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Temperature and Heart Rate Monitoring System Using Lab view

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Abstract: *This project presents the design and implementation of a real-time temperature and heart rate monitoring system using National Instruments (NI) myDAQ hardware and LabVIEW software. The primary goal is to develop a cost-effective, portable, and user-friendly biomedical monitoring solution suitable for educational use, preliminary diagnostics, or home healthcare applications. The system utilizes analog sensors, including an LM35 temperature sensor and a heart rate sensor, to acquire physiological signals from the human body. These signals are conditioned and digitized by the NI myDAQ, which acts as the interface between the sensors and the computer. LabVIEW, a graphical programming environment, is employed for real-time signal processing, analysis, and visualization. Key software features include live data plotting, threshold-based alerts, and data logging for future review. Experimental results confirm that the system reliably measures body temperature and heart rate with adequate accuracy for non-clinical environments. Its modular architecture supports future enhancements, such as wireless data transmission and cloud-based health monitoring. This project underscores the potential of integrating LabVIEW with myDAQ for rapid prototyping in biomedical instrumentation.*

Key Word: *Itemperature, Heart rate , Lab view.*

I.INTRODUCTION

Monitoring vital signs such as body temperature and heart rate is crucial for health assessment in both clinical and non-clinical settings. With the advancement of virtual instrumentation and data acquisition tools, it is now possible to develop compact, low-cost, real-time monitoring systems for educational and personal use. This project presents the design and implementation of a temperature and heart rate monitoring system using National Instruments (NI) myDAQ and LabVIEW. The system uses an LM35 temperature sensor and an infrared (IR) heart rate sensor to acquire physiological signals from the human body. These analog signals are captured by the NI myDAQ, which serves as the interface between the sensors and the computer. LabVIEW software processes, filters, and visualizes the data through a user-friendly interface, offering features like real-time monitoring, data logging, threshold-based alerts, and analysis. The LM35 is a precision sensor that provides a linear output proportional to temperature in Celsius, requiring no external calibration. The heart rate sensor is widely used for fitness and medical applications to monitor pulse rate. This setup offers a hands-on platform for students and researchers to learn how to integrate hardware and software for practical biomedical applications.This paper presents a LabVIEW-based health monitoring system that measures body temperature and continuously monitors pulse rate using ECG electrodes. The system features a user-friendly graphical user interface (GUI), enabling healthcare professionals to remotely monitor patients and access medical records for effective diagnosis and timely treatment[1]. The system utilizes LabVIEW to monitor body temperature using both thermistor and LM35 sensors, and heart rate derived from ECG signals. These physiological parameters are processed and displayed in real-time through a user-friendly graphical user interface (GUI). The interface is accessible remotely by authorized medical personnel, enabling continuous patient monitoring, rapid assessment, and improved healthcare delivery in both clinical and remote environments [2]. This paper focuses exclusively on the development of a temperature monitoring system utilizing the DS18B20 digital temperature sensor. The system employs the MSP430 microcontroller for data acquisition and uses LabVIEW software for real-time analysis and visualization. Heart rate monitoring is not addressed, as the study is specifically centered on temperature measurement and processing [3]. This study presents a low-cost, real-time health monitoring system for ECG, body temperature, and SpO_2 using LabVIEW. Physiological data from temperature and heart rate sensors are processed via an Arduino microcontroller and visualized in LabVIEW through a graphical interface. The system supports biomedical education by enhancing students' practical skills and understanding of physiological signal monitoring [4]. This paper presents a real-time bio-telemetry system using LabVIEW for monitoring heart rate and ECG signals, with a focus on remote analysis of cardiac conditions such as tachycardia and bradycardia. While the system enables efficient remote access and visualization of ECG data, it does not include temperature monitoring as part of its functionality [5]. This paper focuses on the design and implementation of a low-cost ECG surveillance system for cardiac patients using LabVIEW. While it effectively demonstrates real-time ECG monitoring, it does not specifically address temperature or heart rate monitoring. The study centers on ECG signal acquisition, processing, and visualization for cardiac assessment [6]. The paper discusses an ECG-based arrhythmia detection system using LabVIEW, focusing on signal processing and heart rate display. While it doesn't address temperature monitoring, it highlights the system's effectiveness in detecting ECG abnormalities, enhancing patient outcomes through early detection and continuous heart activity monitoring for healthcare professionals [7]. The paper details a LabVIEW-based system for detecting cardiac arrhythmia through ECG analysis, emphasizing de-noising, feature extraction, and automatic identification of heart abnormalities. It does not focus on temperature or heart rate monitoring, prioritizing the detection of ECG irregularities for improved diagnosis and patient care [8]. The paper discusses an ECG patient monitoring system using LabVIEW, specifically for heart rate analysis. It does not cover temperature monitoring, making it irrelevant to a combined temperature and heart rate monitoring system. The focus remains on heart rate analysis and ECG signal processing for patient monitoring [9]. The paper focuses on an IoMT-based heart rate and body temperature monitoring system using components like Arduino, Xbee, and Raspberry Pi. It highlights real-time data display on a web server and sensor calibration results, rather than using LabVIEW, making it more suited for IoT applications in healthcare monitoring [10]. The paper focuses on developing an exercise pulse monitor using LabVIEW for detecting arrhythmias, emphasizing heart rate detection and arrhythmia identification through real-time analysis. It does not address temperature monitoring systems, prioritizing ECG signal processing and heart rate analysis for detecting cardiac abnormalities during exercise [11]. The paper focuses on a telehealth system for monitoring vital signs, specifically for elderly patients with arrhythmia, with an emphasis on ECG analysis. However, it does not specifically address temperature monitoring alongside heart rate using LabVIEW, concentrating primarily on arrhythmia detection and ECG signal processing for patient care [12]. The paper focuses on a Heart Rate Monitoring System that utilizes IoT and AI, integrating Arduino for heart rate data analysis. It does not address temperature monitoring or the use of LabVIEW in its design or implementation, concentrating instead on heart rate detection through IoT-enabled devices and AI algorithms [13]. The paper does not specifically address a temperature and heart rate monitoring system using LabVIEW. Instead, it focuses on a Biphasic Kalman filter-based model for estimating human core temperature from heart rate measurements in occupational settings, emphasizing advanced modeling techniques for temperature estimation rather than real-time monitoring systems [14]. The paper does not address a temperature monitoring system. It focuses on a pulse and heart rate cooperative monitoring and classifying system that uses heart rate and pulse sensors for patient monitoring and the classification of potential pathogenesis risks, emphasizing early detection and risk assessment for better healthcare outcomes [15].

