EECE 5552-Assistive Robotics

Assignment 9-b

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Group Project 1 – Interfacing Metal Touch Sensor Module KY-036 with Intel Galileo Gen2 Board

Objective -

The goal of this project is to interface the Metal Touch Sensor Module KY-036 with the Intel Galileo Gen2 board. The sensor detects contact with its metal spike and outputs signals through both digital and analog channels.

Components Used -

- Intel Galileo Gen2
- Metal touch sensor
- USB Cable
- Power supply cable
- Arduino IDE to run code

Connection Diagram -

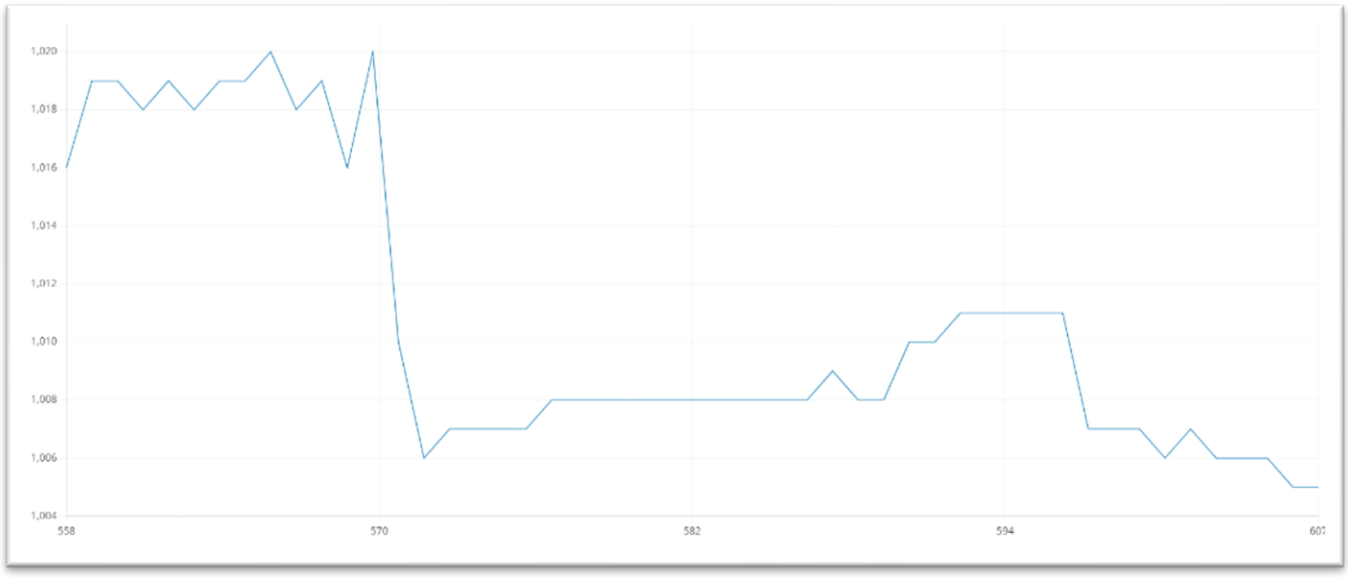
KY-036	Arduino
S	A0
+	5V
G	GND
D	D7

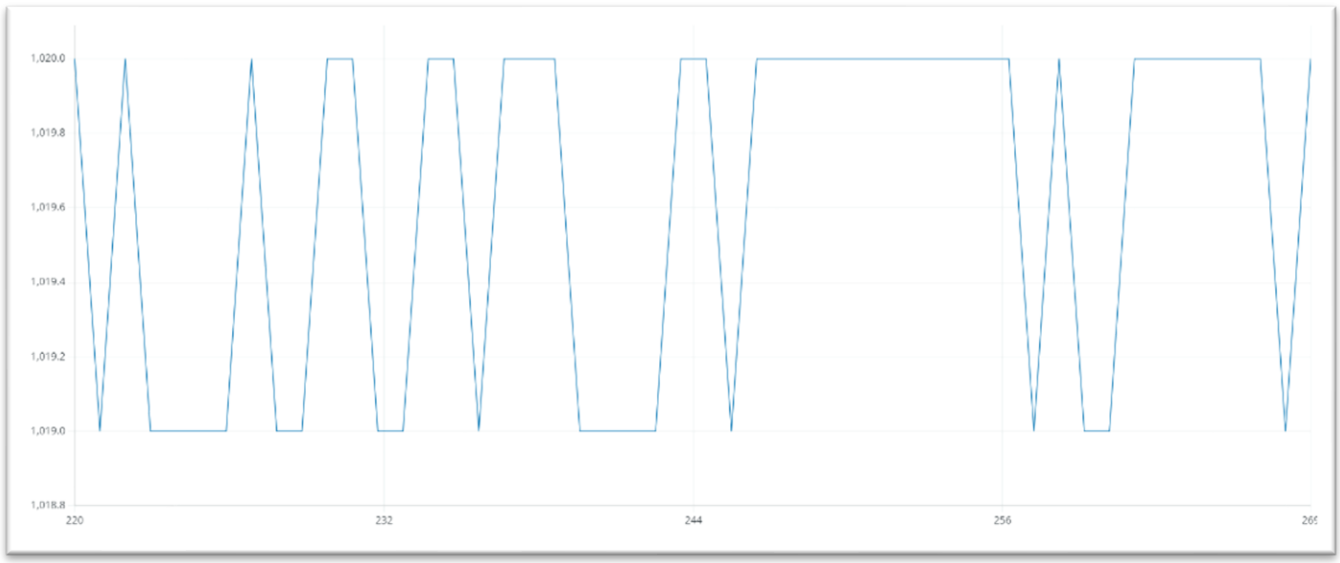
Description -

- The sensor will output a signal on the digital channel when contact with the metal spike is detected.
- The analog output provides a direct measurement of the sensor value, allowing for more precise readings.
- LED1 indicates that the sensor is supplied with voltage.
- LED2 shows when the sensor detects a magnetic field.
- The potentiometer on the sensor allows for the adjustment of sensitivity, enabling customization for different scenarios.

Results:-

- Our results include both sensor outputs analog and digital values along with a timestamp for each reading. The timestamp indicates the time at which each measurement was taken.
- The analog values we got vary over time which indicates changes in physical conditions that metal sensor is exposed.
- The analog values range from 0.6549 to 4.9853.
