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An IoT Based Medi-Kit for Passengers in Train

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ABSTRACT-

One of the most popular, affordable, and quick modes of transportation for long-distance travel and the movement of large commodities is the railway. Among the biggest rails is the Indian Railways. In India, trains are the primary mode of transportation for both short and long distances. There is no first aid system on trains to assist people who require medical attention right away. The use of an Internet of Things-based Medi-kit for train passengers is a major step forward in improving rail travel security and safety. The project's goal is to reduce health hazards and enhance emergency response capabilities by utilizing IoT technologies, which will ultimately make travel for passengers safer and more comfortable.

Keywords – Internet of Things , Wireless Sensor Network , Health Care , Immediate aid, Efficient.

1. Introduction

A worldwide concern for humans is health. Over the past ten years, there has been a significant amount of focus on healthcare. The most important thing was to create a robust case monitoring system so that medical personnel could handle patients who are also undergoing rehabilitation or going about their daily lives as usual. Healthcare personnel are important to the traditional approach. This study proposes an Internet of Things-based health monitoring system that can carry out a variety of tasks under predetermined time, cost, and delicacy constraints. This IoT-anchored technology is inexpensive and perpetually functional. Detectors identify the natural parameters of situations.

2. LITERATURE SURVEY

In this study, Chandana [1] et al., have suggested one of the major technologies that helps in healthcare is the Internet of Things (IoT) which helps in attaining revolutionary technology, we will be able to observe the vitals of the patient effectively and effortlessly. In this project, an Intelligent health care and monitoring system is being developed for railway passengers that incorporates the Internet of Things technology by making use of cost-effective sensors such as the Pulse sensor and Respiratory sensor to check the vitals of human beings such as heart rate and breathing rate respectively.

In this research, Saravanan [2] et al., have suggested that telemedicine is facing a lot of challenges in the first aid treatment for heart attack, stroke, accident, and fire accidents of patients where the Doctors are not available. When rescuing a car crash, the accident patient should be carried via an ambulance bus, the vital signs of the wounded should be monitored and first aid treatment inside the bus to avoid sudden death or major injuries.

In this work, Toshiyo Tamura [3] et al., have suggested The Internet of things is increasingly being applied in healthcare. The system provides unobtrusive monitoring, a highly efficient database, and interventions by health professionals. This report focuses on the core technologies of our system, particularly those involved in BP monitoring.

In this study, Uddin Ahmed [4] et al., have suggested the system for monitoring the patient's body 24/7 by using Internet of Things (IoT). This system is responsible for collecting pulse, body temperature and heart beat from the patient's body and send the data into IoT Cloud platform by using WIFI-Module and health condition of patient stored in the cloud.

3. EXISTING SYSTEM

In the existing system, there is no new technique had been implemented till now to help the emergency patients in the train travel. Till now emergency wire pulling method is used to stop the train for emergency. But, by stopping train will increase the time to reach to the hospital. It will results

in delay in process. Moreover, existing public transportation systems typically do not incorporate advanced sensor technologies for continuous health surveillance.

4. PROPOSED SYSTEM

In proposed system, we are having two different sections namely Compartment and Pilot sections. In the Compartment section, when an emergency situation occurs then there will first aid set available in the compartments. While turning on the setup, we are able to monitor the heartbeat and respiratory level of the patients through respective sensors. If any value goes beyond threshold value then the controller will give assistive support by prerecorded Voice from the voice IC. When the respiratory level comes down then the controller will give command to turn on the ventilator mechanism to give breath support to the patient. Likewise when the heartbeat range goes down then the controller will activate the CPR mechanism. During this state the emergency message will be sent to the loco pilot through WSN module. In addition to that patient health status will be uploaded in the web server through IOT module.

5. HARDWARE DESCRIPTION

A. Power Supply

An electric power adapter may enable the connection of a power plug, sometimes called, used in one region to an AC power socket used in another, by offering connections for the disparate contact arrangements, while not changing the voltage. An AC adapter, also called a "recharger", is a small power supply that changes household electric current from distribution voltage) to low voltage DC suitable for consumer electronics.

Some modify power or signal attributes, while others merely adapt the physical form of one electrical connector to another. For computers and related items, one kind of serial port adapter enables connections between 25-contact and nine-contact connectors, but does not affect electrical power and signalling -related attributes.

Fig.1 Adapter

B. Microcontroller

These systems provide sets of digital and analog input/output (I/P) pins that can interface to various expanision boards (termed shields) and other circuits. ESP32 is a series of low-cost, low-power system on a chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. The ESP32 series employs either a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations, Xtensa LX7 dual-core microprocessor or a single-core RISC-V microprocessor and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. ESP32 is created and developed by Espressif Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using their 40 nm process.

