iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 Issue: IV Month of publication: April 2026

DOI: https://doi.org/10.22214/ijraset.2026.80882

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Leveraging the Internet of Thing for Advance Clinical Disease Diagnosis

Sanjaya Kumar Mohanty[1], Dr. Bidush Kumar Sahoo[2]
[1]*Scholars of MTech, Gandhi Institute of Engineering and Technology University Department of CSE*
[2]*Guide, Gandhi Institute of Engineering and Technology University, Gunpur, Odisha*

Abstract: This Paper Presents a Smart health monitoring using Internet of Things (IoT) and Arduino Uno involve the simplification of intricate sensor data and device functionalities into clear, user-friendly health information for both patients and healthcare providers. In a health monitoring system that tracks heart rate, Blood Oxygen (SpO_2), body temperature, and ECG signals, sensors consistently gather physiological data and relay it to a microcontroller The system transforms raw electrical signals into comprehensible metrics such as beats per minute, oxygen saturation percentage, temperature in degrees, and ECG waveforms, which can subsequently be presented on a mobile application or web dashboard.

By Leveraging the IoI for Advance Clinical Disease Diagnosis technology, the data can be observed remotely in real time, facilitating the early identification of irregularities such as abnormal heart rhythms, low oxygen levels, or elevated body temperature. This layer of abstraction guarantees that users are not required to grasp the technical intricacies of signal processing or hardware communication, while still reaping the benefits of precise, continuous, and automated health monitoring.

Keyword: IOT, Bpm, SPO2, Body Temperature, ECG, Real-Time Data, Smart healthcare , Arduino Uno, Embedded system

I. INTRODUCTION

Healthcare Monitoring is very important in today's world, Traditional system require patients to visit hospitals
Regularly, This paper proposes a real-time monitoring system using IoT, The Leveraging the Internet of Thing for Advance Clinical Disease Diagnosis monitoring Heart Rate, SpO_2, Body Temperature, and ECG monitoring.through Remote Patient Monitoring and Sensors, combined with Real-Time Data, we can foster Smart Healthcare.This conversion of complex biomedical signals into relevant health metrics is essential for the early detection of issues such as irregular heartbeats, fever, or low oxygen levels. Overall, an IoT-based health monitoring system enhances patient safety, reduces the frequency of hospital visits, and supports timely medical interventions through intelligent and effective healthcare solutions.

II. BACKGROUND STUDY

Healthcare systems based on the Internet of Things underscore the increasing significance of remote patient monitoring and intelligent medical Solutions, Studies conducted by Maria R.Lima et al highlight Discovering Behaviotial Patterns using conversational Technology for in home health and well being monitoring explains how AI and IoT-powered smart health monitoring devices are revolutionizing elder care in India by enabling continuous, real-time surveillance of vital signs including temperature, heart rate, and ECG,it is possible to monitor behavioral changes through speech and household activities, particularly for people with dementia and also studies conducted by Punit Gupta et al highlight IoT based Smart healthcare kitm presents a health monitoring system based on IoT technology, aimed at enhancing emergency medical services, especially in intensive care units, utilizing the Intel Galileo 2nd generation board. The system gathers, processes, and transmits real-time data on patients, including heart rate, blood pressure, and ECG, to facilitate prompts medical interventions. By enabling remote monitoring, it lessens the necessity for frequent doctor visits, thereby conserving time for both patients and healthcare professionals. In critical situations, the system automatically notifies physicians with the patient's current health conditions and complete medical records. This method enhances the efficiency of healthcare delivery while decreasing related expenses.and also by Shubham Banka alt illustrates the efficacy of IoT-enabled systems that employ sensors and microcontrollers such as Raspberry Pi to track vital parameters and assist patients in remote locations.additionally,

.