II. DESIGN PANEL

2.1 Block Diagram Design for Lm35 Temperature Sensor

The paper presents the development of a temperature monitoring system using LabVIEW, emphasizing the integration of the LM35 temperature sensor for precise and continuous body temperature measurement. The LM35 is a widely used integrated-circuit temperature sensor that delivers an analog output voltage linearly proportional to the temperature in degrees Celsius. It operates within a temperature range of −55°C to 150°C and offers a high level of accuracy and stability. A key advantage of the LM35 is its direct calibration in Celsius, which simplifies signal processing, as it eliminates the need to convert from Kelvin or subtract a constant offset from the output voltage.

To implement the system, the user begins by launching LabVIEW and creating a new Virtual Instrument (VI). Within the block diagram environment, necessary modules such as the DAQ Assistant, multiplier, timer, and display indicators are added. The DAQ Assistant is configured to acquire analog voltage signals from the LM35 sensor, setting appropriate voltage ranges and sampling parameters. A multiplier module is used to convert the voltage to temperature values, based on the LM35's scale factor of 10 mV/°C. The timer controls how often readings are taken, and a while loop is incorporated to ensure continuous monitoring until the user presses a stop button.

Temperature readings are displayed in real-time on the LabVIEW front panel using numeric indicators or gauges. Additionally, a file path is created to log each reading along with a timestamp, enabling future analysis and record keeping. This allows healthcare professionals to track temperature trends over time, aiding in diagnosis and treatment planning. Before running the program, all connections within the block diagram must be thoroughly verified to ensure the system functions correctly and without interruption. The design supports non-invasive, real-time monitoring, making it ideal for both clinical and personal health monitoring applications as shown in fig 1.

