IOT Based Patient Drips Monitoring System in Hospital

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I. ABSTRACT:

Hospital patient monitoring has been transformed by the introduction of Internet of Things (IoT) technology, which provides real-time data collecting and analysis for improved patient care. To monitor and control intravenous (IV) drips given to patients in hospitals, this paper offers the Patient Drips Monitoring System (PDMS), which is based on the Internet of Things. The suggested system makes use of Internet of Things (IoT) sensors to continually track some IV drip-related characteristics, such as drip rate, volume, and drug concentration. Data is wirelessly transmitted by the Internet of Things sensors to a central monitoring unit, which processes the data instantly. Healthcare professionals can remotely access and simultaneously check the progress of IV drips for many patients using a web-based interface. By using clever algorithms, the system can identify deviations from predetermined thresholds and send out alerts.

Key Components: Sensors, Data Processing Unit, Wireless Connectivity, User Interface, Alerting Mechanism.

II. INTRODUCTION:

The use of technology has completely changed patient care in the current healthcare environment, improving overall service quality, accuracy, and efficiency. The Patient Drips Monitoring System is one such creative use case that makes use of the Internet of Things (IoT) to guarantee accurate and timely monitoring of hospitalized patients receiving intravenous (IV) drips. In hospitals, giving intravenous fluids, drugs, and nutrients is standard procedure. On the other hand, human error can occur when manually monitoring IV drips, which could result in issues like over- or under-dosing and seriously jeopardize patient safety. Conventional IV drip monitoring techniques entail routine nursing staff inspections, which might not offer continuous and instantaneous patient condition data. The Patient Drips Monitoring System uses Internet of Things (IoT) technologies to improve and automate the monitoring process in order to address these issues. This system combines wireless connection, data processing, and sensors to monitor IV drips continuously. It also

notifies healthcare personnel in a timely manner if there are any anomalies or deviations from the recommended settings.

III. EXISTING METHOD:

Hospitals can use a variety of IoT (Internet of Things) components and technologies to implement patient drip monitoring systems. Here's a summary of the current approach:

Sensors: To track variables including flow rate, volume infused, and drip status, Internet of Things (IoT) sensors are affixed to intravenous (IV) drip lines. These sensors can be pressure, flow, or optical sensors, depending on the particular needs and limitations of the application.

Processor/microcontroller: A processor or microcontroller gathers information from the sensors. To take additional action, it analyzes this data and talks with the central system.

Connectivity: The microcontroller is linked by Ethernet, Wi-Fi, or other connectivity methods to the hospital's network infrastructure. As a result, it can speak with the central monitoring system.

Central Monitoring System: This system gathers information from every linked sensor placed across the hospital's numerous IV drip lines. It might be a server or cloud-based platform with real-time processing and analysis capabilities for massive volumes of data.

Alerting Mechanism: When the system detects any anomalies or deviations, it notifies healthcare providers. The hospital's current alerting systems can be connected with them, or these notifications can be provided via SMS and email.