- The digital values indicate whether the metal spike of the sensor is touched or not. A value of '0' shows no contact, while '1' would typically indicate contact.
- In our results , the digital value remains ‘0’ which shows that metal spike was not touched during the time while recording readings from board.





Observations:-

- The graph show that the analog values remain high around 4.9853 while the digital value remains '0' which indicates no touch.
- Around timestamp 342500, there is a significant drop in the analog value 2.4389 which could show change in the physical condition.
- At timestamp 372573, there is a sudden drop in the analog value 0.6843 indicating a notable change in the physical condition or touch event.
- The analog values continue to vary throughout the data collected, with occasional drops and rises.
- The sensor appears to respond to changes in the sensed environment, as indicated by fluctuations in analog values. The absence of '1' in the digital values suggests that no touch events were recorded during the observed time frame.

<u>Group Project 2</u> – Interfacing KY-026 Flame Sensor Module with Intel Galileo Gen2 Board

Objective -

The main goal of this project is to interface the KY-026 Flame Sensor Module with the Intel Galileo Gen2 board and sample the sensor at different frequencies (1 Hz, 5 Hz, 10 Hz, and 20 Hz) for 30 seconds each. The goal is to detect infrared light emitted by fire and observe the sensor's behavior under varying sampling rates.

Components Used:-

- Intel Galileo Gen2
- Flame sensor
- USB Cable
- Power supply cable
- Arduino IDE to run Code.