III. OBJECTIVE

The primary goal of the proposed IoT-based health monitoring system is to create and implement a dependable and real-time solution for the continuous observation of essential health metrics such as heart rate, blood oxygen saturation (SpO_2), body temperature, and ECG signals. the system is designed to gather, process, and transmit physiological data via IoT technology, facilitating remote patient monitoring and the early identification of potential health issues. by delivering precise and prompt health information to both patients and healthcare providers, the aim is to enhance medical response times, improve patient safety, minimize the necessity for frequent hospital visits, and foster effective and intelligent healthcare management.

IV. METHODOLOGY

A. Header File Use

```
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <MAX30105.h>
#include <heartRate.h>
#include <OneWire.h>
#include <DallasTemperature.h>
```

B. Blood Pressure and Blood Oxygen (spo2) Measurement using iot device

The approach for tracking Blood Oxygen (SpO_2) levels and estimating Blood Pressure with the MAX30102 sensor in conjunction with Arduino Uno commences by connecting the MAX30102 pulse oximeter and heart-rate sensor module to the Arduino Uno utilizing the I2C communication protocol (SDA and SCL pins). The MAX30102 employs red and infrared LEDs to detect variations in light absorption within blood vessels, which are instrumental in calculating SpO_2 levels and heart rate. The Arduino Uno captures the unprocessed photoplethysmography (PPG) signals from the sensor, applies programmed algorithms for processing, and translates them into significant metrics such as oxygen saturation percentage and beats per minute (BPM). For estimating blood pressure, the system may utilize characteristics of the pulse waveform or approximation methods based on pulse transit time (PTT) derived from the PPG signal (it is important to note that this method provides estimation rather than a direct measurement using a cuff). The processed information is subsequently displayed on an LCD mobile application for remote monitoring. Alerts can be triggered if readings surpass normal thresholds, facilitating real-time health monitoring and prompt medical intervention.

The approach for assessing Blood Pressure and Blood Oxygen (SpO_2) through an IoT-enabled device entails the integration of suitable biomedical sensors with a microcontroller and a module.of digital blood pressure sensor (cuff-based) is employed to gauge systolic and diastolic pressure, whereas a pulse oximeter sensor is utilized to measure SpO_2 levels and pulse rate through light absorption methods. These sensors are linked to a microcontroller, such as Arduino uno board, which gather and process the raw signals. The system perpetually monitors the readings, archives the data for analysis, and issues alerts if the values surpass normal thresholds. This methodology facilitates real-time remote monitoring, precise data recording, and prompt medical intervention.

C. Temperature Measurement

The process of measuring temperature with the DS18B20 sensor entails connecting the digital temperature sensor to a microcontroller, such as the Arduino Uno, utilizing the One-Wire communication protocol. The DS18B20 sensor is linked through three pins: VCC, GND, and a data pin, which includes a pull-up resistor (commonly $4.7k\Omega$) situated between the data line and VCC. After being powered, the microcontroller issues commands to commence temperature conversion, while the sensor gauges body or ambient temperature through its integrated digital thermometer. The temperature value obtained is transmitted digitally to the microcontroller, thereby negating the necessity for analog-to-digital conversion. The Arduino then processes the incoming data and presents the temperature in degrees Celsius or Fahrenheit on an LCD screen,This approach guarantees precise, noise-resistant, and real-time temperature measurement, making it ideal for healthcare and monitoring applications.

The operational procedure of the DS18B20 temperature measurement system commences once the sensor is energized and linked to the Arduino Uno via the One-Wire data line. Upon system initiation, the Arduino dispatches a command to the DS18B20 to commence temperature conversion. The sensor utilizes its internal digital sensing element to gauge the temperature and transforms the measurement into a 12-bit digital value. Once the conversion process is finalized, the Arduino retrieves the digital data from the sensor through the identical data pin.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

The microcontroller subsequently processes the obtained value and translates it into a comprehensible temperature format in degrees Celsius or Fahrenheit. Ultimately, the recorded temperature is either exhibited on an LCD screen or relayed to an IoT platform for remote monitoring and data logging, facilitating ongoing and real-time temperature observation.

