

Design & Development of Viscosity Analyzer

Group Number : 91

MID REVIEW – AUGUST

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Problem Definition

Measuring viscosity accurately with known viscometers has been a challenge.

Nowadays we have found many instruments to find or measure viscosity values. But there was almost no comparison method to compare the devices and easy to use.

In the Falling Ball Viscometer, the liquid in the falling tube is mixed with bubbles, so the viscosity of the respective liquid does not get the correct value.

Viscosity can change as the walls of the tubes exert pressure on the fluid being used in the tubes.

Measurement errors may occur due to the inability to identify the measuring stations used in the calculation of time.


A problem with the test is that there is no way to compare the data over time with the records because there are no historical records.

The error may arise due to non-alignment (left to right) of the tubes used.



Our Aim

Allowing easy and safe Viscosity measurement of any liquid with high efficiency while contributing to economic benefits to the modern technology through development of viscosity Analyzer.

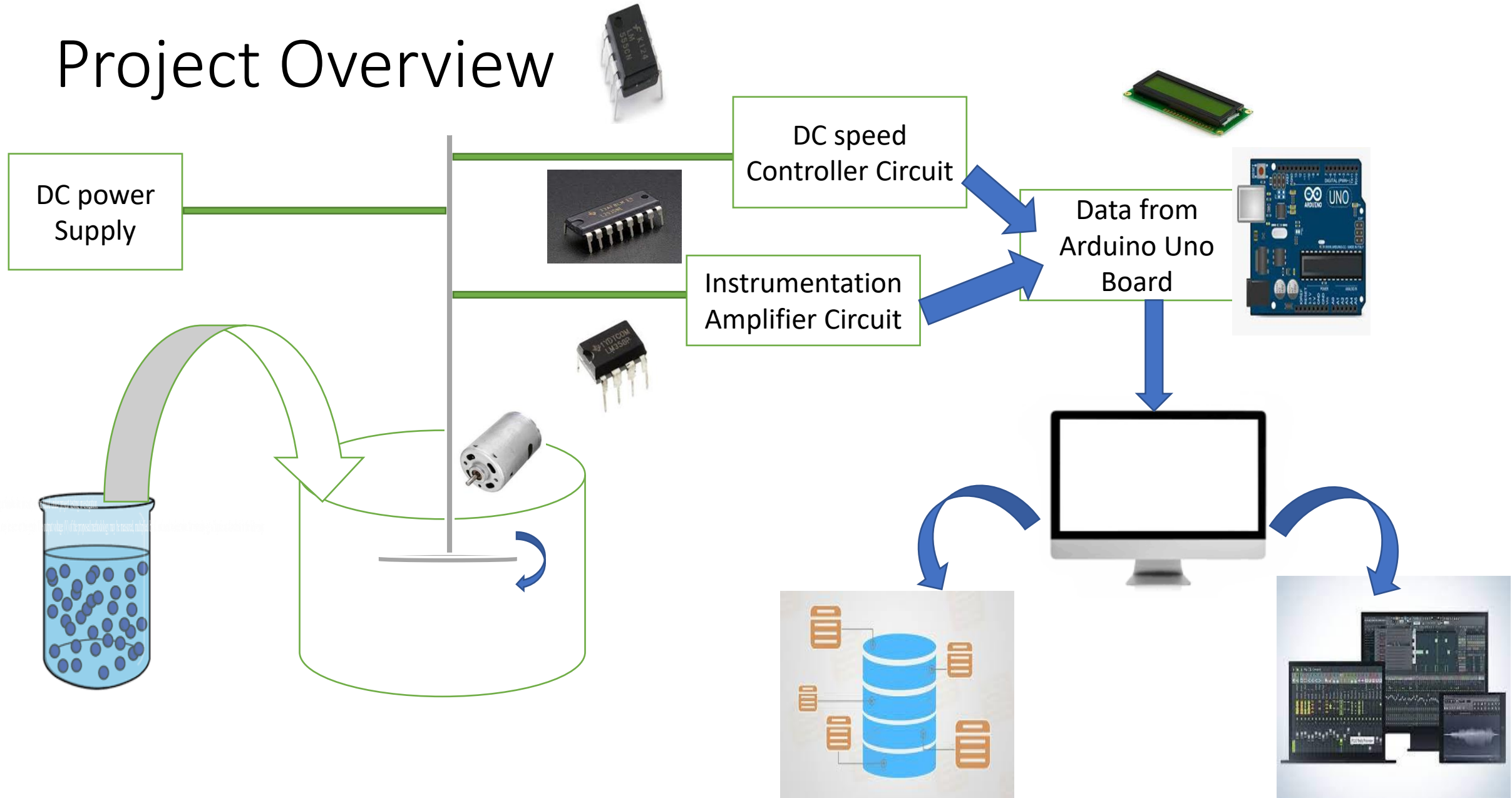


A background image of laboratory glassware, including a graduated cylinder in the foreground filled with blue liquid, and several Erlenmeyer flasks containing yellow and green liquids in the background. A white silhouette of a hand is pointing towards the objectives.

Objectives

- Design a low cost device to measure viscosity accurately.
- Design an electronic circuit to measure viscosity of an unknown fluid.
- Design a software to calculate/compare viscosity of a liquid and a data base to store values.

Project Overview

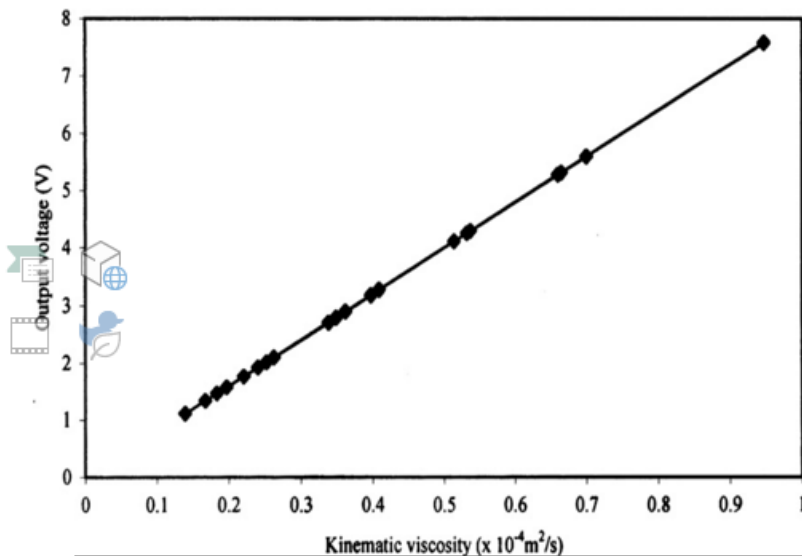


Mathematical Solution

- The current of dc shunt motor is directly proportional to the viscosity of the liquid under project testing investigation.
- A linear association between the two values may be seen on this graph. The output voltage (V) of the proposed methodology may be measured, multiplied by K, and used to determine the viscosity (g) of liquids as described in the following:

