

Image Based Calling System for Heartpatient with Heartbeat Monitoring

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Abstract—This system is designed to help heart patients by continuously monitoring their heartbeat and detecting sudden health issues. It uses sensors like a heartbeat sensor and accelerometer connected to an Arduino to track vital signs and body movement. If any abnormal condition or fall is detected, the system immediately triggers an alert using a buzzer and sends a notification through a wireless module. An LCD screen displays real-time health data for easy monitoring. The image-based calling feature allows patients to quickly request help by selecting predefined options, making it useful for elderly or physically weak patients. This system is low-cost, reliable, and suitable for home healthcare monitoring.

Index Terms—Heartbeat Monitoring, Arduino Uno ADXL345 Accelerometer, Fall Detection, Image-Based Calling System, Wireless Communication (ESP8266/NodeMCU), IoT Healthcare, Emergency Alert System

I. INTRODUCTION

Cardiovascular diseases are one of the leading causes of death worldwide, making continuous monitoring of heart patients essential for timely medical intervention. With the advancement of embedded systems and IoT technologies, it is now possible to design smart healthcare solutions that provide real-time monitoring and emergency support. The proposed “Image-Based Calling System for Heart Patient with Heartbeat Monitoring” focuses on improving patient safety by integrating health monitoring with an easy-to-use communication system.

The system shown in the figure is built around an Arduino Uno microcontroller, which connects to various sensors such as a heartbeat sensor for

measuring pulse rate and an ADXL345 accelerometer for detecting sudden falls or abnormal movements. Additional components like a buzzer and LCD display are used to provide alerts and display real-time information. A wireless communication module (such as ESP8266/NodeMCU) enables remote monitoring by sending alerts and patient data to caregivers or medical personnel.

One of the key features of this system is the image-based calling mechanism, which allows patients to communicate their needs quickly using predefined visual options. This is particularly useful for elderly or physically challenged patients who may have difficulty speaking or using complex devices. By combining real-time health monitoring, automatic emergency alerts, and simple communication methods, this system aims to provide an effective, low-cost solution for home-based healthcare and continuous patient supervision.

If any emergency occurs, it sends alerts and activates a buzzer for immediate attention. An LCD displays real-time data, and a wireless module helps in remote communication. The image-based calling feature allows patients to easily request help. This system improves patient safety and provides a low-cost solution for healthcare monitoring.

Table 1: Literature Review on Image Based Calling System For Heartpatient With Heartbeat Monitoring

Author(s) & Year	Key Focus	Key Points
Sarowar et al., 2022	IoT-based heart rate & fall detection system	Real-time heart rate and fall detection improves elderly patient safety.

Das, 2023	IoT fall detection using ADXL345	ADXL345 sensor effectively detects falls using acceleration data.
Wixley, 2022	Wearable ECG & accelerometer-based fall detection	Combining ECG and accelerometer increases monitoring accuracy.
Al-Kababji et al., 2021	IoT-based remote fall monitoring framework	IoT-based systems enable remote monitoring with high accuracy.
Mahfuz et al., 2018	IoT data analytics for fall detection	Deep learning enhances fall detection accuracy from sensor data.
Chen et al., 2017	Accelerometer-based fall detection survey	Accelerometer-based systems are reliable for fall detection.
Wu et al., 2015	ADXL345-based fall detection	Threshold-based methods are simple and effective for detecting falls.
Yusnita et al., 2023	Wearable IoT fall detection system	Wearable IoT devices provide continuous patient monitoring.
Khan, 2020	IoT-based heart disease prediction	IoT with AI improves heart disease prediction accuracy.
Athallah et al., 2024	Low-cost accelerometer systems	Low-cost sensors make healthcare systems affordable and accessible.
Obaid et al., 2025	Multi-model DL for kidney disease	Large dataset; Darknet53 model
Pan et al., 2024	AI for CKD prediction	AI performance review

II. DESIGN METHODOLOGY

The proposed system is designed to monitor the health condition of heart patients and provide immediate assistance during emergencies. It is developed using an Arduino Uno as the main controller, which is connected to a heartbeat sensor and an ADXL345 accelerometer. The heartbeat sensor continuously measures the patient's pulse rate, while the accelerometer detects sudden falls or abnormal body

movements. The collected data is processed by the Arduino and compared with predefined threshold values to identify any abnormal conditions.

