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# Saline Level Indicator

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***Abstract:*** *This papers main aim would be to put forward the implementation of saline level indicator in the saline bottle using Internet of Things (IOT) as the platform. The proposed system comprises of IR sensors which is used to detect/ monitor some aspects in its surrounding. The IR sensor will act as a level sensor for monitoring the critical level of the saline in the saline bottle. Whenever the level of saline reaches a pre-defined critical level; the RF based automatic device alert and notification are sent to the hospital staff. The alert message will be sent through the use of internet to the nurses and doctors who are in charge for the patients. Along with that an alarm buzzer will also start ringing. The objective here is to present the design and implementation of saline indicator. This proposed system can be utilized efficiently in homes as well as in hospitals.*

***Keywords:*** *Arduino controller, Buzzer, DC Motor, Spring, IOT, IR Sensor*

## I. Introduction

These days technology is growing at a very high speed. Automation of everything is the need of the hour. Human lives have become much more dependent on electronic devices. Today's world requires sophisticated control in its different electronic gadgets. The basic aim of saline level indicator is to ease human lives. Automation of the surrounding environment of a modern human being helps to increase the work efficiency and saves time. Saline is fed when the patient's body is dehydrated. A constant monitoring of the saline level in the bottle is required. If the saline in the bottle is fully consumed, and the bottle is not replaced immediately then the pressure difference between the patient's blood pressure and the empty saline bottle causes an outward rush of blood into the saline. Theses situation can pose as a serious threat to the patient's well-being. Thus the automation device is suggested in this paper in order to avoid any inconvenience that may be caused to the patient's in case of lacking of constant monitoring by patient's relatives or hospital employees.

## II. Literature Review

Saline is a key ingredient as a part of intravenous solution that delivers water to patients in hospitals and clinics. Professional nurses, doctors or the care takers of the patient is responsible for the patient taking intravenous solutions. There is no such automated system that helps to detect the critical level of saline. More over this paper also helps in controlling the reverse flow of blood into the saline and is not restricted to just informing the care takers of the critical level.

## III. Design Overview

Every automation system generally consist of two parts, transmitter and receiver part. In this proposed system there are two IR Sensor used to transmit and receive the voltage level changes when intravenous fluid level is below certain limit. The system also consist of Arduino micro-controller which will be programmed in order to send alarm buzzer to nurses and doctors to indicate the critical level of saline.

## IV. System Requirements

### 4.1 IR SENSORS

It is used to sense the voltage level changes when the saline in the bottle reaches a crtical level. It will be positioned at the critical level of the saline bottle that is near the neck of the bottle.

### 4.2 ARDUINO MICRO-CONTROLLER

Arduino is a platform which is both hardware and software, providing microcontroller and IDE for programming. Arduino takes some input such as touch of a button, a light signal, etc and produces desired output. To get the desired output the arduino micro-controller needs to be programmed. Here the arduino plays the main role of setting the alarm buzzer ON.

**4.3 DC MOTOR**
It is a device that helps to convert electrical energy into mechanical energy. Once the energy is converted into mechanical energy, it can prove helpful in moving the spring forward and backward.

**4.4 BUZZER**
It is an audio signaling device. It helps to notify the nurses, caretakers and doctors about the saline level.