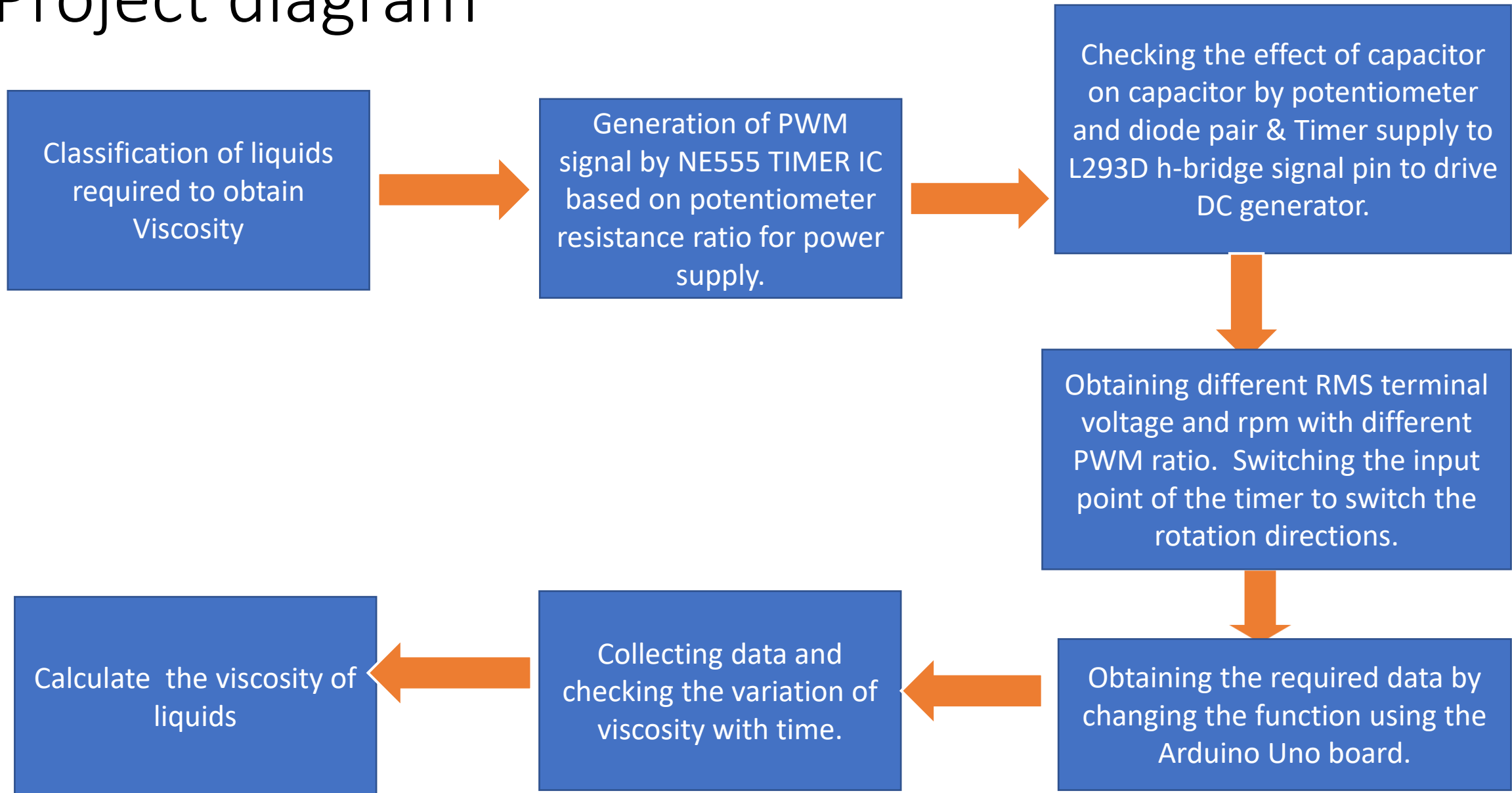
$$\eta = K \times V \quad \text{where } K = 0.0125 \times 10^{-3}$$

(k is a constant.)



Graph of output voltage versus observed viscosity

Project diagram



Components.....

