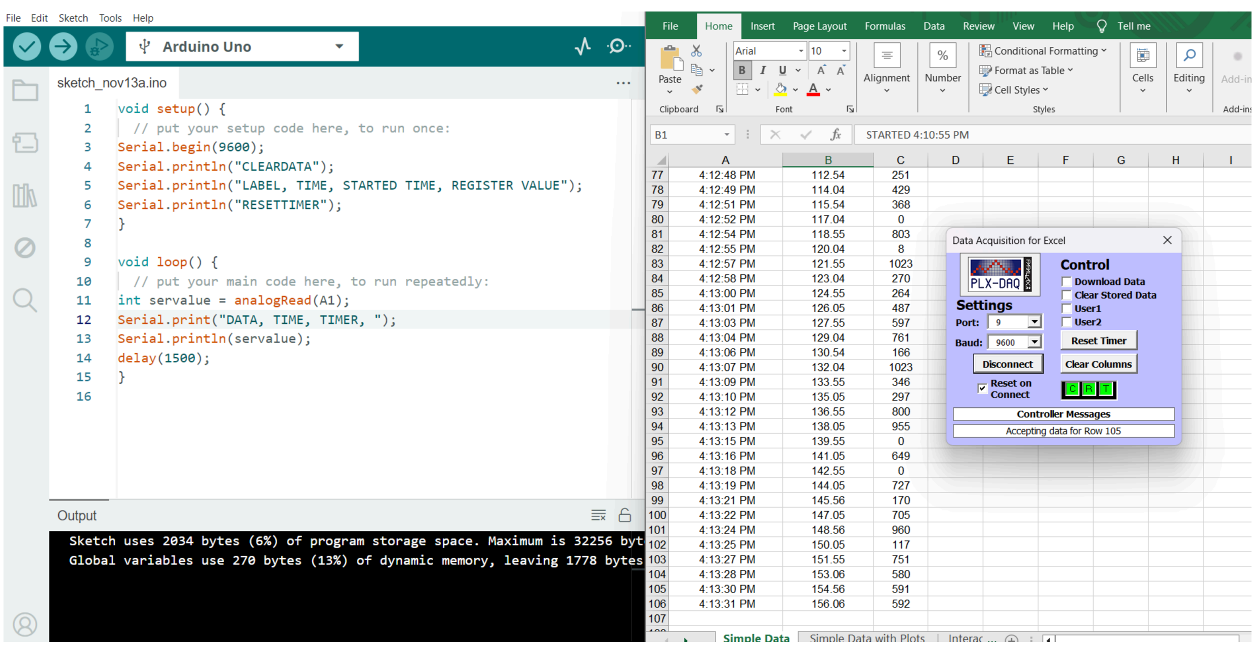


Fig. 5: Arduino code and data acquisition obtained through PLX-DAQ and Excel spreadsheet.

The circuit's voltage divider was designed to dynamically adjust the LDR's resistance value in response to variations in the room's lighting. The change had been performed, as evidenced by the continuous changes displayed on the serial monitor throughout the trial. By monitoring temperature-induced output with a 10 mV shift for every degree Celsius change, the LM35 temperature monitor also assisted. Inaccurate data had been captured throughout the trial, particularly in the temperature data, which varied above room temperature. The LM35's unusual behavior may be the result of damaged components or poor connections. Resolving this issue became essential to ensuring the accuracy of the data in report.

DISCUSSIONS

- **Software**

Arduino will be used as DAQ hardware which will receive and process data from the sensor and later send the data to the computer for analysis. Parallax Data Acquisition (PLX‑DAQ), a software add‑in designed for Microsoft Excel will be used for collecting data from the Arduino board and organizing it into columns as it arrives. This tool simplifies the analysis of data collected in various settings, including field measurements, sensor experiments, and real‑time equipment monitoring, by making it easily accessible and manageable within Excel spreadsheets. The constructed code, as shown in Fig. 4, was then uploaded to the Arduino. After PLX-DAQ was launched, in GUI, the correct COM port and baud rate were selected and the “Connect” tab was pressed. The data from the Arduino will be displayed in the spreadsheet.

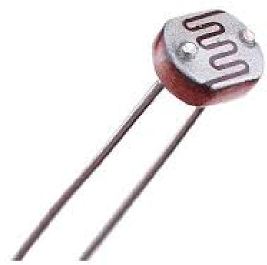
·   **Electrical**

The circuit shows that A0 and A1 pins of the Arduino Uno board are connected to the middle pin of LM35 temperature sensor and LDR respectively. The 5V pin of the Arduino board is then connected to both the VCC pin of LM35 sensor and LDR. The GND pin of the Arduino board is connected to both the ground pin of the LM35 sensor and another LDR pin. Pulldown resistors linked to the LDR act to ensure that the input pin reads a steady zero value when the LDR is not detecting light. When light is detected, it operates as analog input devices, sending signals to the respective pin.

·   **Hardware**

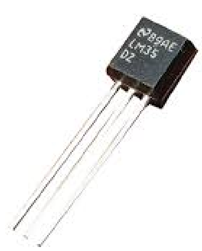
1. Arduino Uno

2. Light Dependent Resistor



Measure light intensity by converting changes in light levels into variable resistance.

3. LM35 Temperature sensor



Measure the temperature as the output voltage directly proportional to the temperature.

4. Resistor

Used for biasing the LDR and ensuring proper circuit functionality.

CONCLUSION

In this experiment, we used an Arduino microcontroller as a data acquisition (DAQ) device to collect and log sensor data with PLX-DAQ software. The setup involved assembling a circuit with an LM35 temperature sensor, an LDR, and necessary components like resistors and jumper wires. Arduino code was written to read analog signals, convert them to digital, and log the data into a spreadsheet for analysis. This task provided practical experience in interfacing sensors with Arduino for real-time data collection and visualization.

RECOMMENDATIONS

For future tasks, consider exploring additional functionalities of PLX-DAQ, such as advanced data analysis tools and real-time graphing, to enhance the utility of the data logging process. Additionally, ensure the Arduino code is well-documented with detailed comments to make it easier to understand and modify. When constructing circuits for similar projects, use clear and labeled diagrams to improve clarity and simplify troubleshooting, especially when collaborating with others or revisiting the project.

ACKNOWLEDGEMENT

We would like to express our gratitude to Dr. Wahju Sediono, Dr. Ali Sophian, Dr. Zulkifli Bin Zainal Abidin, for providing the necessary resources and facilities to conduct this and support throughout the duration of the project. Additionally, we extend our appreciation to all individuals who contributed to the success of this lab report through their valuable insights and feedback.

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 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 that no further improvement on the reports is needed from any of the individual contributors to the report.

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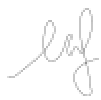
Signature: 	**Read**	/
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