Connection Diagram:-

KY-026(Flame Sensor)	Arduino
A0	A0
G	GND
+	5V
D0	2

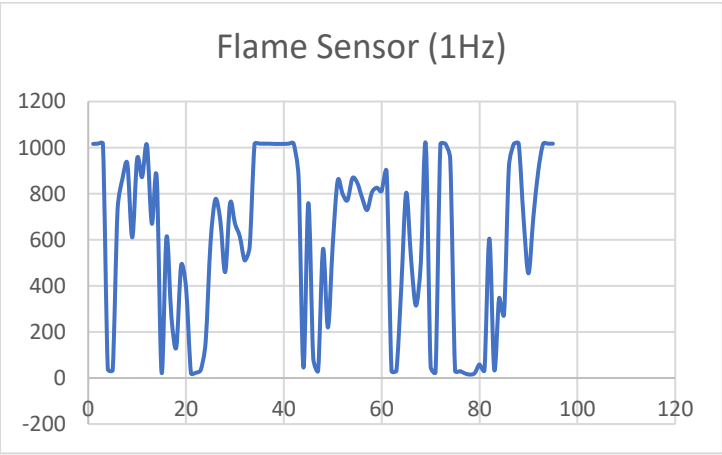
Description -

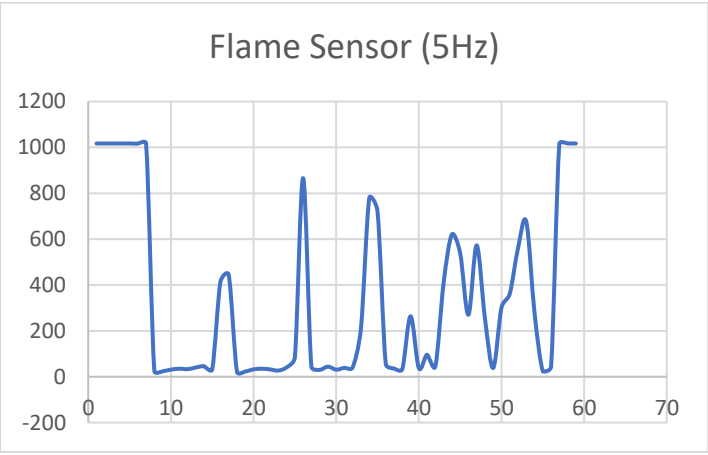
- The potentiometer on the KY-026 Flame Sensor Module is to adjust the sensitivity according to the requirements of the fire detection system.
- Recorded the analog and digital output values at each sampling rate.

Results –

Potentiometer value when set to 1Hz –

- The readings fluctuate between values in the range of 15 to 1017 which is shown in the graph below.
- When the sensor is not exposed to flame the readings ranges from 1016-1017.
- In the presence of flame values drops to lower such as 39 and 34.
- higher values like 898 indicate an increased intensity of the flame or a spike in the infrared radiation.





Potentiometer value when set to 5Hz -

- The readings continue to fluctuate between values in the range of 24 to 1017.
- The data being sampled at 5Hz provides more frequent readings compared to1Hz dataset.

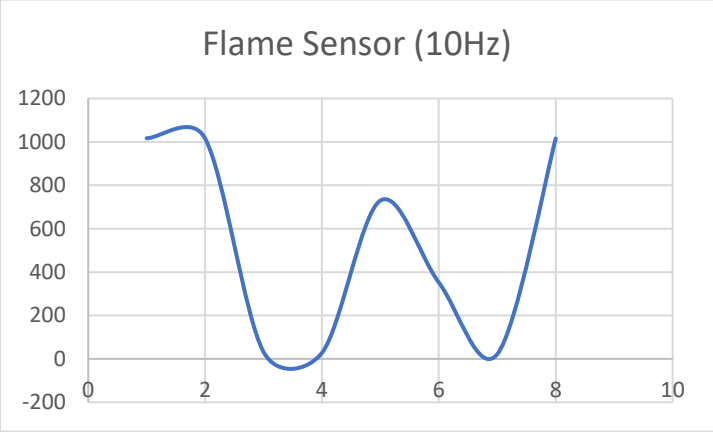
- The flame sensor continues to exhibit similar behavior with occasional drops in values.
- Increasing the frequency of data collection allows the flame sensor to detect subtle changes in the environment more frequently.

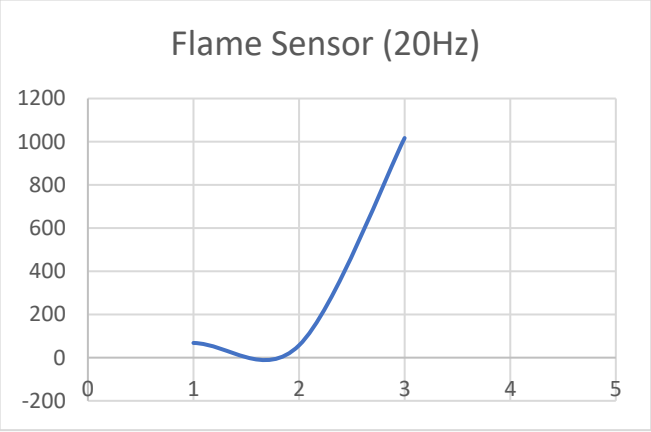
Potentiometer value when set to 10Hz –

- The readings exhibit a range of values from 22 to 1017.
- The data, being sampled at 10Hz, provides even more frequent readings compared to 5Hz dataset.
- Utilize the detailed data from the 10Hz sampling to fine-tune the sensitivity of the flame sensor, ensuring it effectively distinguishes between normal conditions and the presence of a flame.