Fig.2 ESP32

C. Wireless Sensor Network

A Wireless Sensor Network (WSN) is a network of spatially distributed autonomous sensors that cooperatively monitor physical or environmental conditions and communicate the collected data through wireless communication to a central location or other nodes in the network. It comprises

autonomous sensor nodes that monitor physical conditions and communicate data wirelessly. They offer scalability, flexibility, and real-time monitoring, aiding in timely decision-making.

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used for wireless networking. It is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless M2M networks. ZigBee (CC2500) is a low cost true single chip 2.4 GHz transceiver designed for very low power wireless applications. The RF transceiver is integrated with a highly configurable baseband modem.

Fig.3 Zigbee

D. IoT Module

The Internet of Things (IoT) is the network of everyday objects - physical things embedded with electronics, software, sensors, and connectivity enabling data exchange. A little networked computer is attached to a thing, allowing information exchange to and from that thing. Be it light bulbs, toasters, refrigerators, flower pots, watches, fans, planes, trains, automobiles, or anything else around you, a little networked computer can be combined with it to accept input (especially object control) or to gather and generate informational output (typically object status or other sensory data). This means computers will be permeating everything around us - ubiquitous embedded computing devices, uniquely identifiable, interconnected across the Internet. Because of low-cost, networkable microcontroller modules, the Internet of Things is starting to take off.

E. Heart Beat Sensor

Heartbeat is sensed by using a high-intensity type LED and LDR. The finger is placed between the LED and LDR. As a Sensor a photodiode or a phototransistor can be used. The skin may be illuminated with visible (red) using transmitted or reflected light for detection. The skin may be illuminated with visible (red) using transmitted or reflected light for detection. The very small changes in reflectivity or transmittance caused by the varying blood content of human tissue are almost invisible.

Medical heart sensors are capable of monitoring vascular tissue through the tip of the finger or the ear lobe. It is often used for health purposes, especially when monitoring the body after physical training. It works on the principle of light modulation by blood flow through finger at each pulse.

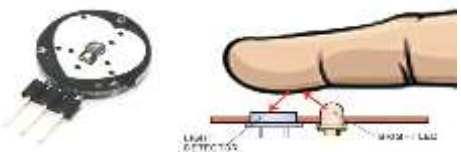

Fig.4 Heart Beat Sensor

F. Respiratory Sensor

The Respiration Sensor is used to monitor abdominal or thoracical breathing, in biofeedback applications such as stress management and relaxation training. Besides measuring breathing frequency, this sensor also gives you an indication of the relative depth of breathing. The Respiration Sensor for Nexus can be worn over clothing, although for best results we advise that there only be 1 or 2 layers of clothing between the sensor and the skin. The Respiration Sensor is usually placed in the abdominal area, with the central part of the sensor just above the navel. The sensor should be placed tight enough to prevent loss of tension.

Fig.5 Respiratory Sensor

G. Liquid Crystal Display (LCD) LCD performs the same functions (display characters numbers special characters ASCII characters etc). Their programming is also the same and they all have the same 14 pins (0-13) or 16 pins (0 to 15). LCD connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply.

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. The 16 x 2 intelligent alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used).

Fig.6 LCD

H. Speaker

Speakers are one of the most common output devices used with computer systems. Some speakers are designed to work specifically with computers, while others can be hooked up to any type of sound system. The Speaker is the mouthpiece for the House, for example, conveying Messages and Addresses from the House to the Governor. The Speaker is also charged with upholding the rights and privileges of Members and the House.

Amplitude, or loudness, is determined by the change in air pressure created by the speakers' sound waves. Therefore, when you crank up your speakers, you are actually increasing the air pressure of the sound waves they produce. Since the signal produced by some audio sources is not very high (like a computer's sound card), it may need to be amplified by the speakers.

Fig.7 Speaker

I. Buzzer

A buzzer is an electronic device that generates an audible sound when electricity is applied. They are commonly used for alarms, notifications, and sound effects in various electronic projects.

They come in different operating voltages, offer varying sound levels and frequencies, and are typically compact in size. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm device, timers, train and confirmation of user input such as a mouse click or keystroke.

Fig.8 Buzzer

J. Voice Integrated Circuit (IC)

A Voice Integrated Circuit (VIC) is a compact electronic component designed to process and manipulate audio signals in various electronic devices. It incorporates specialized circuits and algorithms tailored for tasks such as voice recognition, speech synthesis, noise cancellation, and audio processing. VICs are commonly utilized in applications ranging from smartphones and smart speakers to automotive systems and IoT devices, enabling seamless interaction through voice commands and facilitating clear communication in noisy environments.

These circuits often integrate digital signal processing (DSP) capabilities and may incorporate advanced machine learning algorithms to enhance their performance in recognizing and generating human speech. With the rapid advancement of voice technology, Voice Integrated Circuits play a pivotal role in enabling natural and intuitive human-machine interfaces across a wide array of consumer and industrial products.