IV. BLOCK DIAGRAM:

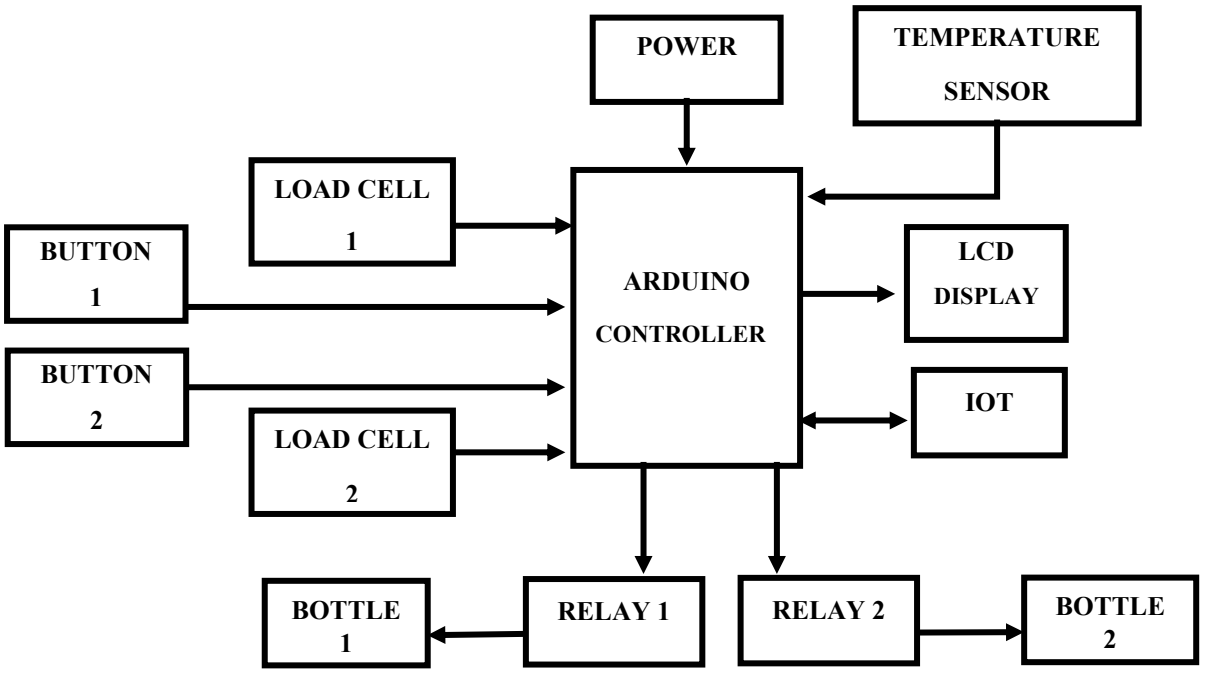

Fig.1 Block Diagram

V. BLOCK DIAGRAM EXPLANATION:

Arduino Controller: The Arduino Controller is the main processing unit of the system. The Arduino controller is in charge of collecting data from multiple sensors, analyzing it, and directing the system's actions.

Power Supply: Gives the entire system its electrical power. It guarantees that every component gets the necessary voltage and current to operate as intended.

I2C: I2C stands for Inter-Integrated Circuit, which is a communication protocol used to link several integrated circuits together within a system. It makes communication easier between other parts, such as display modules and sensors, and the Arduino controller.

IoT: With the help of this module, the system can connect to the internet, facilitating remote control and monitoring. It might be an Ethernet or Wi-Fi module that communicates with the Arduino controller to send data to a server or an internet platform for monitoring and analysis.

Relay Modules (Relays 1 & 2): The Arduino can regulate relays, which are electrically powered switches. They may be utilized to manage the drips' pace of infusion as well as the liquid flow within the system.

Load Cells (Load Cells 1 & 2): The load cells, referred to as load cells 1 and 2, are transducers that transform force into an electrical signal. They are probably employed in this situation to weigh the drip bottles and keep track of how much liquid is left in them.

Buttons (Button 1 & Button 2): The first and second buttons on the interface have the potential to be utilized for user engagement, like starting alterations to the system's operating mode or validating certain operations.

Temperature Sensor: The temperature sensor keeps track of the system's internal temperature to guarantee that the drips are kept at the proper temperature for the patient to receive them.

Bottle 1 & Bottle 2: The drip bottles that hold the patient's medication or fluids are designated as Bottles 1 and 2. To track the amount of liquid left, load cells are probably connected to them.

LCD: The LCD offers a graphical user interface that shows crucial data such as liquid levels, drip rate, system status, and any cautions or alerts.

All things considered, this system employs a variety of hardware parts along with Internet of Things technology to oversee and control the dispensing of drips to patients in a medical facility, guaranteeing precise dosage and prompt action when required.

VI. SOFTWARE ASPECTS:

Multiple essential components are included in the software of an IoT-based patient drip monitoring system in a hospital:

Firmware for Arduino Controller: Create firmware for the Arduino controller that facilitates the gathering of sensor data, regulates drip flow using relay switches, connects to the Internet of Things module, and controls button and display-based user interaction.

Data Acquisition and Processing: Put software procedures into place to read data from sensors, including temperature sensors, load cells, and any other pertinent sensors, to monitor liquid levels and other relevant parameters. Extract useful information from this data, such as

temperature, drip rate, and liquid volume remaining.

Control Algorithms: Create algorithms that utilize sensor readings to regulate how the system operates. For instance, set alerts or sirens to sound if liquid levels are dangerously low, or if you want to maintain the specified drip rate by modifying the relay switches that regulate the flow of drips.

Communication with IoT Module: Integrated software will allow the Arduino controller and the IoT module to communicate with one another. For online platform or server-based remote monitoring and analysis, use protocols like MQTT or HTTP to send sensor data accumulation data.

User Interface: The LCD's user interface can be made more user-friendly by implementing software. Give important details including liquid levels, drip rate, system condition, and any alerts or warnings. Provide buttons to allow users to engage with the system and do tasks such as verifying notifications or modifying drip settings.

Security and Authentication: Use authentication methods to limit system access to authorized users exclusively to ensure system security. Protect sensitive patient data by encrypting communications between the IoT platform and the monitoring system.

Error Handling and Logging: Create error handling systems to identify and address problems or flaws in the system. For the sake of compliance, auditing, and troubleshooting, log sensor readings, events, and system operations.

These software elements work together to give the patient drip monitoring system the ability to safely monitor drip administration, guarantee patient safety, and facilitate remote monitoring and management via the Internet of Things capability.

VII. HARDWARE SETUP:

A variety of hardware components are included in a hospital's patient drips monitoring system, which uses Internet of Things (IoT) technology to guarantee precise and dependable tracking of intravenous (IV) drips given to patients. The Arduino controller, which acts as the central processing unit in charge of coordinating the functioning of the entire system, is at the center of it all. A sturdy power supply unit is utilized to offer uniform electrical power to every component, guaranteeing their continuous functioning.

