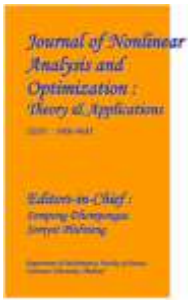
Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 15, Issue. 2 : 2024
ISSN :**1906-9685**



SOP COMPLIANCE AND MONITORING ELECTRONIC SYSTEM FOR BUSINESS AND PUBLIC PLACES USING IOT

[1]Ms.C Yamuna ,[2]Jillala Sruthi , [3]K.Akshaya , [4]G.Nitheesha
[1]Assistant Professor, Dept of ECE , MALLA REDDY ENGINEERING COLLEGE FOR WOMEN(Autonomous), Hyderabad, TS, India
[2,3,4] U.G Student, Dept of ECE , MALLA REDDY ENGINEERING COLLEGE FOR WOMEN(Autonomous), Hyderabad, TS, India.

1.ABSTRACT:

In recent years, monitoring the health of individuals, especially the elderly and vulnerable, has become a growing challenge in ensuring prompt assistance during emergencies. Traditional approaches, such as periodic health assessments and caregiver oversight, are often inefficient and resource-heavy. This paper introduces a Smart Healthcare Monitoring System that utilizes the Internet of Things (IoT) to improve personal health tracking and emergency response. The system incorporates IoT-based sensors, including a DHT sensor for body temperature monitoring, a BP sensor for blood pressure measurements, and an accelerometer to track posture and movements, such as sitting, sleeping, or falling. The data collected is processed in real-time by the ESP8266 and stored on a cloud platform for ongoing analysis and historical tracking. When a sudden change in movement or a fall is detected, the system

activates a buzzer to alert nearby individuals and uses a GSM module to notify caregivers of the incident. Additionally, an LED and LCD display are included to provide the user with real-time health information.

2.INTRODUCTION

Healthcare monitoring has emerged as a crucial issue in recent years, particularly for the elderly, individuals with chronic conditions, and those in need of constant supervision. Traditional methods, such as manual monitoring and periodic check-ups, are often time-consuming, inefficient, and insufficient for addressing emergencies in

https://doi.org/10.36893/JNAO.2024.V15I2.125

real time. This gap highlights the need for innovative solutions that enable continuous health monitoring and provide instant alerts during critical situations. The Smart Healthcare Monitoring System aims to tackle these challenges by utilizing the Internet of Things (IoT). It combines advanced sensors and communication technologies to continuously monitor vital health parameters and detect sudden changes in an individual's condition. The collected data is processed in real-time using the ESP8266 module and stored on a cloud platform for remote access and analysis. In the event of an emergency, such as a fall or sudden abnormal movement, the system triggers a buzzer to alert the individual and uses a GSM module to immediately notify caregivers. Additionally, an LED and LCD display offer the user local access to real-time health information. This project integrates IoT technologies with smart sensors and communication systems to enhance healthcare monitoring, improve emergency response times, and support independent living for individuals who need continuous care.

3.LITERATURE SURVEY

Chen, L., & Liu, Z. (2021). Soldier health and location tracking using Wi-Fi and IoT-based wireless networks. IEEE Transactions on Industrial Informatics, 17(3),2234–2246.

This research paper presents a system that utilizes Wi-Fi and IoT-based wireless networks to monitor the health and location of soldiers in the field. The system integrates health monitoring devices, such as ECG and pulse oximeter sensors, with GPS units via Wi-Fi, enabling continuous tracking of soldiers' well-being and positions. The primary goal is to provide real-time health data and location updates to commanders, facilitating timely medical intervention when necessary. The paper discusses challenges related to ensuring system reliability, minimizing latency, and managing power consumption in challenging environments. Field tests demonstrate that the system effectively monitors health and tracks location in real-time, offering a scalable solution to improve soldier safety and mission effectiveness.

4.EXISTING SYSTEM:

Existing COVID-19 monitoring and safety compliance systems use a combination of IoT devices and technologies to ensure adherence to health and safety protocols. Temperature monitoring systems, such as thermal cameras and infrared (IR) sensors, are commonly deployed in public spaces like airports, hospitals, and businesses to detect elevated

body temperatures, a key symptom of COVID-19. These systems trigger alerts when an individual's temperature exceeds a predetermined threshold. Mask detection systems, powered by AI-based image processing, verify if individuals are wearing masks before granting entry into a facility. Cameras capture images, and machine learning algorithms assess mask compliance, issuing warnings or denying access if a mask is not detected. Automatic hand sanitization stations are also widely implemented in high-traffic areas like malls and offices, using motion or infrared sensors to release sanitizer when hands are detected. RFID-based access control systems, integrated into many facilities, authenticate and verify authorized personnel using RFID tags or cards. These systems control access to restricted areas and often work in conjunction with temperature or mask detection systems to enforce compliance.