Potentiometer value when set to 20Hz –

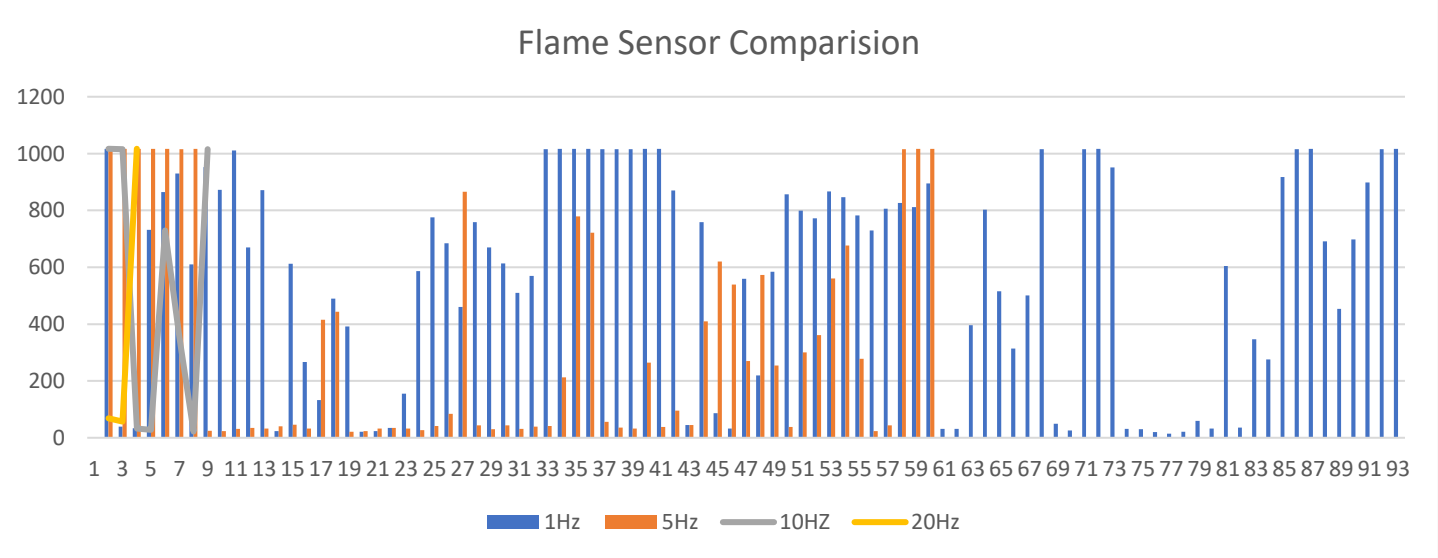
- The readings include values of 68, 57, and 1017.
- The flame sensor is now sampled at an even higher frequency of 20Hz.
- The 20Hz sampling rate allows for a more dynamic and detailed monitoring of changes.





Observation for 1Hz, 5Hz, 10Hz, 20Hz –

- As the sampling rate increased the flame sensor demonstrated heightened sensitivity to changes in the environment.
- The graph below shows a comparison of values at different Hz i.e. 1Hz, 5Hz, 10Hz and 20Hz.
- The higher frequency allowed for even more detailed monitoring and responsiveness to rapid changes.



<u>Group Project 3</u> - Interfacing KY-024 Linear Magnetic Hall Sensor with Intel Galileo Gen2 Board

Objective -

The objective of this project is to interface the KY-024 Linear Magnetic Hall Sensor with the Intel Galileo Gen2 development board, sample the sensor at different frequencies (1 Hz, 5 Hz, 10 Hz, and 20 Hz) for 30 seconds each, and plot the results. The sensor reacts to the presence of a magnetic field, providing both analog and digital outputs. The potentiometer allows for sensitivity adjustment.

Components Used -

- Intel Galileo Gen2
- Magnetic Hall sensor
- USB Cable
- Power supply cable
- Arduino IDE to run Code.