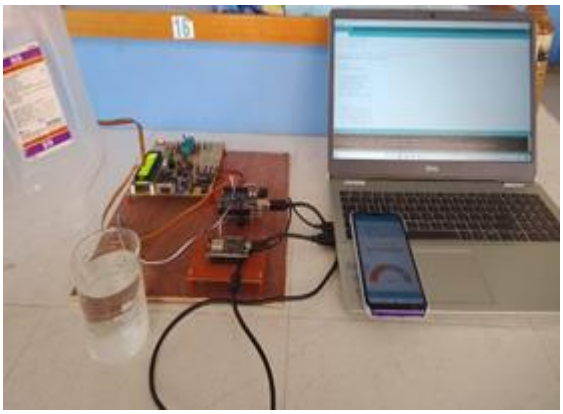

Fig.2 Hardware Setup

To enable smooth data transfer between the Arduino controller and different peripheral devices, the system makes use of the I2C communication protocol. One of these is an Internet of Things (IoT) module that connects the system to the Internet so that IV drip administration can be remotely monitored and controlled. This connectivity is essential in a hospital context since it allows medical personnel to remotely check on patients' IV drip status and take prompt action if needed.

The liquid flow in the system is managed by relay modules, which provide accurate control of the drips' infusion rate. The system is equipped with load cells that precisely gauge the weight of drip bottles, enabling real-time liquid level monitoring. To avoid disrupting patient care, this guarantees that medical personnel can quickly replace empty drip bottles.

The system has user interface components including buttons that can be used to start mode switches or validate certain operations. The drips are kept at the ideal temperature for patients' safe administration thanks to an embedded temperature sensor that keeps an eye on the system's internal temperature.

Fig.3 Saline Level Detection

Medication or patient fluids are contained in drip bottles, which are symbolized by Bottles 1 and 2 in the system. These bottles' load cells allow for continuous liquid level monitoring, guaranteeing that patients always receive the recommended dosage precisely.

Lastly, an LCD module offers a convenient interface for showing important data, including liquid levels, drip rates, system status, and any cautions or alerts. Medical personnel can effectively monitor the IV drip system and act quickly to address any problems that may occur while treating patients thanks to this visual input.

Overall, an array of hardware components is combined in a hospital's patient drips monitoring system which is strengthened by IoT technology to guarantee the precise and dependable delivery of IV drips to patients, improving patient care and safety.

VIII. RESULTS:

Patient care and administration are greatly improved when IoT-powered patient drip monitoring systems are implemented in hospitals. The device guarantees accurate and dependable drip delivery to patients by combining sensors, such as temperature sensors to monitor ambient temperature and load cells to measure liquid levels. Automation of drip rate regulation and notification of prescribed parameter deviations to healthcare practitioners are made possible by the integration of an Arduino controller and relay modules into the system. Additionally, the Internet of Things module facilitates remote monitoring and control, which makes it possible for medical practitioners to receive real-time data and act quickly when necessary. This improves patient safety and lowers the possibility of prescription errors. Incorporating a user interface with buttons and an LCD also makes it easier for users to engage and gives important information quickly. All things considered, the patient drips monitoring system that makes use of IoT technology is a major improvement in hospital treatment that offers better patient outcomes, efficiency, and accuracy.

IX. CONCLUSION:

In conclusion, a major development in hospital care management has been made with the deployment of an IoT-based patient drips monitoring system. This system enhances healthcare practitioners' efficiency and ensures patient safety by merging sensors, controllers, and internet connectivity to allow exact control over drip administration and real-time monitoring. Reducing errors and complications and ensuring proactive intervention are made possible by the ability to remotely monitor drip levels, control infusion rates, and receive early warnings on vital parameters like temperature. Likewise, the smooth interface with IoT makes data gathering, analysis, and reporting easier, empowering medical practitioners to make wise choices and improve patient care. All in all, this creative approach enhances patient outcomes and increases the efficiency of the healthcare system by streamlining hospital operations and raising the standard of care.

X. REFERENCES:

[1]. Satwik Tanwar, Deepa. K, Riddhi Maniktalia, and Ritvik Billa, " IoT Based Drip Infusion Monitoring System" International Journal of Science and Research (IJSR) ISSN: 2319-7064 SJIF (2020): 7.803

[2]. Sri Mathi V, Suganya MB, Sandhiya K, Nivetha D, and Myilsamy G, "Intravenous Drip Monitoring System Using IOT" International Journal of Advances in Engineering and Management (IJAEM) Volume 3, Issue 4 Apr. 2021, pp: 590-593.

[3]. Amey More, Darshan Bhor, Mihir Tilak, Dr. Gajanan Nagare, "IoT-based Smart Saline Bottle for Healthcare", 2021 International Research Journal of Engineering and Technology (IRJET)Volume 10, Issue 06 (June 2021).

[4]. Sanjay. B, Sanju Vikasini. R., " IOT Based Drips Monitoring at Hospitals" 2020 International Research Journal of Engineering and Technology (IRJET) Volume 07, Issue 04 (April 2020).

[5]. Gowri Shankar S, Jamuna P, Bharathi V, Loganayaki A, Praful Nandankar, Neelam Sanjeev Kumar, "IoT based Energy Efficient Smart Metering System" Proceedings of the Second International Conference on Electronics and Renewable Systems (ICEARS-2023).