If the system detects an irregular heartbeat or a fall, it immediately activates a buzzer to alert nearby people and sends a notification to caregivers through a wireless communication module such as ESP8266. At the same time, an LCD display shows real-time health information and system status for easy monitoring. In addition to automatic alerts, the system also includes an image-based calling feature, where the patient can select predefined images or options to request help manually. The overall methodology ensures continuous monitoring, quick detection of emergencies, and fast communication, making the system reliable and effective for improving the safety of heart patients, especially in home-based care environments.

III. PRINCIPLE OF OPERATION

The system operates on the principle of real-time sensing, processing, and alert generation. It continuously monitors the patient's heartbeat using a pulse sensor and body movement using an accelerometer. These sensors convert physical signals (heartbeats and motion) into electrical signals, which are processed by the Arduino microcontroller. The processed data is compared with predefined threshold values to identify abnormal conditions such as irregular heartbeat or sudden falls.

When any abnormality is detected, the system immediately triggers an alert by activating a buzzer and sending a notification to caregivers through a wireless communication module. The LCD displays the current status and health parameters for easy monitoring. Additionally, the image-based calling feature allows the patient to manually send a request for help by selecting predefined visual options.

Thus, the system works on the principle of sensor-based monitoring, threshold comparison, and automatic as well as manual alert communication to ensure timely assistance and improved patient safety.

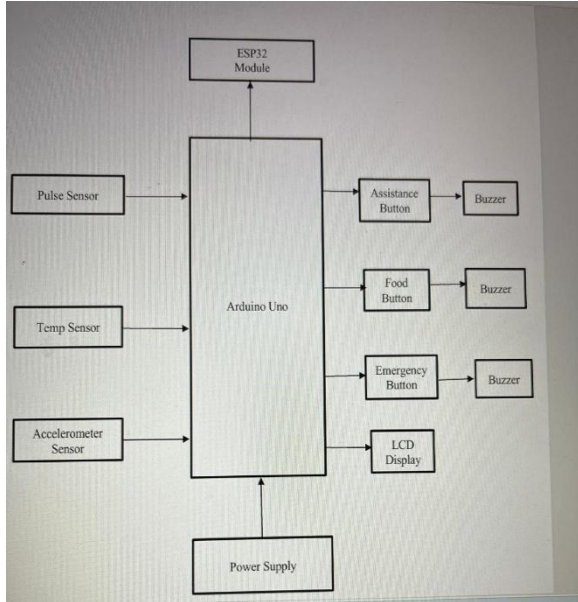


Fig .3.1 Block Diagram

3.1 Overview of the System

The proposed system is a smart healthcare monitoring and communication system designed for heart patients. It continuously monitors vital parameters like heart rate, temperature, and body movement, and provides alerts in case of abnormal conditions. The system also includes an image-based calling feature to help patients easily communicate their needs.

3.2 Input Section (Sensors)

a) Pulse Sensor

The pulse sensor is used to measure the patient's heart rate in real time. It detects the blood flow variations and converts them into electrical signals, which are sent to the Arduino. This helps in identifying abnormal heart conditions.

b) Temperature Sensor

The temperature sensor monitors the body temperature of the patient continuously. Any sudden increase or decrease in temperature is detected and processed by the system.

c) Accelerometer Sensor

The accelerometer sensor detects body movements and sudden falls by measuring acceleration in different directions. It plays a key role in identifying emergency situations like falls.

3.3 Processing Unit

Arduino Uno

The Arduino Uno acts as the brain of the system. It receives input data from all sensors, processes it using programmed logic, and compares it with predefined threshold values. Based on the results, it decides whether to trigger alerts or display information.

3.4 Communication Module

ESP32 Module

The ESP32 module is responsible for wireless communication. It sends real-time patient data and emergency alerts to caregivers or doctors via the internet. This enables remote monitoring and quick response.

3.5 Image-Based Calling System

a) Assistance Button

This button is used when the patient needs general help. Pressing it sends an alert or activates a buzzer.

b) Food Button

This button allows the patient to request food or basic needs.

c) Emergency Button

This button is used in critical situations. It triggers immediate alerts for quick medical attention.

These buttons represent predefined needs, making communication simple and effective, especially for patients with limited mobility.

3.6 Output Section

a) Buzzer

The buzzer provides an audible alert when any abnormal condition is detected or when a button is pressed. It helps in getting immediate attention.

b) LCD Display

The LCD display shows real-time information such as heart rate, temperature, and system status, making it easy to monitor the patient.

3.7 Power Supply

The power supply provides the necessary electrical energy to all components in the system, ensuring continuous and stable operation.

3.8 Working Summary

The sensors collect health data → Arduino processes and analyzes it → If abnormal condition or button press occurs → Buzzer is activated and alert is sent via ESP32 → LCD displays real-time status.

