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IoT Based Saline Controlling System

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ABSTRACT

Modern technology is developing quite quickly. Electronic devices now play a significantly larger role in our life. The world of today requires sophisticated controls for all of its electrical devices. Saline level indicator's primary goal is to make human life easier. Modern humans' environments are automated, which helps to improve productivity and free up time. When a patient is dehydrated, saline is supplied to them. The Arduino microcontroller is a programmable circuit board; in contrast to other circuit boards, the Arduino does not need additional hardware in order to upload a code and is a key component in the creation of monitoring and controlling systems. When patients are fed saline in hospitals as part of the treatment procedure, they must be closely watched. More often than not, due to the busy pace of the staff responding to a high number of patients, the nurse will forget to monitor and change the saline bottle as soon as it is empty. As a result of the imbalance caused by the blood pressure and pressure within the empty saline bottle, blood rushes back to the saline bottle via the intravenous tubing. This may result in the backflow of blood from their vein into the cannula, lowering the patient's haemoglobin levels and causing a lack of Red Blood Cells.

I. INTRODUCTION

Almost everywhere in the hospital, a nurse or caretaker is in charge of continuously checking the saline level without interruption. A large number of patients are dying and being hurt in hospitals as a result of doctors' and nurses' negligence and inattention to saline completion, as well as a lack of nurses with necessary skills in hospitals and their enormous workload. As a result, in order to keep patients safe and protect their lives during the saline feeding period, we will create a smart saline level monitoring and control system.

II. PROJECT OBJECTIVE

- To make the system that automatically stop the flow after emptying of saline bottle using motor mechanism to increasing and decreasing flow rate which is controlling through iot application .

- Provide cost effective and automatic saline level controlling system which can be effortlessly implemented in any hospitals.
- To detect the critical level of saline bottle using non-contact liquid level sensor.

III. LITERATURE SURVEY

1. Paper Name-IOT Based Automatic Saline ontrolling System

Author-Ankita Sapnar & Rutuja Raka

An IoT-based automatic indicating device has been developed, utilizing a load sensor as a level sensor. This innovative system aims to monitor the level of intravenous fluid, specifically saline, in a bottle. When the saline level falls below a certain limit, the load sensor detects the change in weight and triggers an alert. The load sensor measures the weight of the saline bottle, and its output voltage varies based on the fluid level. Once the sensor detects that the saline level is low, an alert is sent to the nurses, providing them with detailed information about the patient and the depleted saline bottle. To ensure prompt attention from the nurses, in case they do not respond immediately, a motor arrangement is activated. This arrangement compresses and flattens the saline tube, effectively stopping the flow of the electrolytic solution. By doing so, the system prevents the formation of air bubbles and reduces the risk of blood clotting, thereby ensuring the patient's safety. The proposed system also offers the convenience of remote monitoring for the nurses. They can use the Blynk application to monitor the saline level from a control room or any remote location. By processing the output obtained from the load sensor, the system determines whether the saline bottle is in a normal state or a warning state. In the event that the level of saline dips below the predetermined threshold, a red LED will illuminate to indicate the low level. This system provides an efficient and automated solution for monitoring the saline levels during intravenous therapy, enhancing patient safety and facilitating nurses in their caregiving responsibilities. An IoT (Internet of Things) based automatic saline controlling system is a technological solution that utilizes IoT principles to automate the control and monitoring of saline solutions in various applications. It incorporates sensors, connectivity, and automation to enhance efficiency and convenience.

2. Paper Name-NRF Transceiver Based Saline Level, Health Monitoring & Control System

Author- Sakshi D. Ambedkar

The population of India constitutes approximately 17% of the global population. Variations in weather conditions can affect human health, leading to changes in immunity levels and often resulting in decreased immunity. Dehydration in patients necessitates the administration of saline to prevent complications. However, it is currently difficult for doctors, caregivers, or nurses to be present continuously beside patients in hospitals. To tackle this issue and facilitate continuous monitoring of patients' conditions, a biomedical application system has been created. This system includes a unit for detecting and monitoring saline levels, along with devices for measuring body temperature and heart rate. Traditional approaches to saline monitoring require nurses or caregivers to continually monitor the patient's glucose status. Moreover, it is impractical for nurses to manually document information for each patient, such as fluctuations in body temperature, heart rate, and critical conditions, as well as the depletion of saline bottles. To address these challenges, a saline monitoring system that integrates heart rate and body temperature monitoring is currently under development. The objective of this system is to assist patients, doctors, and nurses in hospital settings. An NRF (Nordic Radio Frequency) transceiver-based saline level, health monitoring, and control system is a wireless