D. ECG Monitoring System

The approach to ECG monitoring utilizing the AD8232 module entails connecting the AD8232 ECG sensor to a microcontroller, such as the Arduino Uno, to capture and analyze cardiac electrical signals. the AD8232 module is attached to the body through three disposable electrodes strategically positioned on the right arm, left arm, and right leg to monitor the heart's electrical activity. The sensor enhances and filters the minute biopotential signals produced by the heart, effectively eliminating noise and motion artifacts. the analog output (OUTPUT pin) from the AD8232 is linked to an analog input pin on the Arduino, while additional pins like LO+ and LO− are employed to identify lead-off conditions. The Arduino consistently reads the analog ECG signal, converts it into digital values through its integrated ADC, and processes the waveform data. Subsequently, the ECG signals can be visualized in real-time on the Serial Plotter, an LCD screen, this methodology facilitates ongoing heart activity monitoring and the early identification of cardiac irregularities.

The ECG monitoring process utilizing the AD8232 module commences with the placement of three electrodes on the patient’s body, specifically on the right arm, left arm, and right leg, to capture the electrical signals generated by the heart. The AD8232 module then receives these biopotential signals, amplifying them while simultaneously filtering out noise and interference, including artifacts caused by motion. Its analog output pin delivers a clear ECG signal, which is continuously read by the Arduino Uno via its analog-to-digital converter (ADC). The Arduino is responsible for processing the digital data to reconstruct the ECG waveform, monitoring for lead-off conditions through the LO+ and LO− pins, and presenting the real-time signal on a Serial Plotter, LCD screen, or an IoT-enabled dashboard. This system facilitates ongoing heart monitoring, provides alerts for any abnormal patterns, and enables remote observation by healthcare professionals for prompt intervention.

V. RESULT OF LEVERAGING THE INTERNET OF THING FOR ADVANCE CLINICAL DISEASE DIAGNOSIS

The system continuously measured vital parameters such as heart rate, body temperature, and oxygen saturation, Sensor readings were consistent and within acceptable medical ranges, demonstrating reliable performance during testing. The system generated alerts when health parameters exceeded predefined thresholds, helping in early detection of potential health issues.

A. Sample Observations

- Body Temperature: 36.1°C(97 ^{0}F) – 37.5°C (98.6^{0}F)
- Heart Rate: 60 – 100 BPM
- SpO_2 Level: 94% – 99%

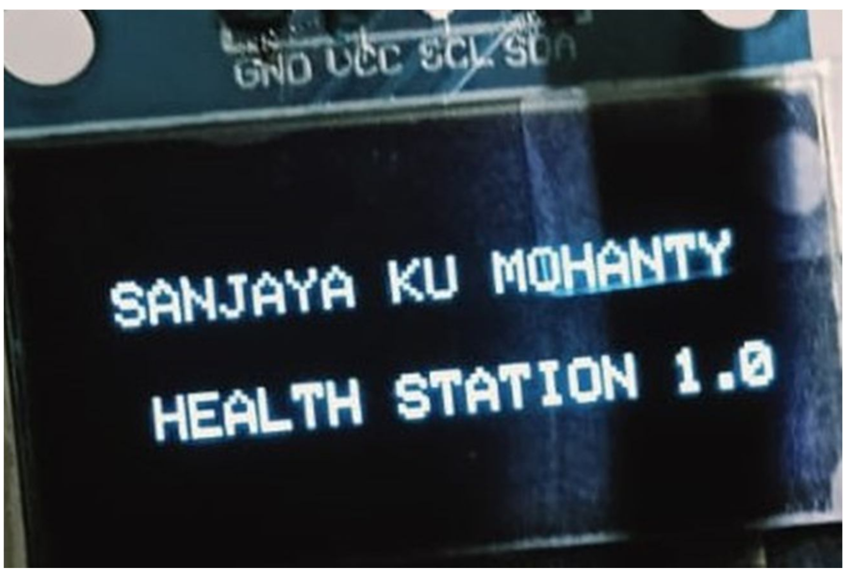

FIG-1(Rsearcher Name)

