



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 9.935

Volume 15, Issue 5, May 2026

Health Monitoring using IoT Enabled Automated Saline Infusion and AED (Automatic External Defibrillator)

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ABSTRACT: With the global population on the rise, there's a growing imperative for proactive healthcare measures. Recent years have witnessed remarkable progress in clinical care, propelled by technological advancements in sensor and microcontroller technologies. These advancements aim to expedite patient recovery in hospital settings. A critical aspect of patient care is ensuring each individual receives optimal treatment and continuous monitoring, alongside timely administration of essential nutrients. Saline solution stands out as a cornerstone therapy for many hospitalized patients, serving to alleviate inflammation in various bodily systems such as the lungs, heart, kidneys, and skin. However, despite its widespread use, administering saline to patients requires constant oversight by nurses or caregivers. Regrettably, instances occur where a patient's blood flow reverses into the saline tubing system, posing potential risks. To address this challenge, this study proposes a system for monitoring saline levels and issuing automatic alerts. This system aims to enhance patient safety during saline administration, mitigating risks associated with inadvertent complications. By implementing such a system, hospitals can ensure more reliable and secure patient care protocols, ultimately contributing to improved healthcare outcomes.

KEYWORDS: Saline Monitoring System, IoT, Load Cell technology, real-time monitoring, patient safety, resource utilization, automation, digitization

I. INTRODUCTION

The load cell, in combination with the HX711 sensor, accurately measures the weight of the saline solution, providing precise information about the saline level in the container. This data is then transmitted to the ESP8266 microcontroller via the I2C module, ensuring reliable communication between the components. To enhance user interaction and provide real-time updates, a 16x2 display is incorporated into the system. This display shows vital information, such as the current saline level, battery status, and any relevant alerts or notifications. Additionally, the Blynk app acts as a remote monitoring tool, allowing users to access the data from anywhere using their smartphones or tablets. By implementing the Saline Monitoring Project, healthcare facilities, laboratories, or any environment requiring precise saline level control can benefit from increased efficiency, reduced manual intervention, and improved accuracy. The project's IoT-based approach provides a scalable and adaptable solution that can be customized to meet specific monitoring requirements. In summary, the Saline Monitoring Project leverages IoT technology and an array of components to automate and optimize saline level monitoring. With real-time data visualization and remote access capabilities, the project aims to improve the overall management of saline solutions, ensuring optimal conditions and enhancing operational efficiency.

Internet of Things commonly referred to as IoT is the "next big thing" in the world right now with an expected presence of around 30 billion devices by the end of this decade. The Internet of Things (IoT) portrays the network of physical object "things" that are installed with programming, sensors, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. In other words, it's a physical object that connects to the Internet. In many cases, IoT systems connect highly specialized devices with limited programmability and customizability. The saline drop rate is adjusted utilizing the drip chamber which delivers the solution at the required amount into the patient body. Whenever there is a saline dripping, there is a need for a person to monitor the glucose level and the glucose flow rate may be at regular intervals of time. The concerned patient should be in careful

observation. Here the nurses/ doctors should screen the level of the saline fluid consistently which is given to the patient because after completion of the saline fluid there are two possibilities, the blood may flow backward from the patient's body to the saline bottle due to low pressure present in the bottle and high pressure of blood flowing in the patient body or there are also chances that the air present in the saline bottle enters in the form of air bubbles from the saline bottle into the blood stream and stops the flow of blood prompting the risky state of the patients. To avoid this risky states the nurses/ doctors should monitor the patient consistently. In this pandemic situation due to their hectic schedules this might be difficult for the nurses/ doctors. Thus an automated system of monitoring the Saline Fluid which is proposed in this paper to save the life of patient and furthermore to reduce the consistent monitoring of the fluid in the hospitals when there are numerous patients assigned to few nurses. This system is also used to check whether the patient is suffering from high temperature or the oxygen level or the pulse rate is decreasing by using the various sensors. This might accommodate medical staffs for observing the saline level from a distance and reduce the continual on-site monitoring by the doctors and nurses.