DISADAVATAGES:

- Manual Monitoring
- Limited Automation
- Lack of Integration
- High Operational Costs

5.PROPOSED SYSTEM

The proposed Smart Healthcare Monitoring System is designed to offer continuous, real-time health monitoring for individuals, particularly the elderly or those with health conditions requiring constant supervision. By leveraging IoT technology, the system integrates multiple sensors, communication modules, and real-time alert mechanisms to track vital health parameters and detect critical situations promptly. Key components of the system work together to ensure comprehensive monitoring. The DHT sensor measures the individual's body temperature, providing essential insights into overall health. The BP sensor continuously monitors blood pressure, which is crucial for identifying potential health issues. The accelerometer detects posture changes and movement patterns, such as sitting, sleeping, or falling, with fall detection being especially important for preventing injury among the elderly, as falls can lead to severe health complications if not addressed immediately. All sensor data is transmitted via the ESP8266 Wi-Fi module, which sends the information to a cloud platform for storage and analysis, enabling remote monitoring. Caregivers and healthcare professionals can access the data and intervene when necessary. Additionally, the system's GSM module sends immediate SMS alerts to caregivers or family members in case of emergencies, such

as a fall or abnormal readings in temperature or blood pressure.

ADAVATAGES:

- Enhanced Compliance Tracking
- Real-Time Monitoring and Reporting
- Data-Driven Decision Making
- Scalability and Flexibility

6.BLOCK DAIGRAM:

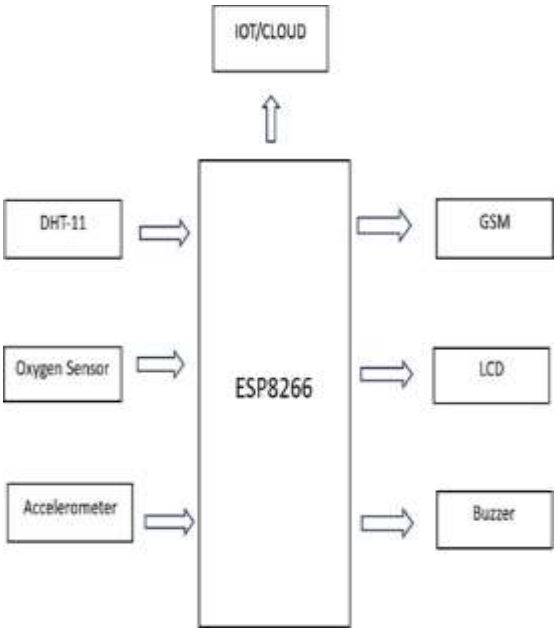


Fig:1

7.HARDWARE DESCRIPTION

NODEMCU

General-purpose input/output (GPIO) is a type of pin on an integrated circuit (IC) that can be configured to function as either an input or output. Its behaviour can be modified in real-time during execution.

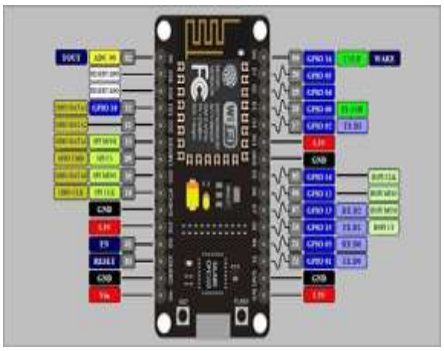


Fig:2

The ESP8266 is a cost-effective and flexible device that provides internet connectivity for a variety of projects. It can function as both an access point (creating a Wi-Fi hotspot) and a station (connecting to a Wi-Fi network), making it easy to collect data and upload it to the internet, simplifying IoT applications. Additionally, the module can retrieve data from the web using APIs, enabling your project to utilize online resources and expand its functionality. One of the key benefits of the ESP8266 is its ability to be programmed with the Arduino IDE, making it highly user-friendly. However, this version of the module is limited to two GPIO pins (with an option to modify it to support four), so it is often paired with another microcontroller like Arduino for additional functionality.