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

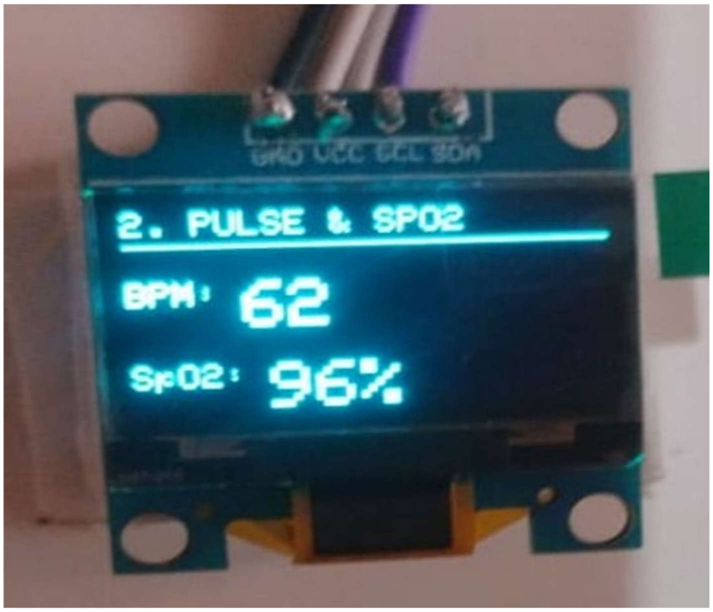

FIG-2(BPM and SPO2 Measurement)

FIG-3(Temperature Measurement)

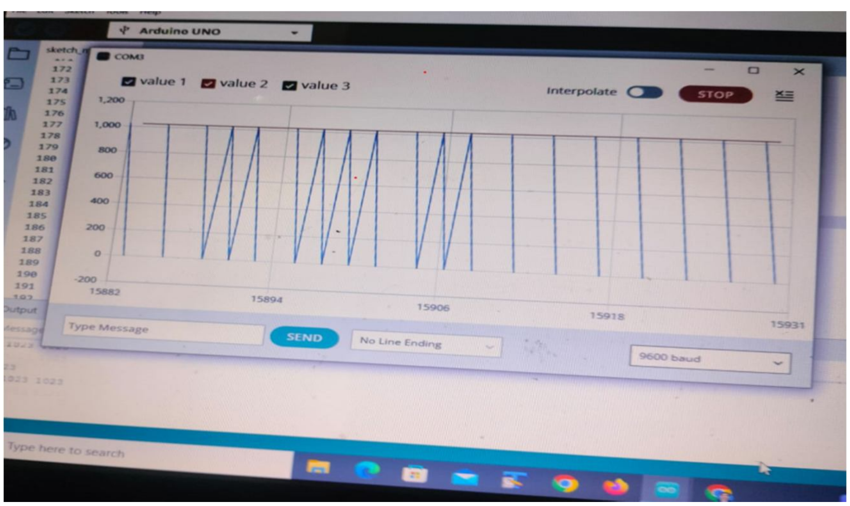

FIG-4(ECG Measurement)

Table-1(Comparative Analysis (Temperature vs. Heart Rate vs. SoP2vs ECG Monitoring)

Comparative Table			
Parameter	Temperature Monitoring	Heart Rate Spo_2	ECG Monitoring
Sensor Type	,DS18B20	MAX30102	AD8232
Measurement Type	Body heat	(BPM & SpO2)	Electrical heart activity
Accuracy	Moderate	High (with good sensor)	Very High (clinical level)
Complexity	Low	Medium	High
Cost	Low	Medium	High
Data Size	Small	Medium	Large (continuous waveform)
Power Consumption	Low	Low	Moderate to High
Real-time Monitoring	Yes	Yes	Yes (critical)
Medical Importance	Basic screening	Vital sign monitoring	Advanced cardiac diagnosis
Alert System	Fever detection	Tachycardia/Bradycardia	Arrhythmia, heart attack risk