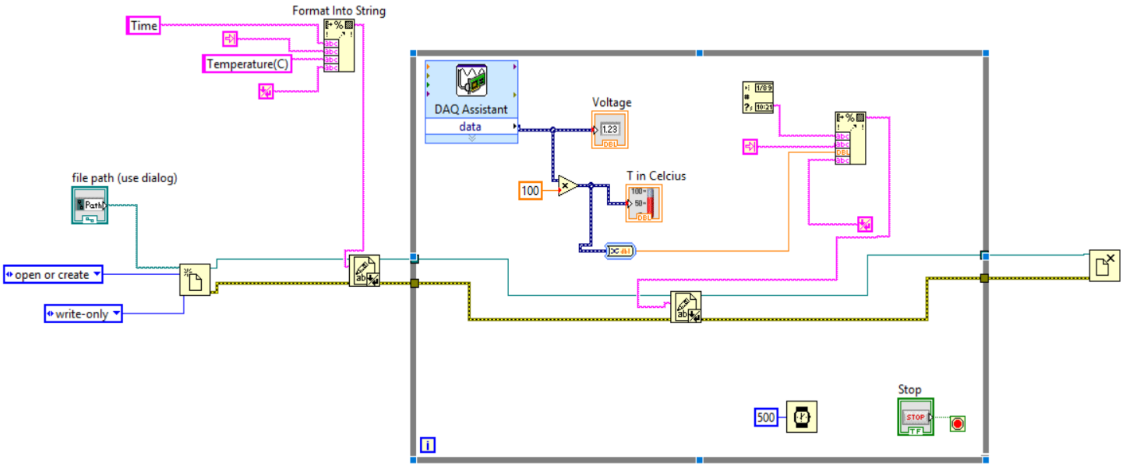


Fig. 1 Block Diagram for LM35 Temperature Sensor

2.2 Block Diagram Design for Heart Rate Sensor

To build a simple heart rate monitor using LabVIEW, begin by opening the software and either loading the previously created temperature VI or starting a new one. In the block diagram, add the necessary modules, including a signal generator to simulate the pulse signal, a waveform graph for graphical display, a bandpass filter to isolate the heart rate frequency, a collector module to gather the filtered signal, and a statistics module for calculating important metrics like mean and standard deviation. The peak detect module will identify the heartbeats by detecting the peaks in the signal. Once the modules are connected, create a file path named "BPM" to store the heart rate data for future reference. Thoroughly check the connections to ensure there are no errors, and then run the VI to display and record heart rate readings. This heart rate monitor can be used by medical practitioners to track patient heart rates, senior citizens with varying pulse rates, and athletes monitoring their fitness levels. The saved BPM data can also help in assessing heart health or fitness improvement over time as shown in fig 2.