IV. METHODOLOGY

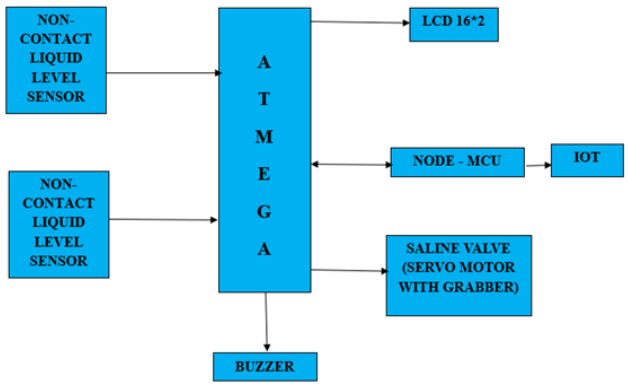

Fig.- Block Diagram

The block design for an IOT-based saline regulating system is illustrated in the picture above, where we use an AT-MEGA 328 controller as the system's heart and will control another sensor with it. Non-Contact Liquid Level Sensor, Buzzer, Servo Motor, Grabber, Node-MCU, and LCD Display are among the components we employ. The Arduino microcontroller is an open-source microcontroller that is used in the development of complex devices and intuitive articles that control and function objects in the real world. It serves as a control and programming unit, giving commands to the servo motor, grabber, and buzzer. The saline solution level is detected by the Non-Contact Liquid Level Sensor in the first scenario. When the saline level reaches low level, the buzzer emits a small sound, to alert the nurse that the saline is at low level. In the second scenario, when the saline level reaches the critical level, the Non-Contact Liquid Level Sensor detects it and, at the same time, the servo motor attached to the grabber begins to rotate, pinching the intravenous saline tube and causing the saline flow to stop, while a buzzer makes sound to alert the nurse that the saline is at critical level. The first saline bottle has been placed in the container box. When the saline is at critical level, the grabber's servo motor will start and clamp the intravenous tubing while a buzzer will sound. Following that, the message will be transmitted to the IOT application.

V. HARDWARE REQUIREMENT

1. GRABBER -

Specification:

- Material: aluminium alloy
- Dimensions: 108mm*98mm • Claw weight: 68g (2.4oz)
- Product Weight: 10.69 x 9.4 x 2.01 Grammes
- Product dimensions (LxWxH): 10.7 x 9.4 x 2 centimetres
- Puzzle Pieces – 1
- Aluminium material type
- Aluminium alloy as a material
- Claw Weight - Maximum paw angle: 54mm (maximum angle does not include the maximum opening distance of the extend board, which is 55mm; install the extension board after the maximum is 94mm)
- Overall length: 108mm/4.25inch (the longest length when the paw is closed).
- Overall width: 98mm/3.86inch (at its widest when the paw is opened)

2. Non-Contact Liquid Level Sensor –

Non-Contact Liquid Level Sensors use advanced signal processing technology and high-speed signal processing processors to minimise the influence of container wall thickness and provide fully non-contact liquid level sensing in sealed containers. The level sensor is mounted on the upper and lower sides of the measured container's outside wall. It is not necessary to open the non-metallic container. It is simple to install and has no effect on production.

3. Servomotor-

A servo motor is a simple electric motor controlled by a servo mechanism. Servo motors are linear or rotary actuators that allow precise control of linear or angular position, acceleration, and speed. This kit includes a motor and a position feedback sensor. A servo motor is usually a main DC motor controlled by an auxiliary servo mechanism for a specific angular rotation. Servo systems are becoming more and more common in the industry.

4. ATMEGA 328 Arduino -

Arduino was conceived at the Interaction Design Institute Ivrea (IDII) as an accessible tool for swift prototyping. Its main focus was to cater to students who lacked prior knowledge in electronics and programming. Its primary purpose was to cater to students lacking expertise in electronics and programming. As the Arduino board gained popularity, it began to evolve to meet new needs and problems, transitioning from simple 8-bit boards to solutions for IoT applications, wearables, 3D printing, and embedded settings. Arduino is a single-board microcontroller that makes it easier to use electronics in multidisciplinary projects. The hardware comprises of a simple open-source hardware board based on an 8-bit Atmel AVR or a 32-bit Atmel ARM microcontroller.

