SMART SALINE BOTTLE FOR HEALTHCARE USING IOT

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INTRODUCTION

- Healthcare industry is becoming expensive day by day, but the number of diseases has also increased.

- IoT associated gadgets are procuring huge potential nowadays because it is abating the human effort for a certain task which is repetitive.

- Low-cost IoT products make the system less expensive for patients rather than appointing more staff for tedious work.

- Healthcare Industry is becoming costlier day by day but the number of patients and diseases is still increasing which causes the overload on the staff as well as abates quality of treatment given nurse station.

- Blynk mobile application is very user-friendly for hospital staff to monitor many patients simultaneously

Abstract

▶ The Healthcare sector has progressed by quantum leaps in the past few years. Hence, it is evident that this growth of the industry should be managed properly by all the hospital staff.

▶ This causes very little attention to patient monitoring level of the saline bottle and as well as close the saline tube comprising of air bubble to avoid air embolism when the bottle is about to get empty.

▶ The Healthcare sector with innovative techniques has brought easiness in day to day life. Automation of the saline system is the need of hospitals.

▶ Saline is a basic thing used in every hospital to deliver drugs to the patient to cure them. Whenever saline is fed to the patient there is always a requirement of nurse and caretaker to monitor it.

▶ Due to inattentiveness of nurses towards saline or lack of patient to nurse ratio in the hospital causing aeroembolism which may lead to heart attack, stroke or respiratory failure.

▶ Blynk is an IoT platform that is with software, and other technologies to connect and exchange data with other devices and systems over the Internet.

▶ Whenever the level of the saline reaches the pre-defined critical level, then the nurses, doctors will be alerted through the message and an indicator will glow to alert the nurse station as well as clamps the saline bottle without any further delay.

▶ So, that fatal accidents through air embolism and further complication can be prevented.
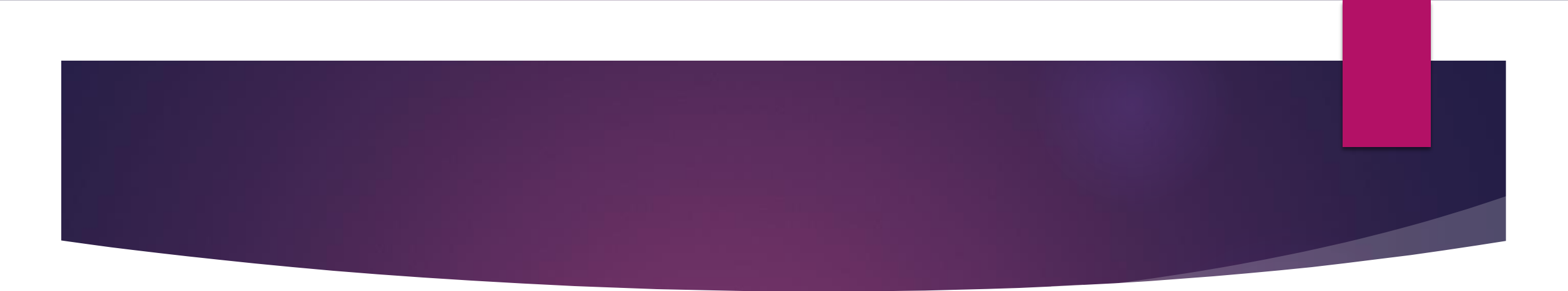
PROPOSED SYSTEM

▶ The proposed system eliminates continuous visual monitoring of the patient by nurses from distinct places. The entire project works on the principle of Beer-lamberts law. In figure 1, the amount of transmitted light from the LED to the photodiode depends upon the electrolyte in the saline bottle. The voltage across the photodiode is monitored every millisecond. Threshold levels of voltage are calibrated on Arduino Uno by programming. Blynk application receives and sends data through mobile. The change in threshold level activates the alarm at the nurse station at the 100 ml mark. However, at the 50 ml mark, a message will be sent to the nurse station as well as a saline tube is clamped through a solenoid plunger to prevent it from air embolism