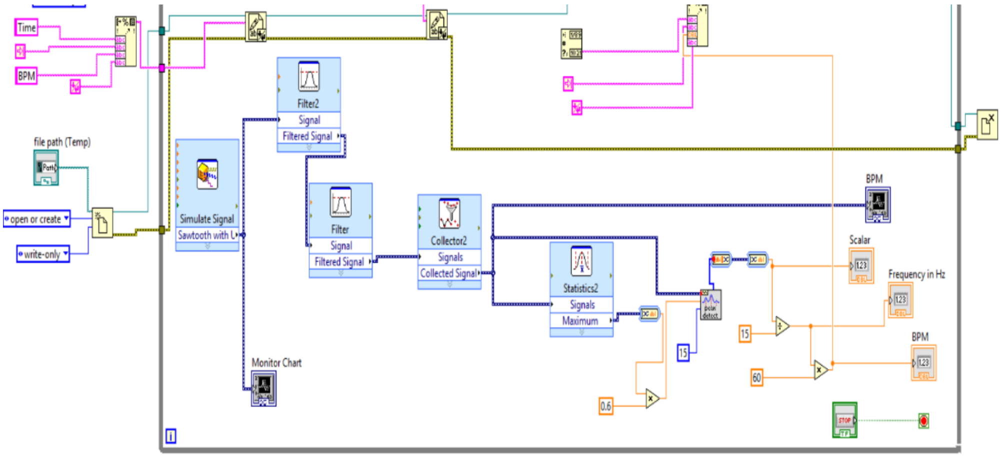


Fig. 2 Block Diagram for Heart Rate Sensor

2.3 Integrated Block Diagram Design for Temperature & Heart Rate Sensor

The block diagram integrates both the LM35 temperature sensor and the Heart Rate sensor to monitor temperature and heart rate simultaneously. The process begins by designing a block diagram for the LM35 temperature sensor as shown in 3, where the sensor measures the body temperature, and the data is processed and displayed on the LabVIEW front panel. Next, a separate block diagram is created for the Heart Rate sensor, which measures the number of beats per second. This data is also processed and displayed on the front panel. Once both individual block diagrams are designed, they are combined into a single block diagram that simultaneously monitors both the temperature and heart rate of the human body.The final integrated design allows for real-time monitoring of both parameters, ensuring no time delay between obtaining the readings. The results are displayed on the LabVIEW front panel, providing users with immediate feedback. Additionally, the readings, along with the corresponding timestamps, are saved in a file path for future reference, enabling easy access to historical data for analysis. This integrated system is a valuable tool for continuous health monitoring, offering a simple yet efficient way to track both body temperature and heart rate at the same time.

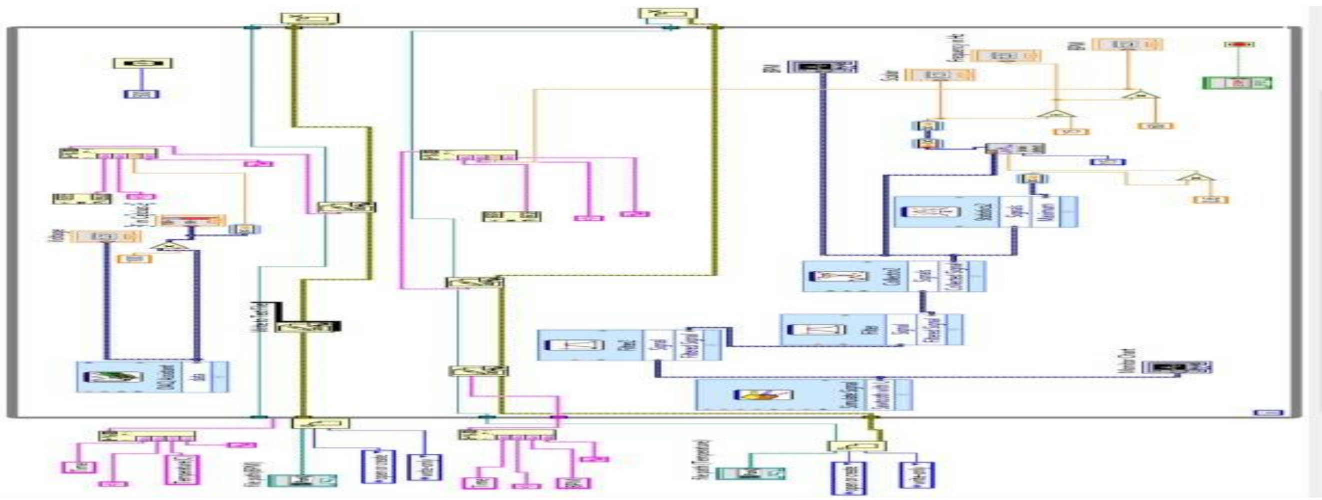


Fig.3 Block Diagram of LM35 Temperature & Heart Rate sensor

III.RESULTS AND DISCUSSIONS

The block diagram illustrates the integration of both temperature and heart rate sensors using LabVIEW, where various modules are systematically connected to provide efficient monitoring of physiological parameters of the human body.This design represents the back panel (block diagram) of the LabVIEW interface, showcasing how data flows from sensor input through signal processing modules to output displays and storage systems. The LM35 temperature sensor and heart rate sensor are configured using DAQ Assistants, with additional modules like multipliers, filters, peak detectors, and timers used to refine and interpret the sensor signals. A key component of this setup is the inclusion of a file path that logs the sensor readings after the program execution. This ensures that every temperature and heart rate measurement is recorded along with timestamps for accurate tracking. These stored data logs serve as a valuable reference for future analysis, allowing healthcare providers or users to observe trends over time and make informed health decisions. By combining real-time display with automated data storage, the system offers a practical solution for continuous monitoring and health assessment. This LabVIEW-based integrated design not only enhances the reliability of physiological monitoring but also aids in proactive healthcare planning to maintain overall well-being as shown in fig.4.

