IOT BASED MULTI PARAMETER PATIENT MONITORING SYSTEM

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Abstract

This project focuses on Design & Development of Health-care Patient Monitoring System using cloud Environment, in traditional method of patient monitoring the patient physiological information is on paper recorded by the nurses. As these nurses work on shift basis the latest details of the patient may not be completely explained from outgoing to incoming nurse. Many times the diagnosis is made based on manually recorded physiological information and the prescription was noted without concern with tolerant current medical records. With such conventional method diagnoses as well as the recommendation are noted against the law, which does not permit to do experts to have an easy entry to tolerant record. With such scenario it is bit difficult to diagnose the patient correctly for the proper treatment. This leads to the expansion of store and ahead at least under ICU environment. With such system the patient's normal functioning in the form of space time records of biological event are seize, stored for as long as to the experts for unplugged. To facilitate population living in rural as well as interior part of the country with portable battery-operated Telemetric unit and to provide flexibility to such patients to have distant medical check-ups as well as continuous patient monitoring. Shows methodology and basic idea about how the sensors, actuators connected to Controller which able to process the signal in proper graphical physiological parameters of patients displayed on LCD by embedded Programming technique later its connected to wireless sensor network then sent to web server to the experts present on another side.

INTRODUCTION

The Internet of things will remodel the healthcare sector and improve the health and wellbeing of humanity. The traditional healthcare system requires patients to visit the clinic or hospital for medical check-ups which is time-consuming and inefficient. The Internet of Things is capable of realizing a real-time health monitoring system that involves sensors to measure heart rate, body temperature and other body functions of patients and visualize the data in real-time. By doing so, people can have better control of their health condition. Instead of relying on infrequent visits to clinics or hospitals for various tests, people can access their health data through the Internet and start to track their health conditions. The Internet of Things that realizes the connection between devices allows activities such as sending an alert email and messages during emergency conditions. There is a need for developing open sensors and middleware components that allow transparent integration and plug and play interoperability of monitoring devices and systems as shown in figure. The use of communications standards seems to be an efficient way to solve these problems. Most stake holders in hospital information systems, medical devices and telemedicine scenarios agree that standard-based solutions are needed to foster the development of these markets and improve the service provided to patients. However, it is frequently claimed that it is not feasible to develop such systems because of either costs or lack of development of the standards.

People who require health care system are increasing day by day while the available resources remain the same. Especially, a

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country like Germany faces the problems, that medical experts such as cardiologists do not pay much attention towards rural areas. As a result, patients from those areas are required to travel for long distances for medical check-ups. Hence, even a simple check-up is connected with significant cost and efforts. Cardiac arrest is considered as one.

II. EXISTING METHOD

The existing block diagram for a smart health parameter patient monitoring system typically includes several key components:

Sensor Module: This component consists of various sensors to measure vital signs such as heart rate, blood pressure, temperature, oxygen saturation, and more. Each sensor is responsible for capturing specific health parameters.

Microcontroller/Processor: The micro controller or processor acts as the brain of the system, receiving data from the sensor module, processing it, and executing commands based on predefined algorithms. It also manages data storage and communication with other modules.

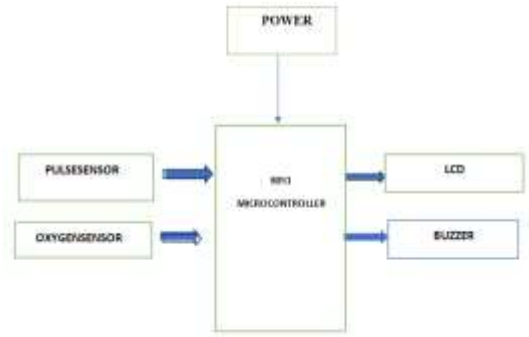

Figure: 2.1 Existing block diagram

Wireless Communication Module: This module facilitates wireless communication between the monitoring system and external devices such as smartphones, tablets, or centralized servers. Common communication protocols include Bluetooth, Wi-Fi, or cellular networks.

Power Management: Power management circuitry ensures efficient utilization of power sources such as batteries or external power supplies, extending the system's operating time and reliability**.**

Alerting System: An alerting system may be integrated to notify healthcare providers or patients of abnormal health parameters or critical events. This can be in the form of alarms, notifications, or visual cues.

Data Analytics/Processing Unit: This unit processes the collected health data to derive meaningful insights, trends, and patterns. It may employ algorithms for real-time analysis, anomaly detection, or predictive modelling to assist healthcare professionals in decision-making.

By integrating these components, the smart health parameter patient monitoring system enables continuous monitoring, analysis, and management of patient health parameters, ultimately contributing to improved healthcare outcomes and patient well-being.

WORKING

Important healthcare parameters remotely tracked in real-time and measured value presented to doctors and patients through a system-specific mobile application. The healthcare parameters are SPO2, heart rate and body temperature. The hardware configured by connecting sensors to the raspberry pi microcontroller.