DC motor



USB port Connectors



Arduino Uno Board



Rotating Disk



breadboard



Potentiometer

LM358 IC



555 Timer IC



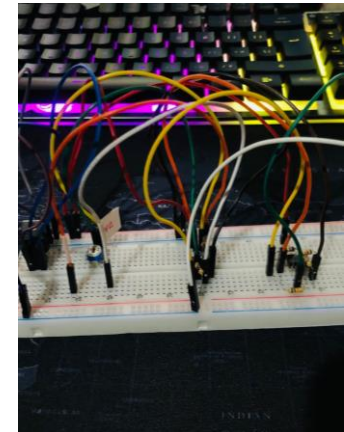
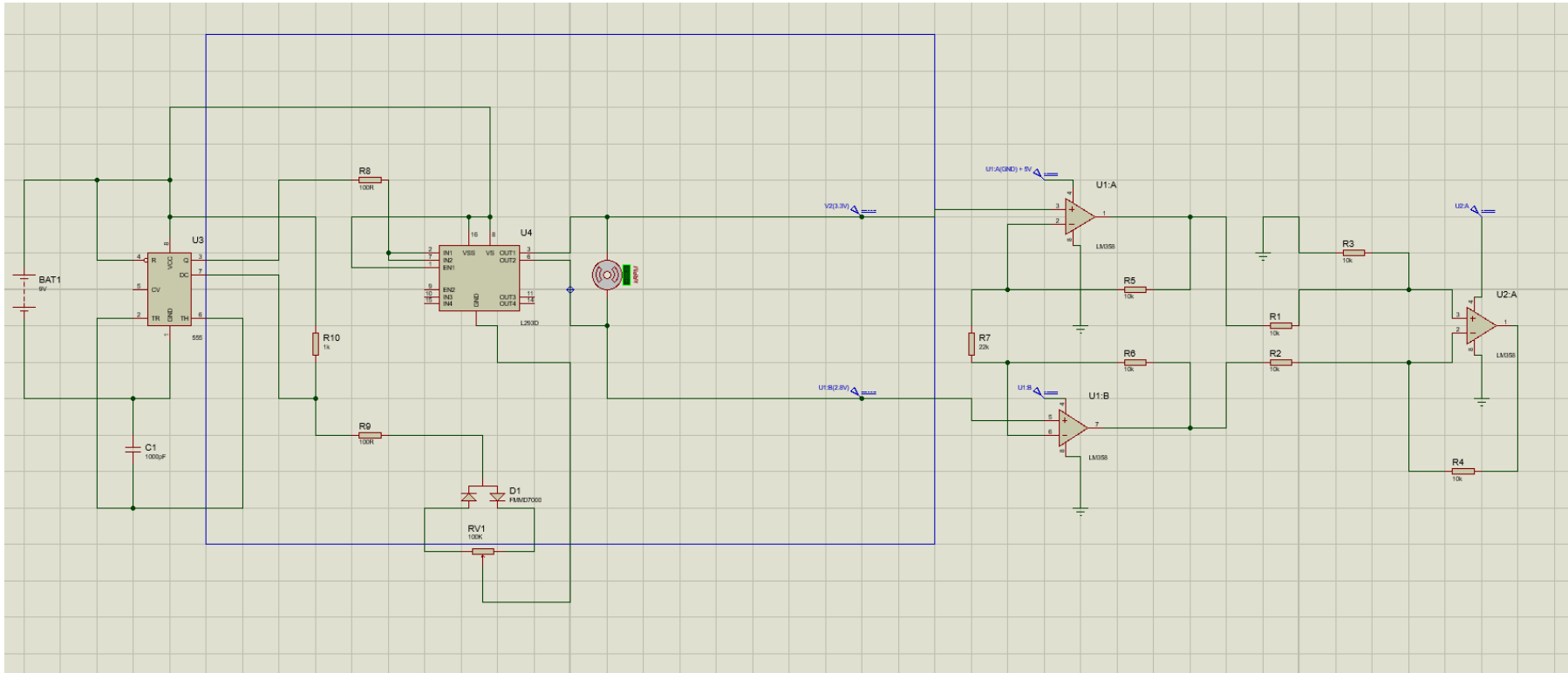
L293D IC