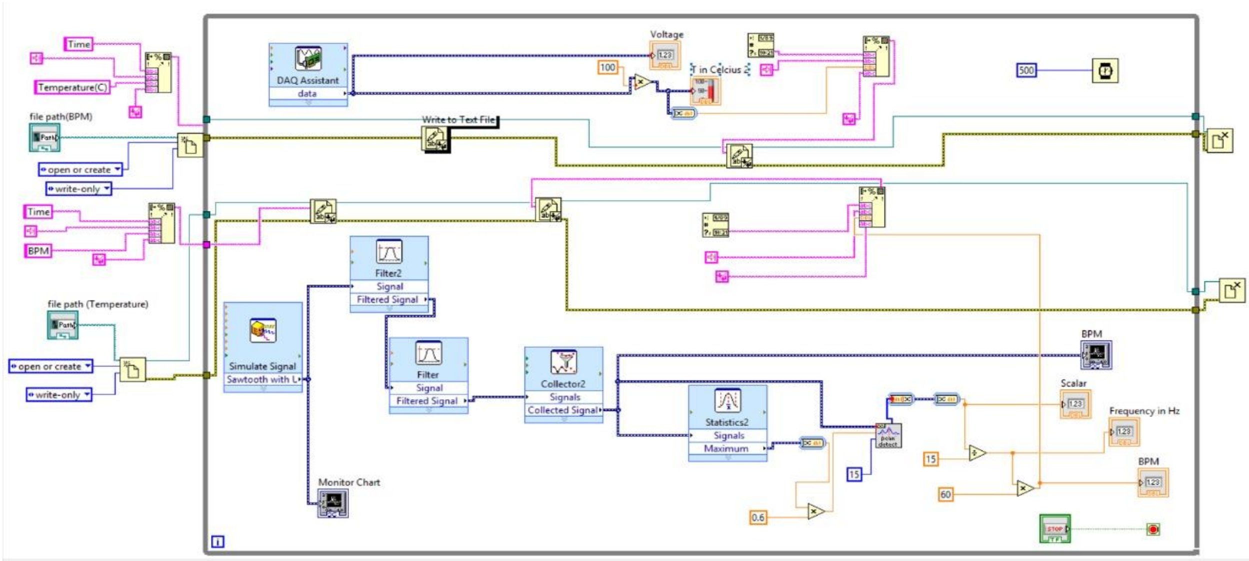


Fig 4 Block diagram of Interface of LM35 and Heart Rate Sensor (Back Panel)