DHT11 SENSOR:

This sensor is used to monitor the humidity fluctuations in the environment where crops

are cultivated. As a digital sensor, it measures the humidity levels and displays the value in percentage format.

Fig:3

DHT11 humidity and The temperature sensor is available both as a standalone sensor and as a module. The main difference between the two is that the module includes a pull-up resistor and a power-on LED. The DHT11 is a relative humidity sensor that measures surrounding air conditions using a thermistor for temperature and a capacitive sensor for humidity. The DHT11 is a low-cost digital sensor designed to measure both temperature and humidity. It can be effortlessly connected to microcontrollers like Arduino, Raspberry Pi, and similar devices, facilitating real-time monitoring of temperature and humidity.

BUZZER:

A buzzer or beeper is an audio signaling device that can be mechanical, electromechanical, or piezoelectric (commonly known as piezo). Buzzers and beepers are typically used in alarm systems, timers, and to confirm user input, such as a mouse click or keystroke.

Fig:4

buzzer is a small yet effective component for adding sound features to a project or system. Its compact 2-pin structure makes it easy to use on breadboards, boards, and even PCBs, making it a widely adopted component in many electronic applications. The buzzer can be powered by a DC supply ranging from 4V to 9V, and a standard 9V battery is one of the available options. However, using a regulated +5V or +6V DC supply is advised for optimal performance. The buzzer is usually connected to a switching circuit that controls its operation, turning it on and off based on specific timing and intervals.

BP SENSOR:

Fig:5

Our final project involves designing and building a portable blood pressure monitor that can measure a user's blood pressure and heart rate using an inflatable cuff. The device

consists of three main components: external hardware, an analog circuit, and a microcontroller. The analog circuit converts the pressure inside the cuff into readable analog waveforms. The microcontroller samples these waveforms and performs A/D conversion, enabling further calculations. With growing awareness about health, monitoring blood pressure and heart rate has become one of the most common methods to assess an individual's health.

I2C 1602 SERIAL LCD MODULE

Fig:6

The I2C 1602 LCD module has a 2-line by 16-character display and is linked to an I2C daughter board. The I2C interface requires just two data connections, along with +5 VDC and GND, to function. For a deeper understanding of the I2C interface and its history,

GAS SENSOR:

This sensor is ideal for detecting dangerous LPG leaks in environments such as cars, service stations, or storage tanks. It can be easily integrated into an alarm system to trigger an audible or visual alert based on LPG concentration levels. The sensor offers high sensitivity and a fast response time, and it is also capable of detecting other gases such as isobutane, propane, LNG, as well as cigarette smoke.

Fig:7

The human nose has 400 types of scent receptors, enabling us to detect approximately 1 trillion distinct odors. However, many people struggle to identify the type or concentration of gases in the air, which is where sensors become essential. Various gas sensors are available to detect gases such as oxygen, carbon dioxide, nitrogen, methane, and more.

GSM

GSM, which stands for Global System for Mobile Communication, is a mobile communication modem widely used around the world. The concept of GSM was developed at Bell Laboratories in the 1970s. GSM is an open, digital cellular technology that enables the transmission of mobile voice and data services. It functions across various frequency bands, such as 850 MHz, 900

MHz, 1800 MHz, and 1900 MHz.

Fig:8

The GSM system was created as a digital communication network using the Time Division Multiple Access (TDMA) method. It digitizes and compresses data, transmitting it through a channel by dividing it into two separate streams, each assigned to its own time slot. This digital system is capable of handling data rates ranging from 64 kbps to 120 Mbps. The TDMA technique works by Allocating distinct time intervals to each user on the same frequency.

8.SOFTWARE COMPONENTS

ARDUINO SOFTWARE (IDE)

The Arduino Integrated Development Environment (IDE) features a code editor, a message area, a text console, a toolbar with essential buttons, and various menus. It allows users to upload code to Arduino and Genuino boards and facilitates device communication. Programs written in the IDE, known as sketches, are developed in the text editor and saved with a .ino file extension. The editor offers features such as cut, paste, and search/replace to simplify the editing process. The message area gives notifications about tasks like saving, exporting, or error handling, while the console shows IDE output, including detailed error reports and other important information.