The 4G GSM, GPRS and GNSSHAT Module attached to the raspberry pi which was connected to the MySQL database via Wi-Fi. The raspberry pi and sensors programmed by python language for gathering, analyzing and transferring data. Each sensor was placed to specific defined location of patient’s body, as the temperature sensor placed to the skin and the pulse oximeter to the fingertip. After measuring health parameters, it will compare with its normal reference range then all values are presented to the mobile application, if there

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is any abnormal value i.e., any value below or above normal range, an emergency alert will send to doctors/paramedics and relative of the patients via SMS notification with patient's position thus allowing doctors to make life-saving decisions without requiring patients to be present in clinics and hospitals.

Existing Method Drawbacks

- Sensor's data can be displayed on LCD Only.
- We can't able to monitor the health parameters in our smart devices.
- It is very slow process because of a greater number of lines in coding.
- For programming a microcontroller need a very strong foundation on Embedded C&C.

III. Proposed Block Diagram

The proposed block diagram for a smart health parameter patient monitoring system encompasses innovative features and advancements to enhance functionality and usability. Here's a breakdown of the components.

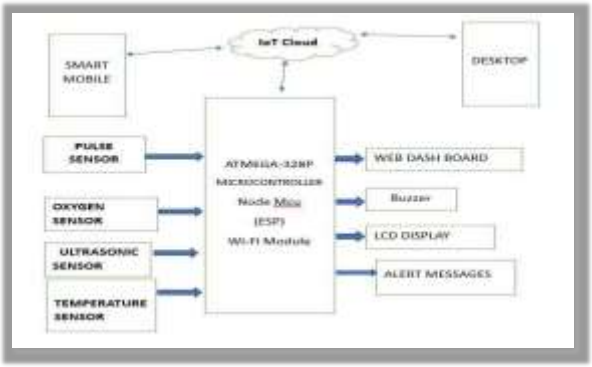

Figure3.1: Proposed method block diagram

By incorporating these advanced features and technologies, the proposed smart health parameter patient monitoring system aims to revolutionize health care delivery, empower patients to take proactive control of their health, and ultimately improve health outcomes and quality of life."

IV: WORKING

CLOUD:

Cloud helps us to secure patient data and ensure regulatory compliance while allowing healthcare providers to continue delivering advanced technological care. This extends the patient experience to the digital space. A variety of public, private, and hybrid cloud platforms help us to get better access to patient's records."

SMART DEVICES:

Mobile devices used in healthcare enable them to access patient records, treatment plans, and histories at the point of care. This immediate access to critical information empowers clinicians to make data driven, smart decisions, reducing the likelihood of errors and improving overall patient safety. From maintaining patient records to scheduling appointments, computers help hospital staff works more efficiently and effectively. In addition, computers can also be used to monitor patients' vital signs like blood pressure and respiration.

ATMEGA328:

ATmega328 is commonly used in many projects and autonomous systems where a simple, low powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno, Arduino Pro Mini and Arduino Nano models.

DASHBOARD:

Dashboards give users access to real-time data on the movements of their resources and patient check-ins. All staff members have easy access to this information and can use it to their advantage. For instance, every authorized staff member, from the doctor to the receptionist, should have access to patient data. It allows patients in health care settings to alert a nurse or other health care staff

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member remotely of their need for help. When the button is pressed, a signal alerts staff at the nurse's station, and usually, a nurse or nurse assistant responds to such a call.

PULSE SENSOR:

Pulse sensors are expected to enable calculation of various vital signs such as HRV analysis (stress level) and vascular age through high-speed sampling and high accuracy measurement.

OXYGEN SENSOR:

Scientists use oxygen sensors to measure respiration or production of oxygen and use a different approach. Oxygen sensors are used in oxygen analyzers, which find extensive use in medical applications such as anesthesia monitors, respirators and oxygen concentrators

ULTRASONIC SENSOR:

The ultrasonic sensor uses the time of wave signal travel (to and back) and velocity to show the distance between the point of wave origin and the object. In healthcare, ultrasound sensors are used in pregnancy monitoring to ensure the development and mother's health are normal.

TEMPERATURE SENSOR:

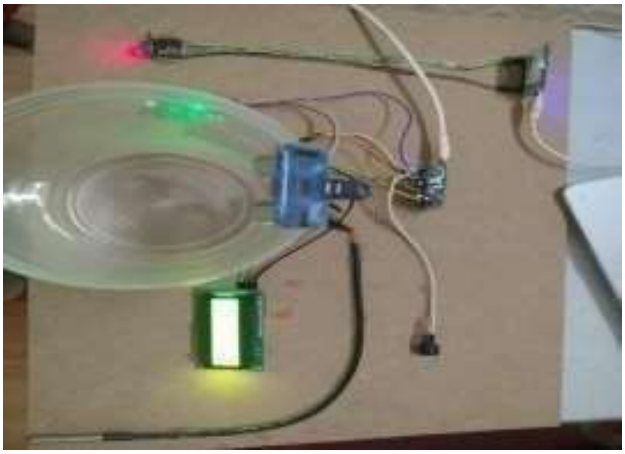
These sensors provide accurate measurements of temperature with a digital output signal and small circuit board package. For example, digital temperature sensors can be designed into medical devices to monitor the temperature of air in respiratory devices to create greater comfort for patients as air enters the airway.