II. RELATED WORK

Kriti Ojha and colleagues [1] introduced an IOT-enabled solution for monitoring saline levels. The system incorporates a level sensor to ensure precise measurements. When the saline level falls below a predefined threshold, notifications are dispatched to nurses via Bluetooth-enabled devices. However, this notification process has the drawback of gradually depleting the battery life of the mobile phones utilized for receiving alerts. The system devised by Kalaivani and coauthors [2] introduces a monitoring solution for cardiac patients, integrating an ECG sensor alongside saline level monitoring. Patient information is presented on an LCD display for easy viewing and assessment. Mansi G. Chidgopkar and collaborators [3] introduced an automated and cost-effective solution for monitoring saline levels, employing a wireless Bluetooth module and the cc2500 transceiver. This system tracks the flow of saline and provides an estimation of the time remaining until the saline is depleted. Additionally, a buzzer is installed near the patient's bedside, activating an alert when the saline is nearing empty. Sagnik Ghosh [4] presented the creation of an intelligent and advanced saline container. Within this setup, a linear regression algorithm is employed to anticipate the upcoming instance when medical staff must replace the saline bottle. Anusha Jagannathachari [5] introduced a saline level gauge. This setup oversees the flow of saline, and in the event of depletion, utilizes a DC motor and spring mechanism to obstruct any backward movement of blood within the tubing. Sanjay. B [6] introduced a hospital-based monitoring system for drips utilizing IOT technology. This setup oversees saline levels using a distinct component known as a load cell, while also dispatching alert notifications in the event of saline depletion. Karthik Maddala [7] introduced a system that tracks the flow of saline and showcases its level on a 16*2 LCD display. In the event of saline depletion, an alert message is dispatched to the nursing or medical staff. Ashika A. Dharmale [8] introduced an IOT-based system for monitoring saline levels and issuing automatic alerts. Within this setup, three infrared (IR) sensors are employed to signify the saline level. Additionally, the system halts the saline flow through the utilization of a micro servo motor. Furthermore, all pertinent patient and saline information is stored in a database for subsequent utilization.

III. LITERATURE SURVEY

Engineering College, Kanuru, Andhra Pradesh, India, ISSN: 2319 – 1058, Volume 7 Issue 2 August 2016

In this project we are implementing a heartbeat monitoring and heart attack detection system using the Internet of things. These days we have an increased number of heart diseases including increased risk of heart attacks. The sensor is then interfaced to a microcontroller that allows checking heart rate readings and transmitting them over internet. The user may set the high as well as low levels of heart beat limit. After setting these limits, the system starts monitoring and as soon as patient heart beat goes above a certain limit, the system seen as been alert to the controller which then transmits this over the internet and alerts the doctors as well as concerned users. Also the system alerts for lower heartbeats. Whenever the user logs on for monitoring, the system also displays the live heart rate of the patient. Thus concerned ones may monitor heart rate as well get an alert of heart attack to the patient immediately from anywhere and the person can be saved on time.

International Journal of Computer Applications (0975 – 8887), Arvind Prakash Project Engineer, Livikodez Bangalore, Karnataka, India, Volume 170 – No.5, July 2017

The IoT will be one of the important trends in future, can affect the networking, business and communication. In this paper, proposing a remote sensing parameter of the human body which consists of pulse and temperature. The parameters that are used for sensing and monitoring will send the data through wireless sensors. Adding a web based observing helps to keep track of the regular health status of a patient. The sensing data will be continuously collected in a database and will be used to inform patient to any unseen problems to undergo possible diagnosis. Experimental results prove the proposed system is user friendly, reliable, economical.

In the medical field, nowadays patient take actively part in collecting and reviewing their reports. In this digitized world, various wireless communication standards have allowed the sensor to develop from traditional forms i.e. require active patient participation to passive form i.e. require no need for patient participation. Today's large number of passive sensors are used that constantly monitor individual patient essential signs and store that data or share it wirelessly with Human-Healthcare professionals. By combining analytics and sensor data, reports are made that describe the early health condition of the patient. Depending on the requirement various types of sensors are being deployed.

INTERNATIONAL JOURNAL OF TECHNOLOGY ENHANCEMENTS AND EMERGING ENGINEERING RESEARCH, VOL 1, ISSUE 3,ISSN 2347-4289,Md. Ashrafuzzaman, MdMazaharulHuq,American International, University-Bangladesh, Dhaka University

Heart attack is a global leading cause of death for both gender and the occurrence is not always known to us. Usually Heart Rate Calculation has traditionally been conducted using specialized hardware or device. It used most commonly in the form of pulse oximeters or Electrocardiogram devices. though these devices have higher method and they are reliable to normal user. However, these devices require users to perform their process. In this paper, we propose a system capable of estimating the heart beat rate using just a camera from a commercially available smart phone and also using a mobile stethoscope to record heart sound for detecting the occurrence of heart attack and also some other heart related disease. Fuzzy Logic is used here, which is a part of Data Mining, the expert problem solution for human illness. In general, case people could not understand whenever they face this problem and this is the main cause of death. Our research is about to determine this problem earlier to reduce the death rate of heart attack. The advantage of this method is that the user does not need specialized hardware and he/she can take a measurement in virtually any place under almost any circumstances. In addition, the measurement can be used as a tool for health coaching applications or effective telecare services aimed in enhancing the user's well being