IV. RESULTS AND DISCUSSION

4.1 OUT PUT

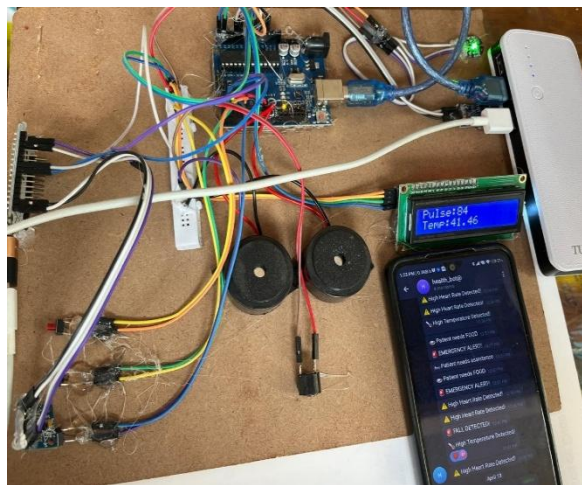


Figure 4.1 Out Put

The developed system successfully monitors the patient's health parameters and provides real-time alerts and communication. The output observed from the implementation is as follows:

- The LCD display shows real-time values of vital parameters such as pulse rate and temperature (e.g., Pulse: 84 bpm, Temp: 41.46°C).
- The system continuously tracks the patient's condition and updates the readings dynamically.
- When abnormal conditions are detected (such as high heart rate or high temperature), the system generates alerts immediately.
- The buzzer is activated to provide an audible warning for nearby people.
- The ESP32 module sends instant notifications to a mobile device, as shown in the image, including messages like:
 - "High Heart Rate Detected"
 - "High Temperature Detected"
 - "Emergency Alert"
 - "Fall Detected"
- The image-based calling system allows the patient to send requests such as:
 - "Patient needs food"
 - "Patient needs assistance"
- All alerts are displayed on the mobile application, ensuring remote monitoring and quick response from caregivers.

ADVANTAGES

- Provides continuous real-time monitoring of heart rate and temperature.
- Enables early detection of abnormal conditions like high/low heartbeat and fever.
- Supports fall detection, improving safety for elderly patients.
- Generates instant alerts through buzzer and mobile notifications.
- Allows remote monitoring using IoT (ESP32), reducing the need for constant physical supervision.
- Includes image-based calling, making it easy for patients to communicate needs.
- Helpful for elderly and physically challenged patients who cannot speak or move easily.
- Offers quick emergency response, reducing risk of serious health complications.

APPLICATIONS

- Used in home healthcare for continuous monitoring of heart patients
- Helpful in hospitals and clinics for patient supervision
- Suitable for elderly care centers and nursing homes
- Used for remote patient monitoring through IoT technology
- Beneficial for post-surgery patients who need regular observation
- Useful for physically disabled or speech-impaired patients
- Applied in emergency alert systems for quick medical response
- Can be used in rehabilitation centers for patient support
- Helpful in rural healthcare areas where medical access is limited

V. CONCLUSION

The Image-Based Calling System for Heart Patient with Heartbeat Monitoring provides an effective solution for continuous health monitoring and emergency assistance. By integrating sensors, Arduino, and IoT communication, the system can accurately track vital parameters such as heart rate, temperature, and body movement. It ensures quick detection of abnormal conditions and immediately

alerts caregivers through buzzer and mobile notifications.

The inclusion of an image-based calling feature makes it easier for patients, especially elderly or physically challenged individuals, to communicate their needs without difficulty. The system is low-cost, reliable, and suitable for both home and hospital environments. Overall, it enhances patient safety, enables timely medical response, and improves the quality of healthcare monitoring.

VI. FUTURE SCOPE

The proposed system can be further enhanced to provide more advanced and reliable healthcare support. In the future, additional sensors such as ECG, blood pressure, and SpO₂ sensors can be integrated for more comprehensive health monitoring. The system can be upgraded with advanced data analytics and machine learning techniques to predict heart-related issues before they become critical.

A mobile application with a user-friendly interface can be developed to display real-time data, history, and alerts more effectively. Cloud integration can be added to store patient data securely and enable access by doctors from anywhere. GPS functionality can also be included to track the patient's location during emergencies.

The image-based calling system can be improved using a touchscreen or voice assistance for better usability. Wearable device integration can make the system more compact and comfortable for continuous use. Overall, future improvements will focus on increasing accuracy, automation, and accessibility, making the system more efficient for smart healthcare applications.

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