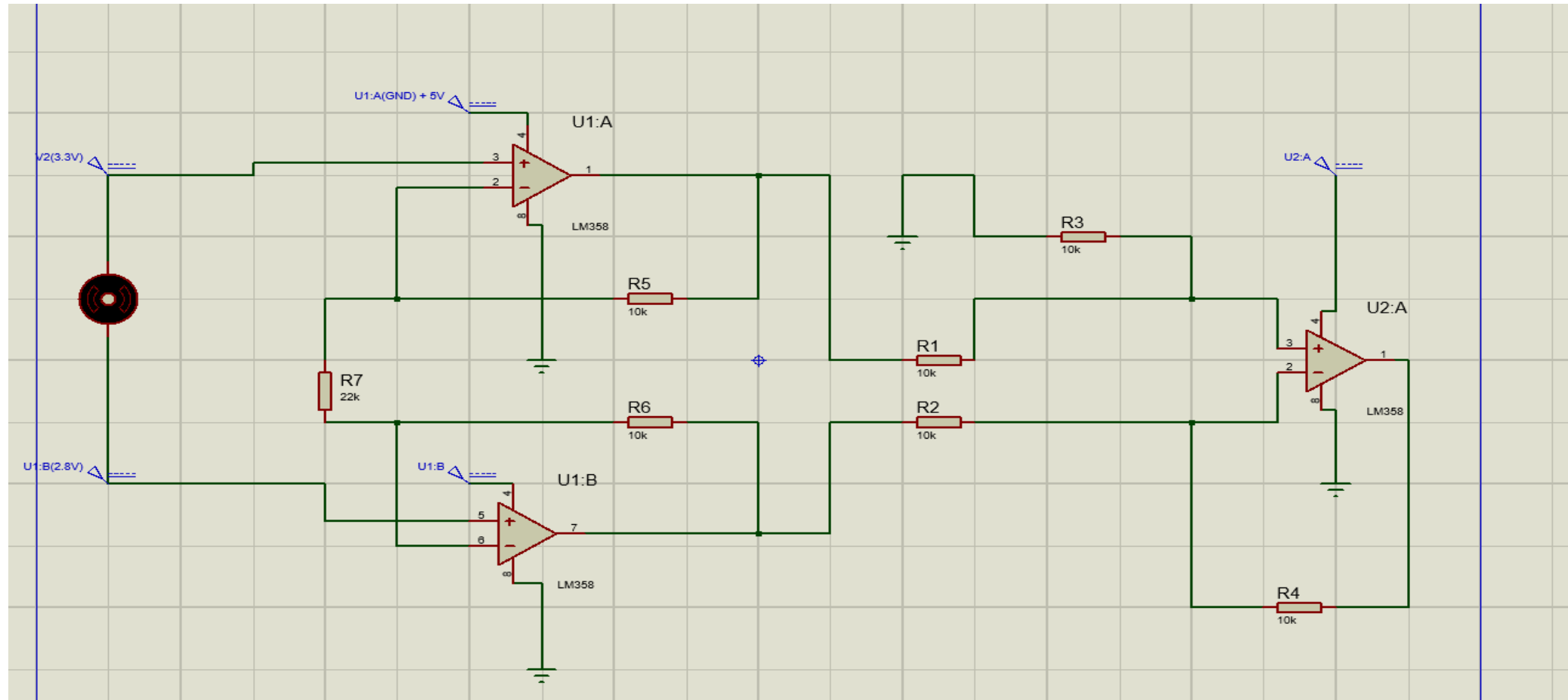
LCD Display



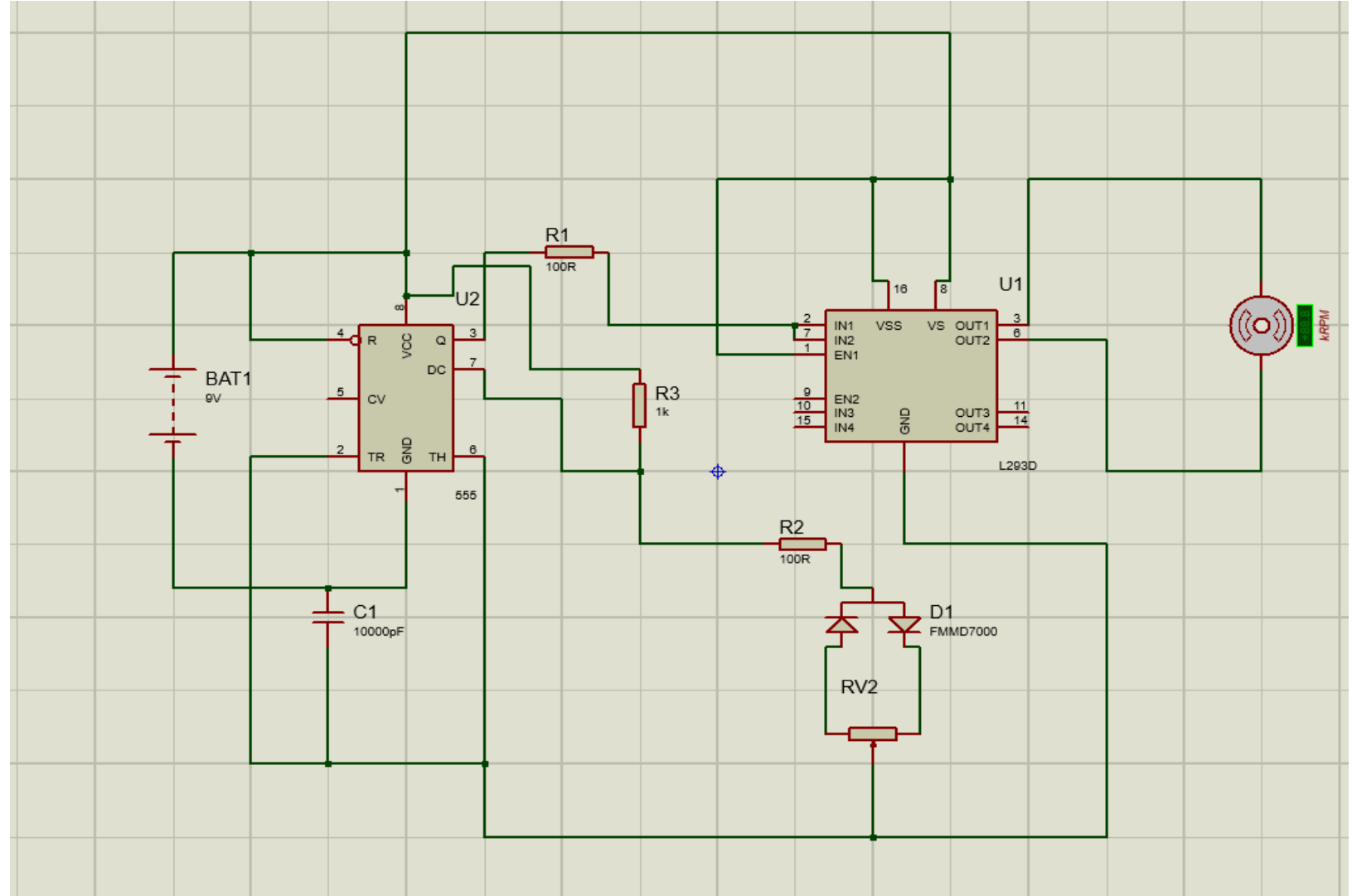
Designed circuit For giving and Controlling the DC supply to DC Shunt Motor