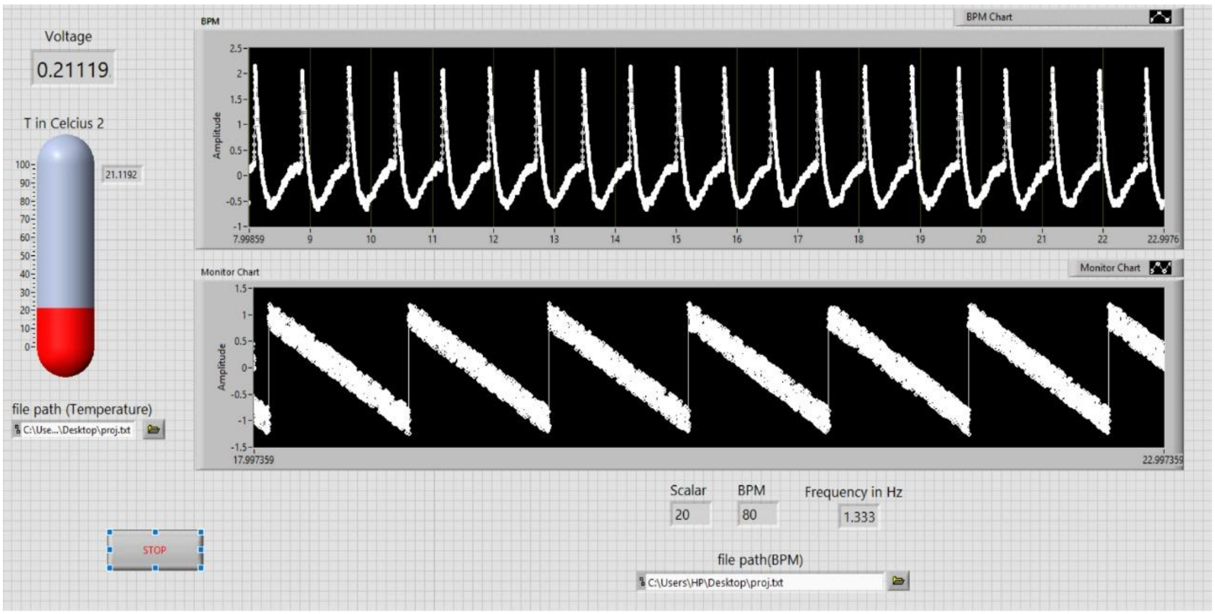
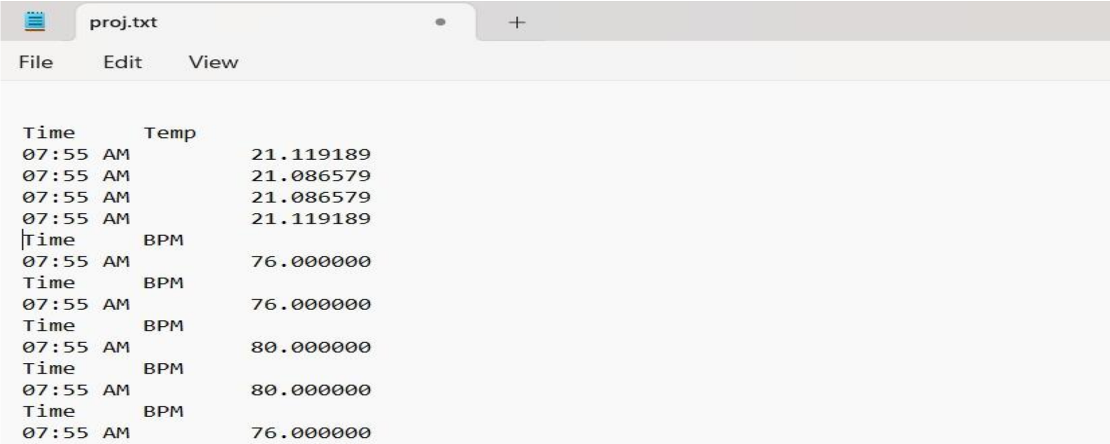


Fig 5 Interface of LM35 and Heart Rate Sensor (Front Panel)

The fig 5 represents the front panel of the integrated temperature and heart rate monitoring system developed using LabVIEW. This front panel serves as the user interface, allowing real-time observation of sensor outputs after the execution of the corresponding block diagram. It visually displays the current body temperature and heart rate values using indicators such as numeric displays, waveform graphs, or gauges, making the system intuitive and easy to interpret. The readings shown are directly obtained from the LM35 temperature sensor and the heart rate sensor, processed through the back-end block diagram. Additionally, the system is linked to a predefined file path where all monitored data, including timestamps and sensor values, are automatically stored. This data logging functionality is useful for future analysis and health tracking, enabling users or medical professionals to assess trends and take necessary actions. The front panel thus plays a crucial role in both visualization and accessibility, making the integrated monitoring system efficient for real-time applications in personal healthcare and clinical environments.


proj.txt
File Edit View

```
Time      Temp
07:55 AM        21.119189
07:55 AM        21.086579
07:55 AM        21.086579
07:55 AM        21.119189
Time      BPM
07:55 AM        76.000000
Time      BPM
07:55 AM        76.000000
Time      BPM
07:55 AM        80.000000
Time      BPM
07:55 AM        80.000000
Time      BPM
07:55 AM        76.000000
```