Connection Diagram -

KY-026(Hall Sensor)	Arduino
A0	A0
G	GND
+	5V
D0	3

Description -

- Recorded both analog and digital output values at each sampling rate of 1 Hz, 5 Hz, 10 Hz, and 20 Hz for 30 seconds each.
- Observed changes in the analog output that reflect the polarity and strength of the magnetic field.

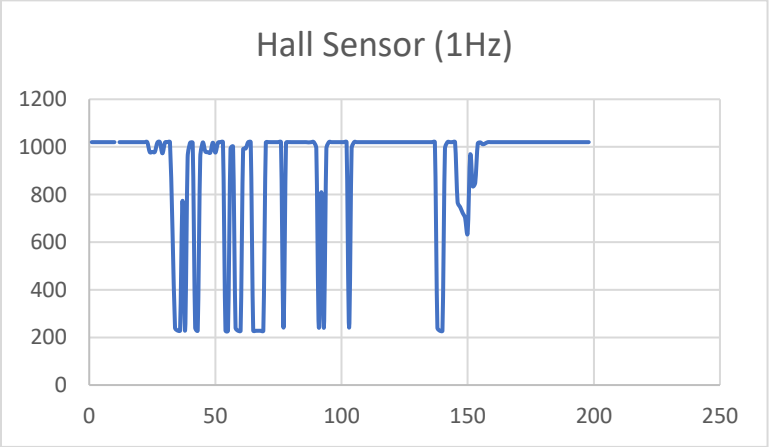
Results -

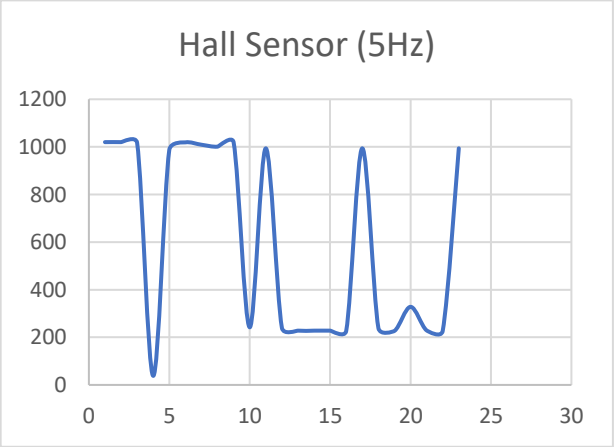
Potentiometer value when set to 1Hz -

- The Hall sensor data at 1Hz indicates a continuous and stable magnetic field, with readings consistently at 1020. The data suggests a stable and continuous magnetic field.
- The uniform readings imply a stable magnetic field or a static sensor environment.

Potentiometer value when set to 5Hz -

- The readings include a mix of 1020 and 1017. The data shows a combination of stable and varying magnetic field conditions.
- The values like 38, 987, and 242 indicates dynamic changes in the magnetic field. The fluctuation between 227 and 328 represent transition states in the magnetic environment.