Fig.9 VOICE IC

6. SOFTWARE DESCRIPTION

A. Embedded C

extends the C language with the primitives that are needed by signal-processing applications and that are commonly provided by DSP processors. The design of the support for fixed-point data types and named address spaces in Embedded C is based on DSP-C. DSP-C [1] is an industry-designed extension of C with which experience was gained since 1998 by various DSP manufacturers in their compilers. For the development of DSP-C by ACE (the company three of us work for), cooperation was sought with embedded-application designers and DSP manufacturers.

The Embedded C extension supports defining both the natural multiple address space built into a processor's architecture and the application-specific address space that can help define the solution to a problem. Embedded C uses address space qualifiers to identify specific memory spaces in variable declarations. There are no predefined keywords for this, as the actual memory segmentation is left to the implementation.

For proper integration with the C language, a memory structure is specified, where the unqualified memory encompasses all other memories. All unqualified pointers are pointers into this unqualified memory. The unqualified memory abstraction is needed to keep the compatibility of the void * type, the NULL pointer, and to avoid duplication of all library code that accesses memory through pointers that are passed as parameters.

B. Arduino IDE

The Arduino Integrated Development Environment (IDE) is a software platform designed to simplify the process of writing, compiling, and uploading code to Arduino microcontroller boards. It provides a user-friendly interface for programming Arduino-compatible devices, allowing both beginners and experienced developers to create projects quickly and efficiently.

We can certainly state that being compatible with the Arduino IDE is now one of the main requirements for a new microcontroller board. Over the years, many useful features have been added to the Arduino IDE and you can now managed third-party libraries and boards from the IDE, and still keep the simplicity of programming the board.

Fig.10 Arduino IDE

7. BLOCK DIAGRAM

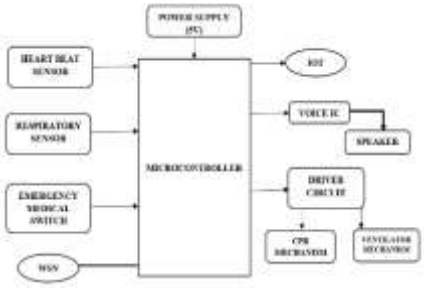

Fig.11 Block Diagram of the Compartment Section

CPR = Cardiopulmonary Resuscitation

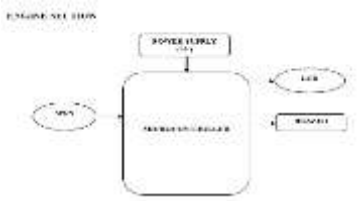

Fig.12 Block Diagram of the Engine Section

8. RESULT AND DISCUSSION

The IoT-based Medi-kit for train passengers has demonstrated significant advancements in onboard healthcare. Real-time monitoring ensures timely intervention during emergencies. Swift alerts to staff improve response times. Enhanced access to medical supplies enhances passenger safety. The kit's modular design allows for scalability and adaptability. Future research should focus on further optimization and collaboration with stakeholders for widespread adoption. Overall, this project represents a pivotal step towards revolutionizing healthcare delivery in railway transportation.

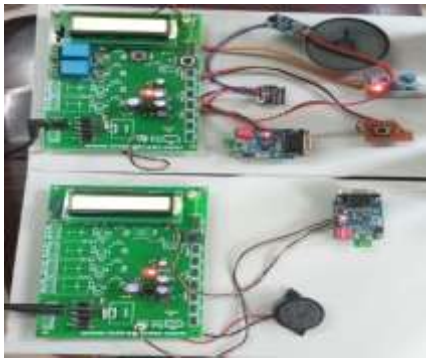

Fig.13 Result of the Hardware Module

Fig.14 Result of the Software Module

9. CONCLUSION

In Conclusion, this study presents a novel and cost- effective system for immediate assistance of health care for passengers in train. Thus an automated electronic system for medical emergency condition during train travel is successfully achieved. This system provides primary medical support for cases before reaching the road station for further medical treatment. IoT and pall integration in healthcare give safe and secure data for cases. The implementation of an IoT-based medi-kit for train passengers represents a significant advancement in enhancing the safety and security of railway travel.The proposed system provides accurate data, a low- cost system for covering the twinkle and respiration rate of the train passengers. The system makes use of a single ESP 32 board and the detectors that make the system cost-effective and also useful. The system substantially focuses on the people to live a happy and healthy life and also on the security of an IoT device.

10. FUTURE SCOPE

The future scope of this project includes enhancing health monitoring with advanced sensors, implementing real-time medical assistance, and developing automated emergency response systems. Research and innovation efforts will explore emerging technologies to further enhance onboard healthcare support, ultimately ensuring continued improvement in passenger safety and well-being.

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