5. Node-MCU

Node-MCU is an open-source software and hardware development platform that is based on the ESP8266 System-on-a-Chip (SoC). The ESP8266, developed and manufactured by Espressif Systems, encompasses essential components of a computer, including a CPU, RAM, networking capabilities (Wi-Fi), and a modern operating system with a software development kit (SDK). This makes the ESP8266 a popular choice for various Internet of Things (IoT) projects. However, working directly with the ESP8266 chip can be challenging. It requires soldering wires to its pins with the correct analog voltage for basic tasks like powering it on or sending commands to the onboard "computer" within the chip

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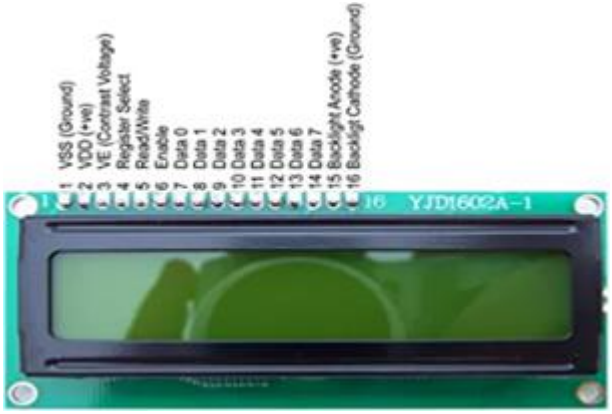
6. LCD 16*2 Display-



A liquid crystal display (LCD) is a widely used flat-panel technology that is employed for the purpose of displaying images and information. Its popularity has grown significantly, and it can be found in a range of devices such as televisions, computer monitors, smartphones, and tablets. The adoption of LCDs can be attributed to their various advantages, including their slim profile, low power consumption, and exceptional image quality

7. Buzzer-

A buzzer is an electronic device used to generate audible signals or alerts. It is widely employed in various applications where the need for an audible indication is necessary. Buzzer devices consist of either a piezoelectric element or an electromechanical component, both of which convert electrical energy into sound waves. The primary function of a buzzer is to provide an audible warning or notification in diverse situations.

ADVANTAGES

- Send alert message on Iot application.
- Save all the data cloud system
- No Need of long time period surveillance.
- It Requires Less Human Intervention.

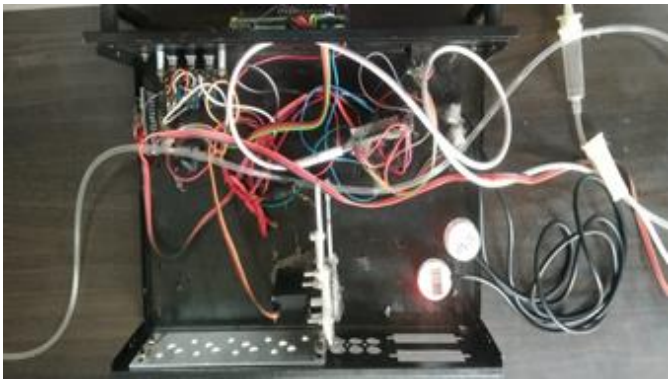
APPLICATION

- It is use in hospital for medical purposes.

VI. RESULTS

The saline solution level is detected by the Non-Contact Liquid Level Sensor in the first scenario. When the saline level reaches low level, the buzzer emits a small sound, to alert the nurse that the saline is at low level. In the second scenario, when the saline level reaches the critical level, the Non-Contact Liquid Level Sensor detects it and, at the same time, the servo motor attached to the grabber begins to rotate, pinching the intravenous saline tube and causing the saline flow to stop, while a buzzer makes sound to alert the nurse that the saline is at critical level. The first saline bottle has been placed in the container box. When the saline is at critical level, the grabber's servo motor will start and clamp the intravenous tubing while a buzzer will sound. Following that, the message will be transmitted to the IOT application.

Hardware and Software Result



VII. CONCLUSION

The purposed framework for IOT Based Saline Controlling System make use of Arduino and Node-MCU. The system is use to monitor the saline level and it automatically control the saline flow to the patient when the reaches below the critical level. The purposed system is suitable for use in hospitals via computer or smartphone, doctors or nurses can screen the saline level can be accessed at any time from any place. The whole system is automated, it requires fewer human interventions. It is useful for nurses especially at the hospitals where many patients are allotted to 2-3 nurses.

VIII. FUTURE SCOPE

In future, it can be implemented with more features using IoT, like

1. It can send the wireless messages to doctors and nurses about the saline droplet rate.
2. It can also include the smart health system, which gives the information about body temperature, blood pressure, heart rate and also the pulse rate. This helps in deciding whether the patient requires another saline bottle or not.

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