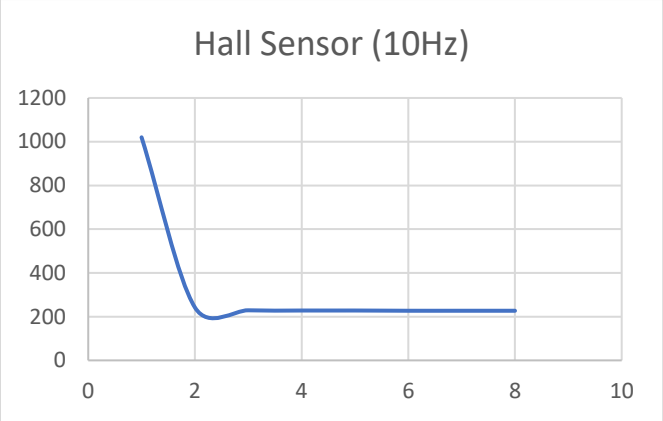


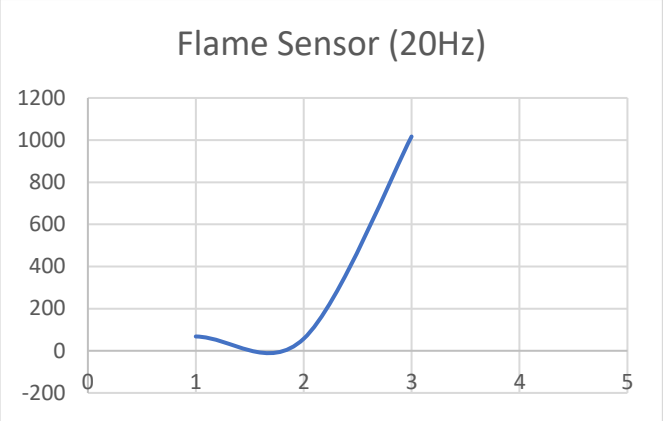
Potentiometer value when set to 10Hz -

- The readings include values such as 1020, 242, and fluctuations between 227 and 228.
- Fluctuations between 227 and 228 and the presence of values like 242 indicate dynamic changes in the magnetic field.

Potentiometer value when set to 20Hz -

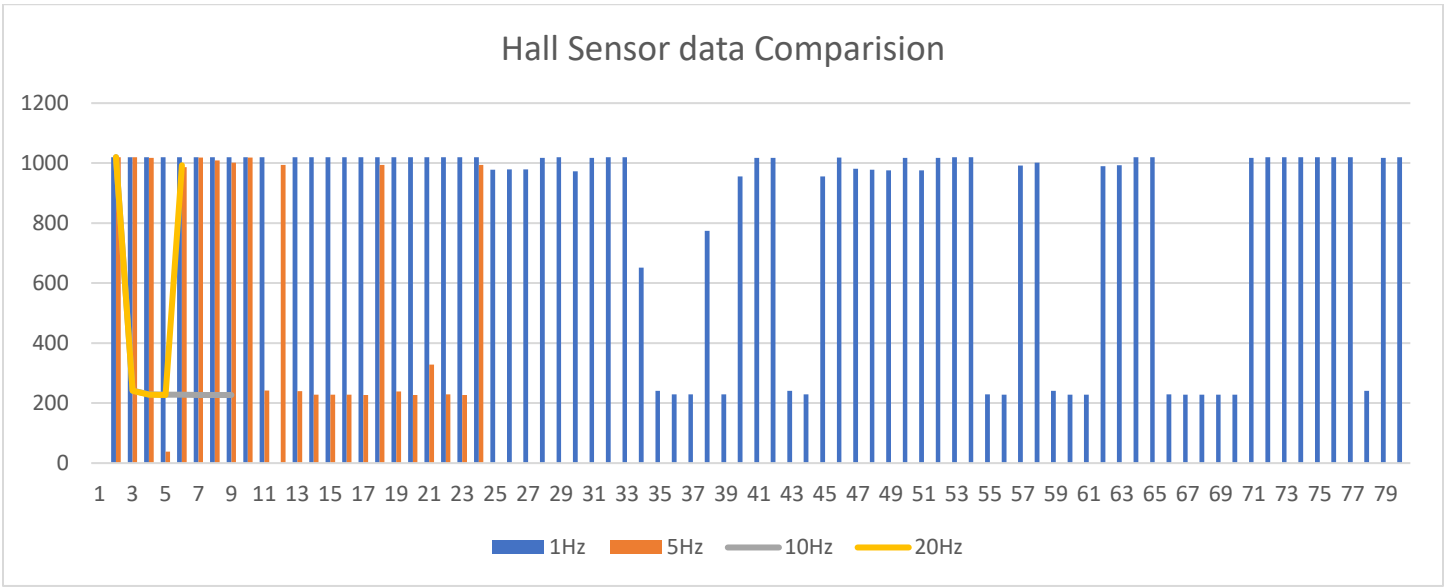
- The presence of values like 68 and 57 indicates dynamic changes in the magnetic field.
- The higher sampling rate of 20Hz allows capturing rapid changes in the magnetic field.





Observation for 1Hz, 5Hz, 10Hz, 20Hz –

- As the sampling rate increases, the Hall sensor demonstrates high sensitivity to dynamic changes in the magnetic field.
- Higher sampling rates (10Hz and 20Hz) allow the sensor to capture rapid fluctuations and respond dynamically to variations.
- The higher sampling rates, especially at 10Hz and 20Hz, enable real-time monitoring and control, making the Hall sensor more responsive to immediate changes.



Data Recorded into excel which can be found in below link.
https://drive.google.com/drive/folders/1-Z-tGjEGQ3zqsKB8zH115o1hY7GkcWzE?usp=drive_link