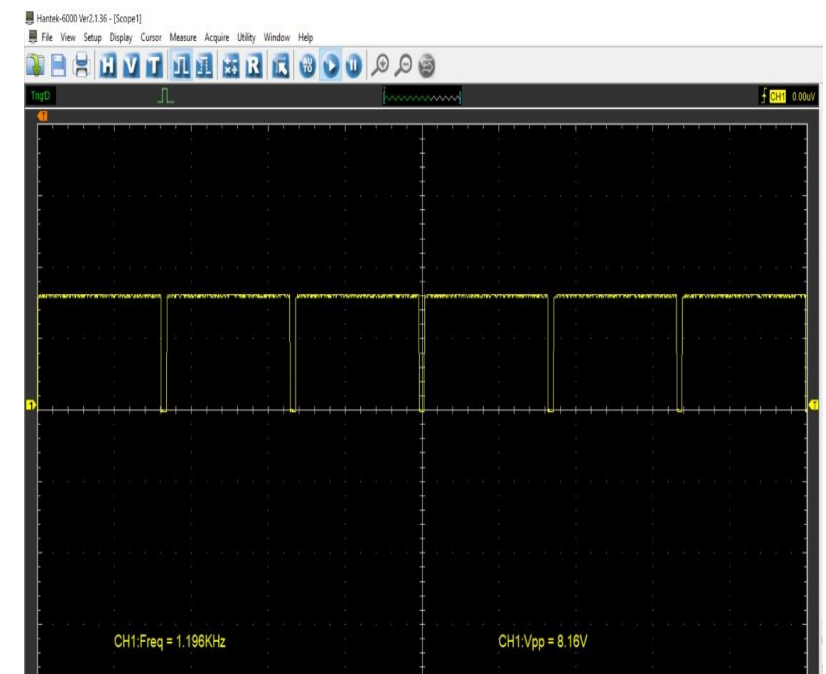
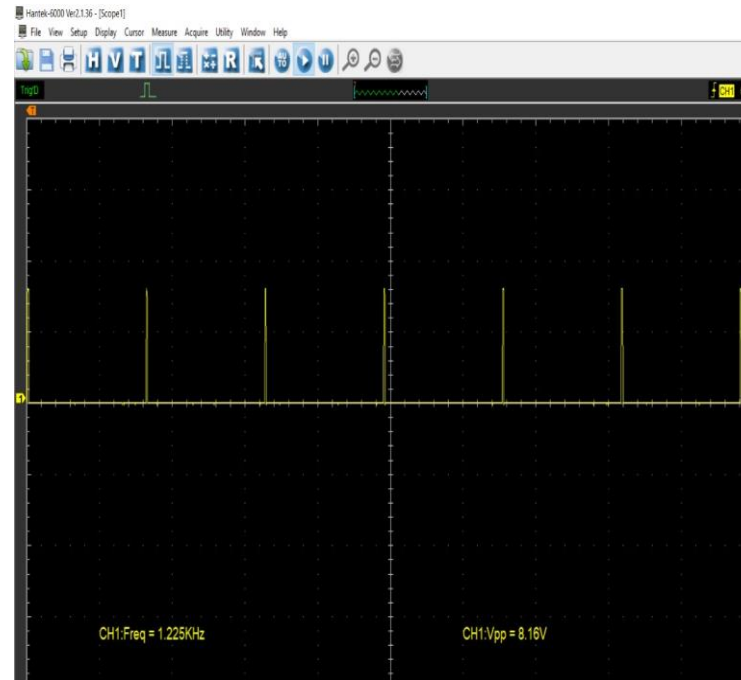
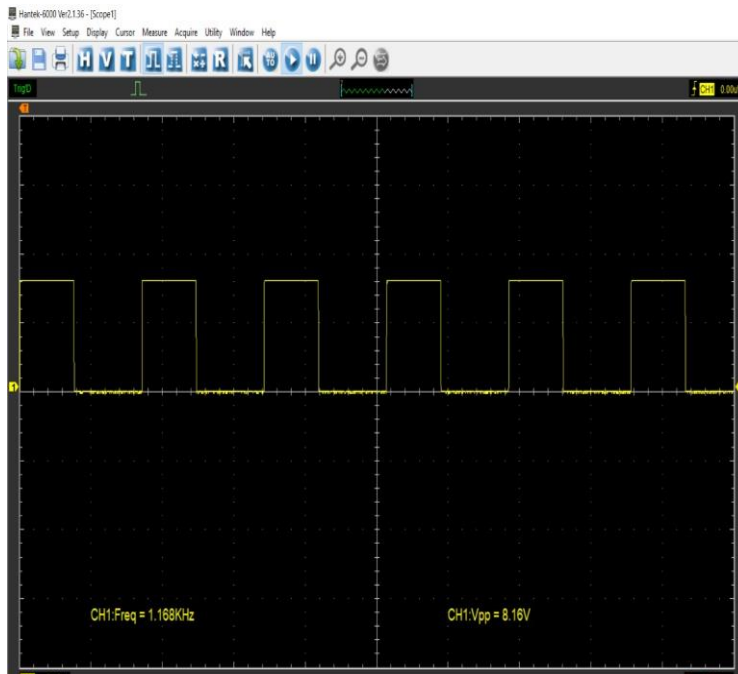