PROPOSED ARCHITECTURE DIAGRAM:
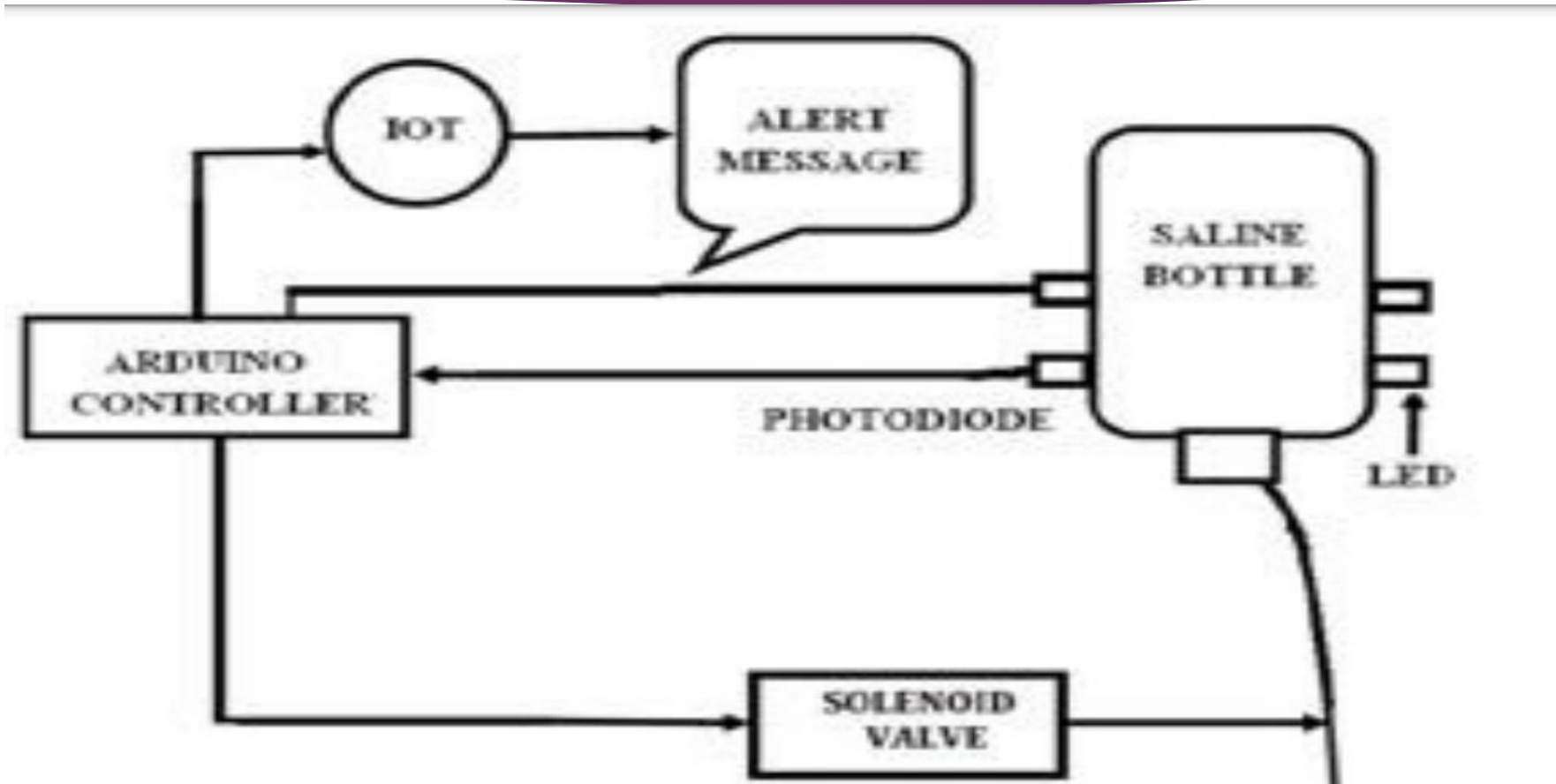
IMPLEMENTATION:

▶ Light Emitting Diode(LED): Light Emitting Diode are used as a light source to pass light between saline bottle, Positioned at the critical level above saline bottle to emit light toward photodiode. In a system, we used blue colour LED of 450 nm, which gave optimum voltage across photodiode.

▶ BPW34: BPW34 is a photodiode made up of p-n junction of semiconductor which works in reverse bias mode (positive voltage supply to cathode & negative voltage supply to anode). Photodiode use to sense light falling on diode and convert light into electrical signals. Photodiodes are placed on a saline bottle opposite the LED.

▶ Arduino Uno: Arduino Uno is an open-source microcontroller board that uses an Atmega328 microprocessor. Arduino Uno used to read sensors electrical signals like photodiode, Wi-Fi module, etc., performs logical operations, And gives a signal as output to connected devices to perform a certain task as the motor rotates with desire speed.

▶ Arduino IDE: Arduino Integrated Development Environment (IDE) is a software platform used to write code for microcontroller boards like Arduino or node MCU which has libraries for particular applications, a serial monitor to show output on a computer screen.

- Solenoid Plunger: Solenoid plunger is a mechanical device that uses electric current to provide linear motion of the plunger. When electric current flows from coil magnetic field forms and the back and forth motion of the plunger happens. In the system, the plunger uses to clamp the saline tube of the bottle, when the saline goes below the critical level

- SL100 transistors: SL100 is an NPN transistor used in many electronic devices in the application of switch, amplifying devices. In a system used as a switch application.

- Bluetooth module (HC-05): Bluetooth module is used to connect the system wirelessly with two-way (Full duplex)communication in applications like Bluetooth connection between two devices. It uses a 5-volt power supply and communicates with help of serial communication (USART) at 9600 baud.

- Blynk: Blynk is an application used for IoT applications, which controls IoT-enabled devices remotely. It collects data from the sensor store it in the blynk cloud & gives access to the user to control the device remotely.

- Power supply: power supply unit provides a 12 volt 1 ampere A.C. supply to provide optimum current and voltage to the system.

- Wires: Wires are the basic cylindrical structure to use connect devices with an electrical signal.

RESULTS

- This project uses the method of optical sensing mechanism, there are different methods of sensing the saline level such as load cell, ultrasound , IR and capacitive based sensors.

- But the advantage of an optical-based system is its cost-effectiveness and very less hardware requirement. can sense and respond to the low saline level by an alert to the nurse station.

- In case if the nurse still does not arrive in time, when the saline bottle is about to be empty this project clamps the saline through the solenoid plunger which additional safety backup gives to this system.

- The device performance and accuracy were tested for the quantitative determination of saline levels.

- When light is incident upon photodiode sensor it sends a signal to Arduino and gives the output as values of Red, Blue, or Green colour through LED according to the alert message.

- The values of output voltages across photodiode against the saline level of the bottle in the sample were used for analysis.

- Out of these three levels each level has a different analog input voltage across photodiode.