V. Results And Discussions

SOFTWARETOOL

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. The Smart Health parameters project aims to develop a system that monitors various health metrics in real-time and provides insightful outputs to users.

A smart health parameter patient monitoring system provides real-time tracking and analysis of vital signs like heart rate, blood pressure, oxygen levels, and more. It offers detailed insights and alerts for healthcare providers, ensuring timely interventions and personalized care for patients. Additionally, it may include features such as remote monitoring, data visualization, and predictive analytics to enhance patient outcomes and streamline healthcare delivery.



Outputs

Figure 5.1: Full kit pic

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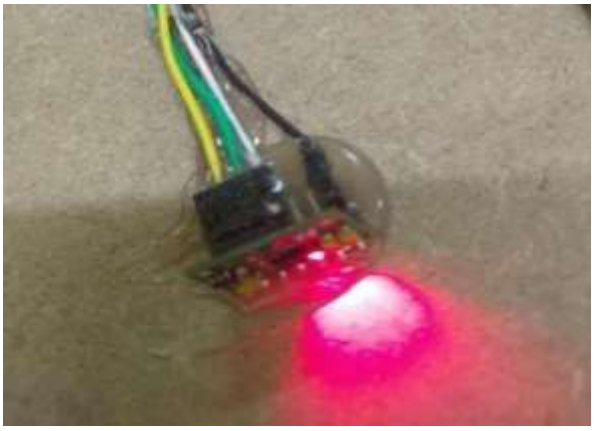
PULSE AND OXYGEN LEVELS

Figure 5.2: Pulse rate and Oxygen level rate

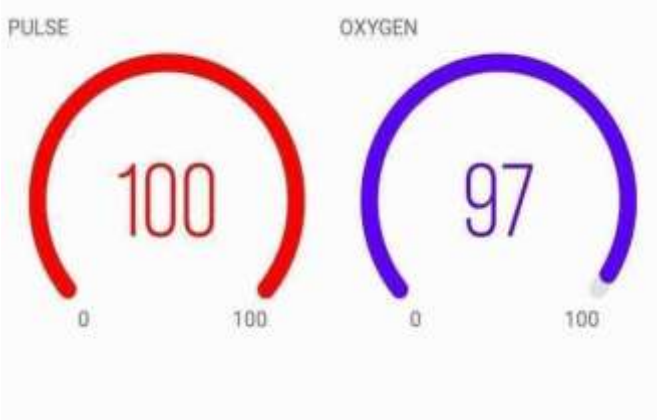
- Heart rate, crucial for assessing cardio vascular health
- Oxygen indicates blood oxygen into overall well-being.
- Early detection of potential health issues.
- Pulse and oxygen levels are key components of smart health monitoring.
- Pulse indicates saturation,
- Essential for respiratory function. Monitoring parameters provide valuable insights



Body Temperature And Saline Level

Figure 5.3: Body temperature and Saline level

Body temperature: Specify the level of accuracy of the temperature sensor to ensure precise measurement of body temperature.



Measurement Range: Indicate the range within which the temperature sensor can accurately measure temperature, covering both normal and fever ranges. By providing a comprehensive description covering these aspects, users can better understand how the temperature sensor enhances their smart health monitoring capabilities, particularly in detecting and managing fevers and other temperature-related conditions.

Saline level monitoring: Real-time monitoring of saline levels in the body, ensuring optimal hydration and electrolyte balance. Alerts healthcare providers or individuals when levels deviate from normal ranges, facilitating timely interventions to maintain health and prevent dehydration-related complications."

EMERGENCYALERT

Alert Type: Specify the type of alert the buzzer indicates, such as abnormal heart rate, low oxygen saturation, or high blood pressure.

Sound Pattern: Describe the sound pattern the buzzer emits, whether it's a continuous tone,

pulsating, or varying in intensity.

Figure 5.4: Emergency alert

Safety Features:

- Include any safety features implemented, such as fail-safes to prevent false alarms
- These mechanisms to ensure proper functioning over time.
- By providing a comprehensive description encompassing these aspects.
- Users can better understand how the alerting buzzer enhances their smart health monitoring experience.

VI. Conclusion

This project revolves around the beat rate, internal heat level and oxygen in blood content checking and making ready which can screen patient's internal heat level condition. The system chooses the well-being information each second and a while later sends parameters to our smart mobile or web dash board caution to the Phone. This IOT based health parameters is compact and practical. It is an effective framework and exceptionally simple to deal with. In this manner it gives incredible adaptability and fills in as an extraordinary improvement over other traditional checking and ready frameworks.

VII. Future Scope

The future scope for IoT-based smart health parameters is v a stand promising. Here are some potential areas of growth and development:

Advanced Monitoring Devices: Future IoT devices will likely become more sophisticated, providing real-time monitoring of various health parameters such as heart rate variability, blood oxygen levels, glucose levels, and more. These devices will be designed to be non-intrusive, comfortable to wear, and seamlessly integrate into everyday life.

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