Mechatronics System Integration (MCTA3203)

Week **6**: DAQ interfacing with Microcontrollers.

Data Acquisition (DAQ) consists of a measurement setup and a computer capable of capturing electrical or physical characteristics and storing them for subsequent analysis. A fundamental DAQ system comprises several parts as shown in Fig.1.

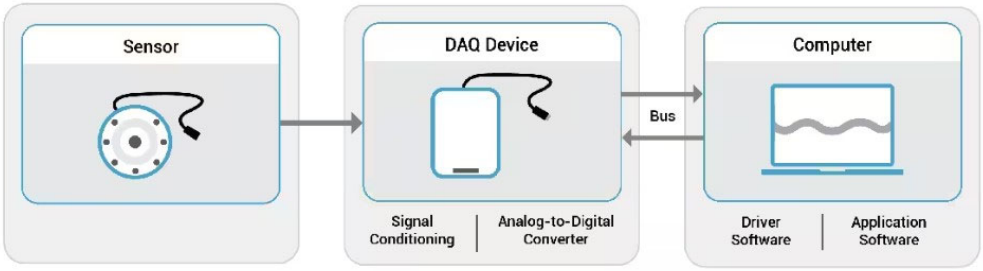


Fig.1 DAQ System

Sensor - Sensors or transducers connect with what's being measured, either through direct contact or without touching it. They change physical values into electrical signals. The kind of sensors used in a DAQ system depends on the specific purpose of the system.

DAQ Device – It serves as the connection between the computer and the sensors. It can be connected to the computer through USB ports or PCI-Express slots on the motherboard. The DAQ hardware receives analog signals from the sensors and changes them into digital signals that the computer can understand.

Computer - The final part in the DAQ system is a computer, which collects all the data received from the DAQ hardware for subsequent analysis.

Example:

Arduino will be used as DAQ hardware which will receive and process data from 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 and organize 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 PLX-DAQ can be downloaded using this link: https://www.parallax.com/package/plx-daq/

In this example, potentiometer will be used as analog input which will then read by Arduino and send to computer where PLX-DAQ record the received data for analysis. The data will then be in a form of Excel spreadsheet.

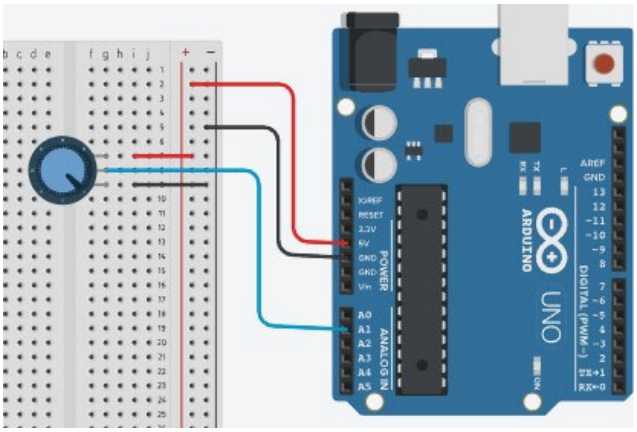
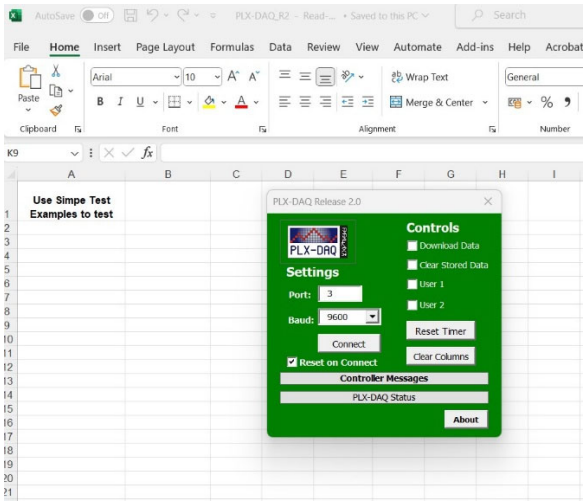


Fig.2

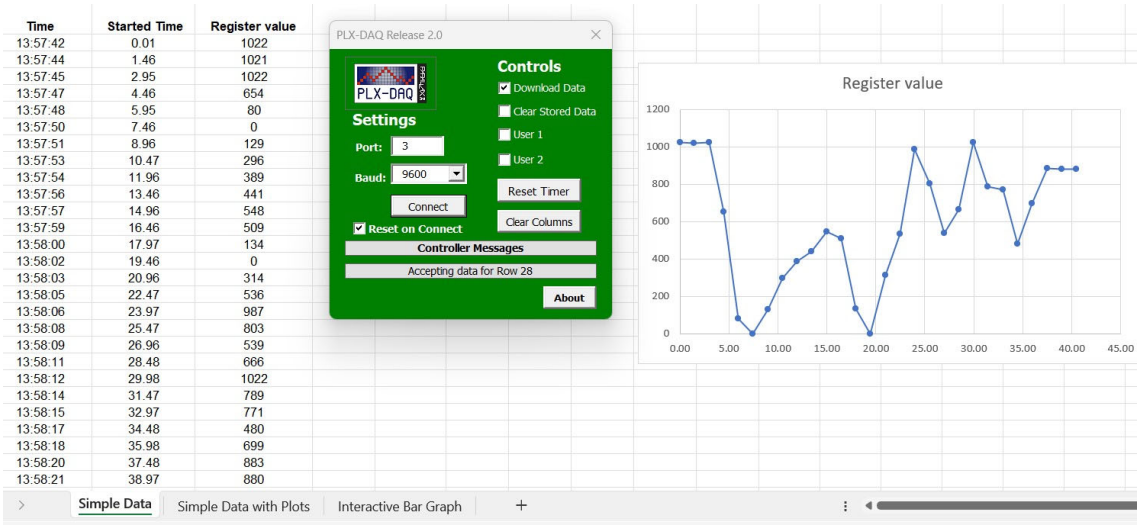
Instructions

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 pop-out GUI window in folder as shown below.