Instrumentation Amplifier Circuit Diagram



DC motor Speed Controller Circuit Diagram





Output Result From DC Motor Controller



Software Implementation

- We use Some software to get data from our project.
 - ☐ Microsoft Excel
 - ☐ Proteus 8 Professional
 - ☐ PyCharm Community Edition 2022 1.4
 - ☐ Jupiter Notebook
 - ☐ Arduino Software
 - ☐ Python libraries(numpy,pandas,tkinter etc.)





Software Process(Unloading)

- First we get real time data from Arduino boards to computer.
- Next we store data to Microsoft Excel through connecting data screamer function.
- Next We save this file with .CSV extension.
- We read CSV files from using python programming Languages in PyCharm Community Edition 2022 1.4 or Jupiter Notebook Software.
- When using CSV file data, we generate the real time graph and GUI applications.
- Finally, we can calculate the liquids of viscosity with using mathematical functions.

Procedure for measuring viscosity of an unknown liquid



The first thing to do is rotate the rotating disk and collect the data



After that, the system is placed on a liquid of known viscosity and data is collected



The system is placed on a liquid of unknown viscosity and data is collected.



Based on the values obtained above, the viscosity of an unknown liquid is calculated based on mathematical principles.



Challenges & Risk Factors

- Time Management
- Hardware implementation can be affected by external environmental factors.
- Software testing & Debugging
- Cost - effective

Next Project Timeline

[illegible]



Thank You !!!

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