Fig 6 Output of the project

The fig 6 represents the file containing the stored values of the temperature and heart rate sensors after the execution of the LabVIEW block diagram. This file is automatically generated and updated based on the data logging setup within the program, where each reading is recorded along with a corresponding timestamp. It serves as a crucial component for documentation and future analysis, allowing medical professionals to review the historical data of a patient's physiological parameters. By accessing this file, a medical officer can monitor trends, identify any irregularities, and make informed decisions regarding diagnosis or treatment. The data storage feature enhances the reliability and practicality of the system, ensuring that no critical health information is lost and that accurate records are maintained for ongoing or future medical evaluation.

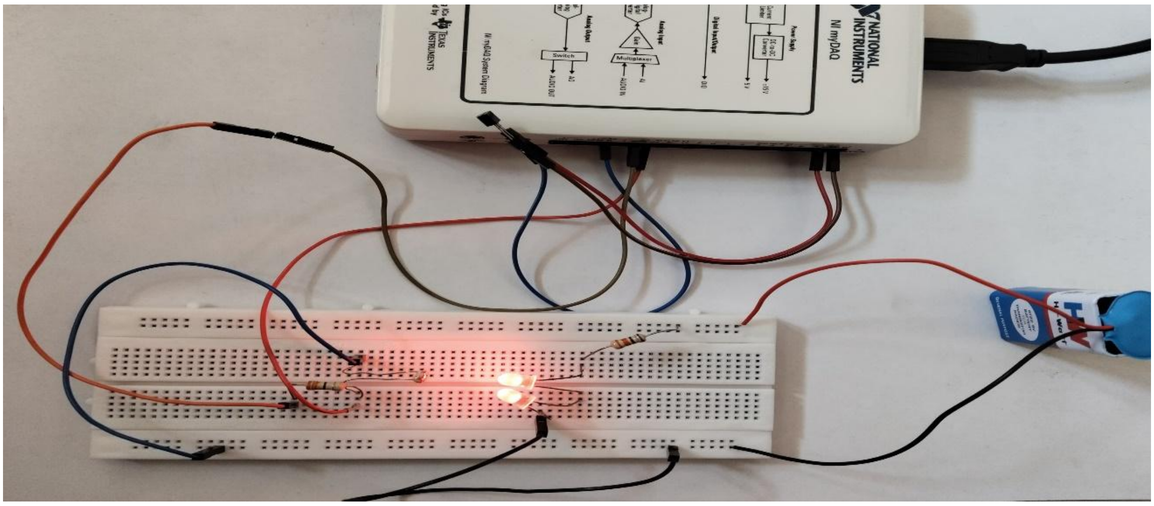


Fig 7 Hardware Connection of the project

The Fig 7 illustrates the hardware setup of the project, where the LM35 Temperature Sensor and the Heart Rate Sensor are physically integrated and interfaced with the NI myDAQ device. This setup enables the real-time acquisition of physiological parameters such as body temperature and heart rate. The sensors are connected to the appropriate analog input channels of the myDAQ, which acts as the bridge between the physical hardware and the LabVIEW software environment. Once the hardware connections are properly established, the user navigates to the previously designed block diagram in LabVIEW and executes the program. During execution, the myDAQ captures the sensor signals and sends them to LabVIEW for processing. The processed data is then displayed on the front panel, allowing real-time visualization of temperature and heart rate readings. This seamless integration of hardware and software ensures accurate monitoring and provides a reliable platform for physiological data analysis, making it suitable for educational, clinical, or personal health monitoring applications.

IV.CONCLUSION

In this paper, we successfully designed and implemented a real-time monitoring system for both temperature and heart rate using LabVIEW and NI myDAQ. The system effectively captured and processed analog signals from the LM35 temperature sensor and a heart rate sensor, converting them into meaningful physiological parameters. The integration of myDAQ hardware with LabVIEW's graphical programming environment allowed for smooth signal acquisition, filtering, analysis, and real-time data visualization on the front panel. The system also included data logging features, enabling recorded values to be stored with timestamps for future medical reference and analysis. The use of LabVIEW provided an intuitive and flexible platform for developing the block diagram, while NI myDAQ ensured accurate interfacing between the physical sensors and the software.