IV. PROBLEM STATEMENT

EXISTING SYSTEM

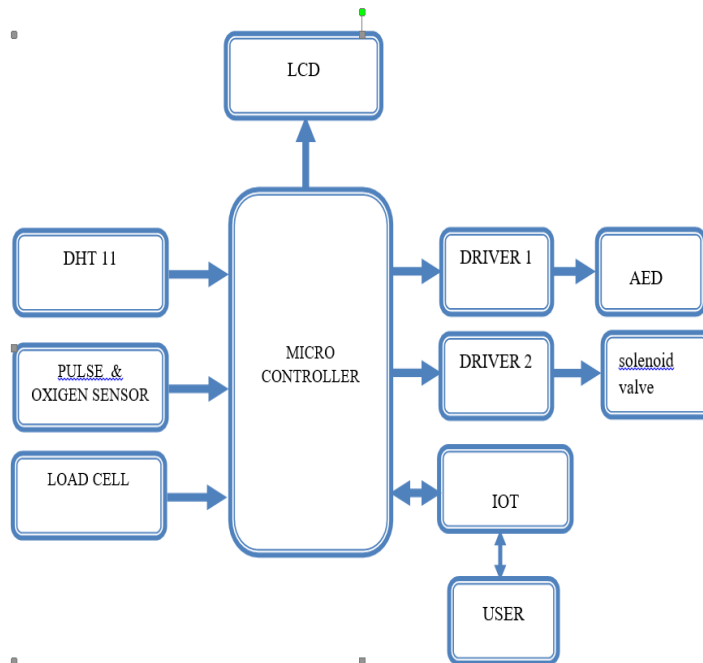
Nursing staff physically check IV bags & Heart beat, which is time-consuming and prone to human error, potentially leading to empty bags, Low heart beat. all process are manual.

PROPOSED SYSTEM

In this system the further application is attached for preventing system that name was AED (Automatic External Defibrillator). In case any low level beat is detects the defibrillator will give the shock on external body of the patients. After the shock the notification is send to the corresponding doctor. And voices also speak at the ICU unit if the patient is admitted in hospital.

In this system have a two segments. One is the transmitting segment which is with patient and the other is receiver segments which is being supervised by the doctor or nurse. The system makes use of heart beat sensor to find out the current heart beat level and display it on the LCD screen. The transmitting circuit include microcontroller interfaced to LCD screen and this transmitting circuit is powered by 6v battery. Similarly, the receiving circuit includes IOT. It includes a buzzer which is used to alert the person supervising the heartbeat rate of patient does not fall within the normal heart beat level set. The inherent noise signal was eliminated using a low pass filter. The device is portable, durable, flexible, reliable and cost effective. Also, it is efficient, easily estimable data and easy-to-use for the end user. Experimental results have shown acceptable range with actual heartbeat rates.

V. BLOCK DIAGRAM



VI. RESULT AND DISCUSSION

With the rising global population, the demand for efficient healthcare systems is increasing rapidly. In hospitals, one of the most common and essential treatments administered is intravenous (IV) saline therapy. However, manually monitoring saline levels is time-consuming and often leads to human errors, such as allowing the saline bottle to empty completely, which can cause serious complications including backflow of blood. To address this issue, this paper presents an IoT-based automatic saline level monitoring and alert system using NodeMCU Wi-Fi technology. The system employs an ultrasonic sensor to continuously monitor the fluid level in the saline bottle. When the fluid level reaches a predefined low threshold, the system triggers an alert using LEDs and also sends a real-time notification to medical staff via Wi-Fi. The NodeMCU module ensures seamless communication and cloud connectivity, enabling remote monitoring and reducing the dependency on continuous human supervision. The system employs an ultrasonic sensor to continuously monitor the fluid level in the saline bottle in real-time. This solution is cost-effective, scalable, and enhances patient safety by minimizing risk due to delayed response. The integration of IoT technologies in such critical monitoring applications marks a significant step forward in the development of smart healthcare systems

VII. CONCLUSION

This paper introduces an automated method for monitoring saline fluid levels in bottles, along with the capability to halt saline flow using a solenoid valve. The proposed system is well-suited for hospital environments and can be accessed via computer or smartphone, enabling doctors or nurses to monitor saline levels, temperature, blood oxygen levels, and patient heart rates remotely and at any time. With minimal human intervention due to its automated nature, this system proves particularly beneficial for nurses managing multiple patients in busy hospital settings.

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