LANGUAGE SUPPORT

Fig:9

Starting from version 1.0.1, the Arduino Software (IDE) is available in more than 30 languages. It automatically loads in the language selected by your operating system. Keep in mind that on Windows and possibly Linux, the language is based on the locale setting, which influences formats like currency and dates, rather than the operating system's language. To change the language manually, open the Arduino Software (IDE), go to the Preferences window, and select your desired language from the dropdown menu next to Editor Language. To apply the chosen language, restart the software. If the language

of your operating system isn't supported, the IDE will revert to English by default.

CLOUD:

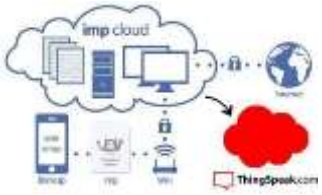


Fig:10

A cloud service has three key features that set it apart from conventional web hosting. First, the service is offered on-demand, often charged by the minute or hour. Second, it is flexible, enabling users to scale their service up or down based on their needs at any given moment. Third, the service is completely managed by the provider, requiring only a personal computer and internet access from the consumer. Developments in virtualization, distributed computing, and faster internet access have greatly accelerated the widespread use of cloud computing.

THINGSPEAK

ThingSpeak is an open-source Internet of Things (IoT) platform and API created for gathering and accessing data from sensors and hardware components. MATLAB analytics is built in to process and visualize the data collected from your sensors or electronic devicesYou can set up separate channels for each sensor's data, choosing to keep them private or make them publicly accessible via public channels.

How to create an Account

Step 1: Go to thingspeak.com

Step 2: Click on 'New Channel' to set up a new channel.

Fig:11

Step 3: Provide the channel information.

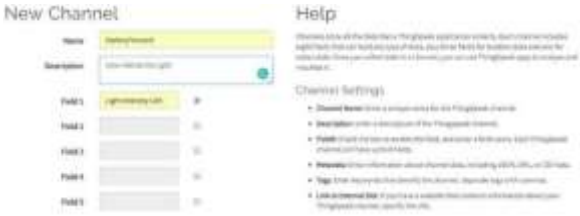


Fig:12

Step 4: The channels are now visible, and you can find the Channel ID and API Keys here.

Fig:13

https://doi.org/10.36893/JNAO.2024.V15I2.125

Step 5: Launch the Arduino IDE and add the ThingSpeak library. To accomplish this, navigate to Sketch > Include Library > Manage Libraries. Then, search for ThingSpeak and install the library.

Fig:14

Step 6: Click Save Channel at the bottom of the settings.

FINAL RESULT:

Fig:15

9.APPLICATION

- ✓ Attendance and Workstation Monitoring: Tracks employee check-ins and ensures compliance with desk-sharing or hybrid work SOPs.
- ✓ Health and Safety Guidelines: Monitors air quality, temperature, and sanitation practices in line with health regulations.
- ✓ Visitor Management: Ensures proper documentation and procedures are followed for visitor access.

10.CONCLUSION

The integration of Internet of Things (IoT) technologies for monitoring and enforcing Standard Operating Procedures (SOPs) in businesses and public spaces brings significant benefits. IoT-driven systems enable real-time tracking, automated management, and precise enforcement of safety and regulatory protocols. By leveraging IoT for SOP compliance, businesses and public establishments can ensure higher levels of safety, efficiency, and accountability. This approach meets the increasing demand for automation, real-time data analysis, and proactive management, ensuring adherence to public health and safety standards in an ever-evolving environment. As IoT technology continues to advance, its role in enhancing SOP compliance and operational efficiency will strengthen, offering more reliable and effective systems for organizations.

https://doi.org/10.36893/JNAO.2024.V15I2.125

REFERENCES

M. Kristo and M. Ivasic-Kos, "Thermal Imaging Dataset for Person Detection," in *2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*, IEEE, pp. 1126-1131, 2019.

A. W. Bartik, M. Bertrand, Z. Cullen, E. L. Glaeser, M. Luca, and C. Stanton, "The Impact of COVID-19 on Small Business Outcomes and Expectations," *Proceedings of the National Academy of Sciences*, vol. 117, no. 30, pp. 17656-17666, 2020.

P. Devikar, "Face Liveness and Disguise Detection Using Raspberry Pi and OpenCV," *International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)*, vol. 5, no. 1, 2017.

K. Kumar, N. Kumar, and R. Shah, "The Role of IoT in Preventing the Spread of COVID-19," *International Journal of Intelligent Networks*, vol. 1, pp. 32-35, 2020.

https://doi.org/10.36893/JNAO.2024.V15I2.125