REFERENCES

[1]. *Krishnan, A. R., Jayanth, S., & Janani, R. (2020). Patient Pulse Rate Monitoring System Using LabVIEW (pp. 557–564). Springer, Singapore. https://doi.org/10.1007/978-981-15-1071-7_45*

[2]. *Agham, N. D., & Thool, V. R. (2014). LabVIEW-Based Physiological Parameters Monitoring System for Patient Healthcare. International Journal of Engineering Research and Technology, 3(2). https://www.ijert.org/research/labview-based-physiological-parameters-monitoring-system-for-patient-healthcare-IJERTV3IS21375.pdf*

[3]. *WANG, J., & ZHOU, Q. (n.d.). Design of a Temperature Monitoring System Based on DS18B20 and LabVIEW. https://doi.org/10.3969/j.issn.1006-7167.2012.03.014*

[4]. *Ciklacandir, S., Mulayim, N., & Sahin, S. (2017). Low cost real-time measurement of the ecg, spo2 and temperature signals in the labview environment for biomedical technologies education. 7, 162–168. https://dergipark.org.tr/en/download/article-file/339734*

[5]. *Raval, J. A., Sakinala, V. V., Jadhav, N. R., & Karia, D. C. (2017). LabVIEW based real time bio-telemetry system for healthcare. International Conference on Communication and Signal Processing, 2153–2156. https://doi.org/10.1109/ICCSP.2017.8286788*

[6]. *Mahmood, R. M., Ajel, A. R., Abed, J. K., Mahmod, R. A., Al-Dujaili, A. Q., & Humaidi, A. J. (2023). LabVIEW-based Design of Smart Wireless Monitoring System for Cardiac Patients. 46–49. https://doi.org/10.1109/icset59111.2023.10295080*

[7]. *Kumar, D. G., R, K., V, M., V, K. T., & S, K. (2023). Lab VIEW Based Design of Arrhythmia Detection System. 230–234. https://doi.org/10.1109/iceca58529.2023.10395584*

[8]. *Kaur, G., Singh, K., & Thakur, D. K. (2017). A LabVIEW Approach for Detection Of Cardiac Arrhythmia. Journal of Emerging Technologies and Innovative Research, 4(8), 173–179. https://www.jetir.org/view?paper=JETIR1708033*

[9]. *Singh, O. P., Mekonnen, D., & Malarvili, M. B. (2015). Labview Based ECG Patient Monitoring System for Cardiovascular Patient Using SMTP Technology. 2015, 701520. https://doi.org/10.1155/2015/701520*

[10]. *Laila, I. R., Arifin, A. S., & Armynah, B. (2022). INTERNET OF MEDICAL THINGS (IoMT)-BASED HEART RATE AND BODY TEMPERATURE MONITORING SYSTEM. Indonesian Physical Review, 5(1), 1–14. https://doi.org/10.29303/ipr.v5i1.134*

[11]. *McLaren, H. (2010). The Development of an Exercise Monitor Prototype for the Detection of Arrhythmia Using the Virtual Instrumentation Capabilities of Labview. https://macsphere.mcmaster.ca/bitstream/11375/14445/1/fulltext.pdf*

[12]. *Raad, M. W., & Sheltami, T. R. (2015). A Labview Based Ubiquitous Telehealth System for the Elderly (pp. 508–516). Springer, Cham. https://doi.org/10.1007/978-3-319-47063-4_55*

[13]. *S, S. (2024). Heart rate monitoring system. Indian Scientific Journal Of Research In Engineering And Management. https://doi.org/10.55041/ijsrem31259*

[14]. *Falcone, T., Del Ferraro, S., Molinaro, V., Zollo, L., & Lenzuni, P. (2024). A real-time biphasic Kalman filter-based model for estimating human core temperature from heart rate measurements for application in the occupational field. Frontiers in Public Health. https://doi.org/10.3389/fpubh.2024.1219595*

[15]. *Yarong, H., Bo, Q., Jiang, C., & Zhenyu, W. (2016). Pulse and heart rate cooperative monitoring and classifying system.*