5. In the GUI, select the correct com port number and the ensure the baud rate is the same as the one written in the code.
6. Once done, press the connect tab and the data from the Arduino will be displayed in the spreadsheet.
7. You may now observe the received data and use all tools available in the MS Excel for analysis.



THE TASK

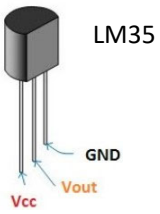
Part A

LDR and LM35 Sensor Circuit

In this task, you are required to collect data from sensors by using Arduino as a simple DAQ device and transfer the data to the PLX-DAQ for data logging and analysis. Construct the circuit shown in Fig.3.

Materials Needed:

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



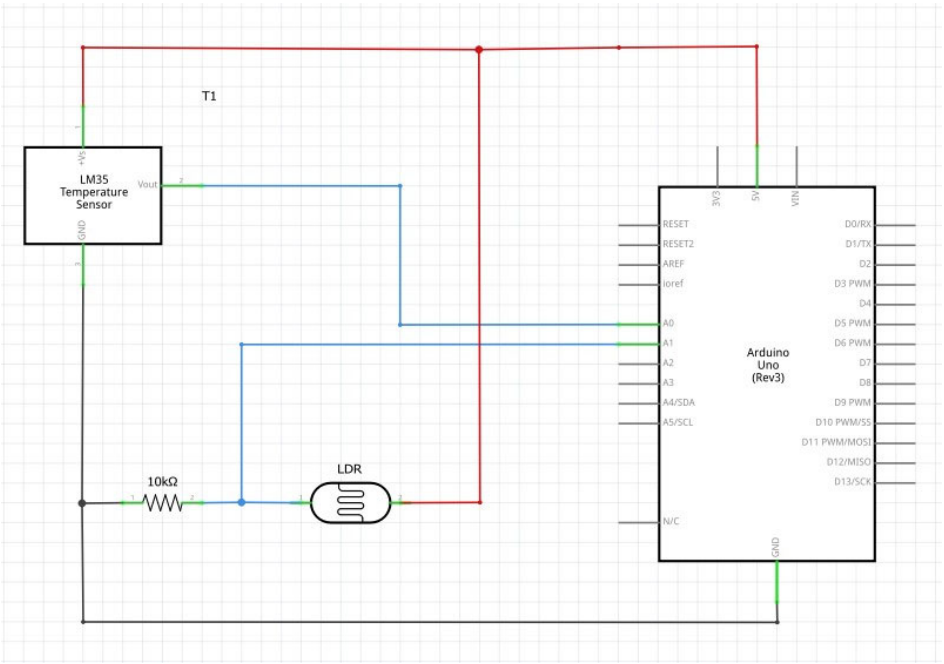
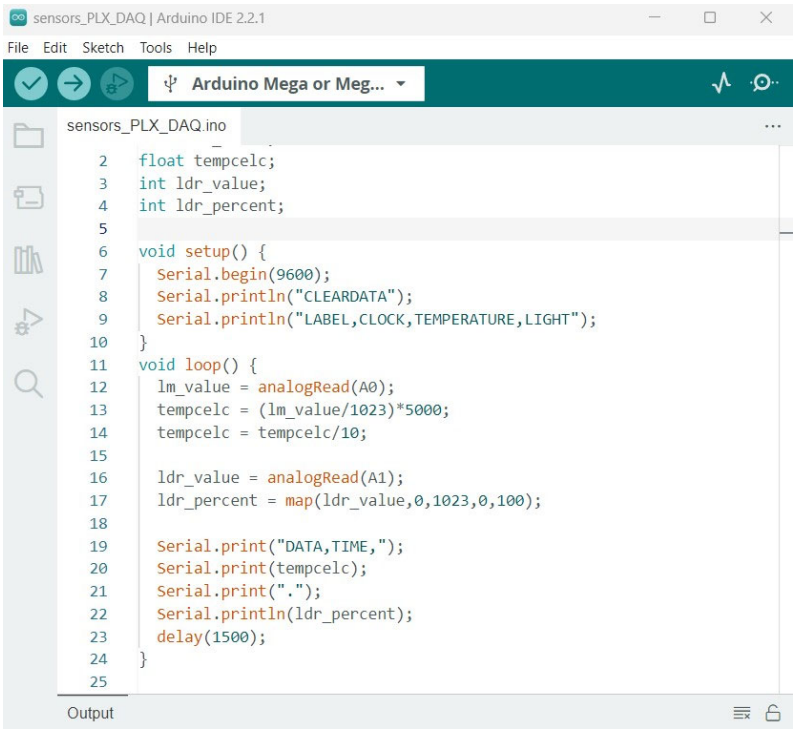


Fig. 3

Experiment Steps:

1. After constructing the circuit, launch Arduino IDE and write code that allows Arduino to read analog signals from the LM35 and LDR and convert it to digital.
2. Complete the example code below. (Alternatively, you may write your own code from the start).



3. Verify the codes and upload it to the Arduino board.
4. Launch the PLX-DAQ spreadsheet. Ensure correct com port is selected and generate the output from the sensors in the spreadsheet.
5. In your report, write the comments to explain each line of the codes and produce meaningful excel plots from the sensors' data.