Table-2(Patient Investigation Report)

Health Monitoring Report							
Times Stamp	Patient ID	Heart Rate (bpm)	SpO_2 (%)	Temp (oC)	Ecg	Activity Level	Alert (Yes/No)
03-04-2026 09:41	P001	62	97	98.2		Walking	NO
03-04-2026 09:55	P002	95	96	98.6		Resting	NO
03-04-2026 10:10	P003	110	94	99.5		Exercise	Yes
03-04-2026 10:16	P004	88	97	98.6		Active	NO
04-04-2026 09:43	P005	72	99	97.8		Walking	NO
04-04-2026 09:50	P006	65	99	97.8		Resting	NO
05-04-2026 10:10	P007	70	98	97.7		Exercise	Yes
06-04-2026 09:50	P008	85	97	97.2		Walking	NO
07-04-2026 09:50	P009	120	92	98.2		Critical	Yes
08-04-2026 09:50	P010	82	93	97.2		Recovery	NO
10-04-2026 09:50	P011	86	94	99.3		Resting	NO
10-04-2026 11:10	P012	71	96	98.4		Walking	NO

VI. DISCUSSION

The IoT-based health monitoring system developed shows effective integration of various biomedical sensors with the Arduino Uno for real-time patient monitoring. It assesses heart rate, blood oxygen (SpO_2), body temperature, ECG signals, and glucose levels, offering a thorough overview of physiological health. The acquisition of real-time data improves responsiveness in healthcare monitoring, while continuous operation verified stable performance of the sensors, confirming the Arduino Uno as a viable low-cost controller. The heart rate and SpO_2 sensors provided dependable readings similar to those from standard medical equipment, although slight discrepancies were noted due to sensor placement and motion artifacts. The ECG sensor effectively captured cardiac waveforms, facilitating basic cardiac analysis, but motion-related noise necessitated further filtering. The body temperature sensor consistently delivered accurate readings with minimal delay, highlighting the significance of proper sensor calibration and positioning.

VII. CONCLUSION

The suggested health monitoring system based on IoT and utilizing Arduino Uno presents an efficient method for the ongoing observation of essential physiological metrics. By incorporating sensors for heart rate, blood oxygen saturation, body temperature, ECG, and glucose levels, the system delivers a holistic perspective on a patient's health. Real-time data collection and analysis facilitate the early identification of irregularities, which is crucial for prompt medical intervention. The use of affordable and readily available sensors renders the system both cost-effective and easily accessible. The Arduino Uno serves as a dependable central controller, overseeing the management of sensor data and communication. Wireless communication allows healthcare professionals to monitor patients remotely, minimizing the necessity for frequent hospital visits. Ongoing monitoring guarantees immediate notifications for critical situations like abnormal heart rates or decreased oxygen saturation. Integration with cloud services enables access to data at any time, supporting

VIII. FUTURE SCOPE

1) Data Store in Cloud and Machine learning– In this system the doctor and patient family member can know patient data, through mobile or any electronic device on use of internet and get massage of patient information and automatic medicine suggestion
2) Alert Message to Resisted Doctor and family member of patient information
3) Development of smart portable device with low power consummation

REFERENCES

[1] Alam F, Pławiak P, Almaghthawi A, Qazani MR, Mohanty S, Alizadehsani R. NeuroHAR: a neuroevolutionary method for human activity recognition (HAR) for health monitoring. IEEE Access. 2024 Aug 9.
[2] Abu-Jassar AT, Attar H, Amer A, Lyashenko V, Yevsieiev V, Solyman A. Remote Monitoring System of Patient Status in Social IoT Environments Using Amazon Web Services Technologies and Smart Health Care. International Journal of Crowd Science. 2025 May 13;9(2):110-25.
[3] Attar H, Alghanim M, Ababneh J, Rezaee K, Alrosan A, Deif MA. B5G Applications and Emerging Services in Smart IoT Environments. International Journal of Crowd Science. 2025 May 13;9(2):79-95.
[4] Banka S, Madan I, Saranya SS. Smart healthcare monitoring using IoT. International Journal of Applied Engineering Research. 2018;13(15):11984-9.
[5] Bhardwaj V, Joshi R, Gaur AM. IoT-based smart health monitoring system for COVID-19. SN Computer Science. 2022 Mar;3(2):137.
[6] Casino F, Patsakis C, Batista E, Postolache O, Martínez-Ballesté A, Solanas A. Smart healthcare in the IoT era: A context-aware recommendation example. In2018 international symposium in sensing and instrumentation in IoT era (ISSI) 2018 Sep 6 (pp. 1-4). IEEE.
[7] Do CT, Khai ND, Tuan DN, Chau PH, Thanh NT, Le AN, Nguyen VD, Van Chien T. IoT-powered mental healthcare: Sleep state analyzing and monitoring based on EEG signals. IEEE Access. 2025 Apr 11.
[8] Dharmik RC, Gotarkar S, Dinesh P, Sant Burde H. An IoT framework for healthcare monitoring system. InJournal of Physics: Conference Series 2021 May 1 (Vol. 1913, No. 1, p. 012145). IOP Publishing.
[9] Gupta P, Agrawal D, Chhabra J, Dhir PK. IoT based smart healthcare kit. In2016 International Conference on Computational Techniques in Information and Communication Technologies (ICCTICT) 2016 Mar 11 (pp. 237-242). IEEE.
[10] Gómez-Valiente P, Pérez J, Lillo-Castellano J, Marina-Breysse M. Smart-IoT business process management: a case study on remote digital early cardiac arrhythmia detection and diagnosis. IEEE Internet Things J. 10/19 (2023) [Internet]. 2023
[11] George MM, Cyriac NM, Mathew S, Antony T. Patient health monitoring system using IoT and android. Journal for research. 2016 Mar;2(01).
[12] Islam MM, Rahaman A, Islam MR. Development of smart healthcare monitoring system in IoT environment. SN computer science. 2020 May;1(3):185.
[13] Khan S, Imtiaz N, Biswas AK, Bin Siddique Z, Khan QA. An expert hybrid federated learning and trust management for security, efficiency, and power optimization in smart health systems. IEEE Access. 2025 Mar 31.
[14] Kumar A, Chattree G, Periyasamy S. Smart healthcare monitoring system. Wireless Personal Communications. 2018 Jul;101(1):453-63.
[15] Khan MM. IoT based smart healthcare services for rural unprivileged people in Bangladesh: current situation and challenges. In1st International Electronic Conference on Applied Sciences 2020 Nov (Vol. 10, p. 30).
[16] Keerthana K, Kiruthikanjali N, Nandhini G, Yuvaraj G. Secured smart healthcare monitoring system based on Iot.
[17] Lima MR, Su T, Jouaiti M, Wairagkar M, Malhotra P, Soreq E, Barnaghi P, Vaidyanathan R. Discovering behavioral patterns using conversational technology for in-home health and well-being monitoring. IEEE Internet of Things Journal. 2023 Jun 29;10(21):18537-52.
[18] Lata K, Singh P, Saini S, Cenkeramaddi LR. Deep learning-based brain tumor detection in privacy-preserving smart health care systems. IEEE Access. 2024 Sep 9.
[19] Manikandan R, Patan R, Gandomi AH, Sivanesan P, Kalyanaraman H. Hash polynomial two factor decision tree using IoT for smart health care scheduling. Expert Systems with Applications. 2020 Mar 1;141:112924.
[20] Patel N, Patel D, Jadav NK, Rathod T, Tanwar S, Pau G, Sharma G, Alqahtani F, Tolba A. Fuzzy-enhanced secure messaging framework for smart healthcare system. IEEE Access. 2024 Jul 23;12:102977-93.