**4.5 SPRING**
It is used to store mechanical energy. It helps to stop the reverse flow of blood in the tube.

**4.6 POWER SUPPLY**
The power supply consist of battery which will provide units of 5 voltage.

## V. Diagramatic Representation Of System

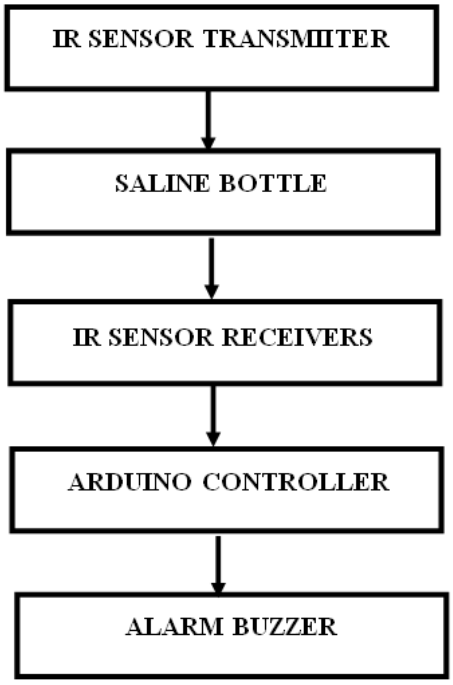


**Fig. 1** Flow chart demonstrating the work flow of proposed automated monitoring system

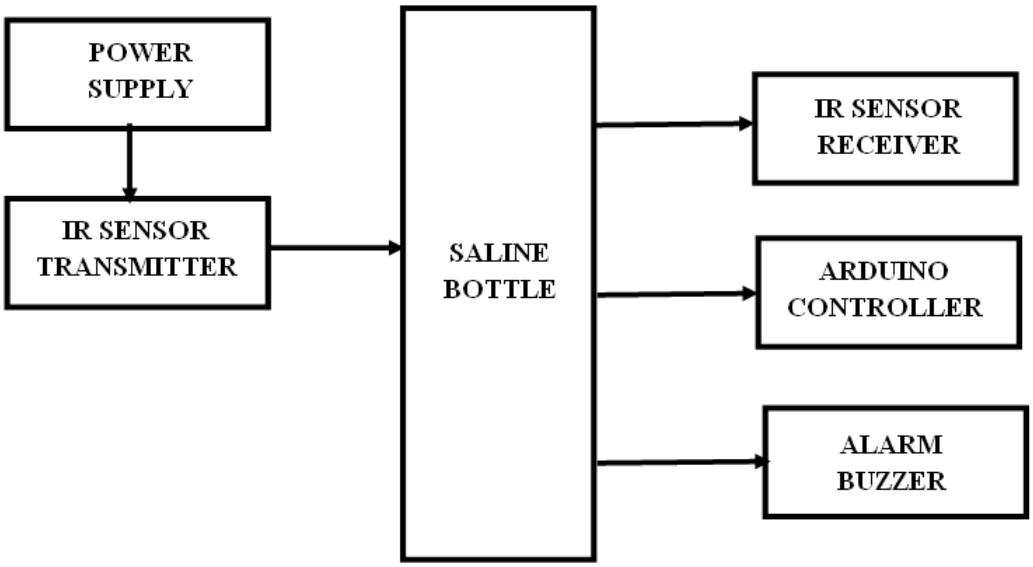


**Fig. 2** Architectural overview of the system

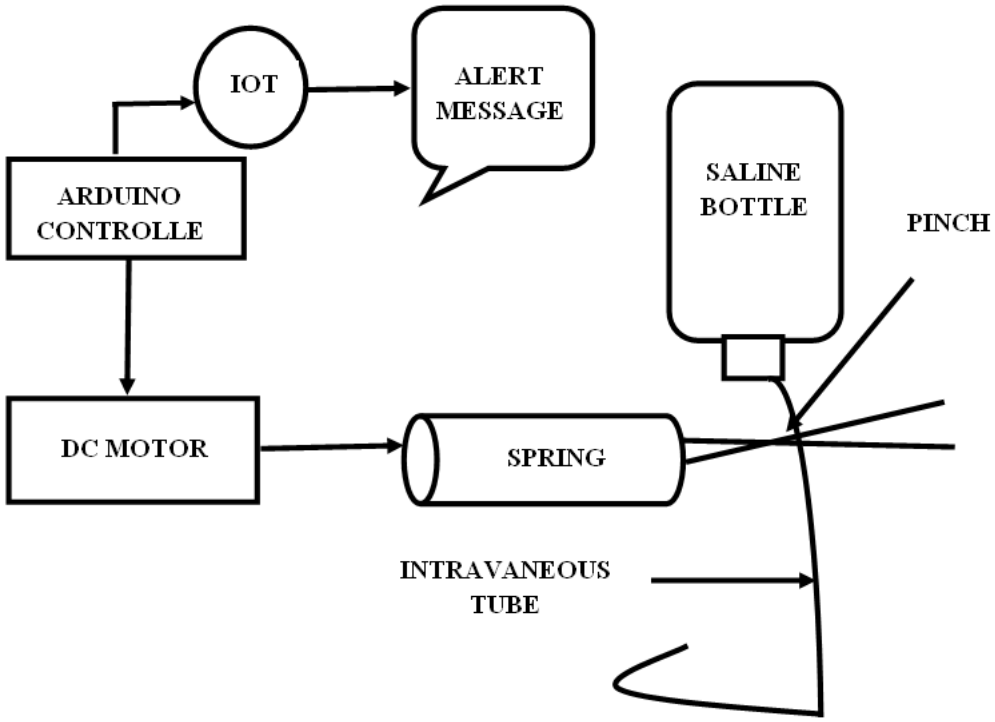


**Fig. 3** Mechanism for stopping reverse flow of flow of blood

## VI. System Working

Generally saline bottle contains 500ml solution. In general the critical limit is set as 70ml. As soon as the saline level reaches the critical limit, the voltage changes and the IR sensor senses it. Now the IR Transmitter passes this voltage change signal to IR receiver. IR receiver signals the arduino micro-controller about this condition. The arduino micro-controller sets the alarm buzzer ON by passing Radio Frequency to the buzzer (shown in Fig. 2). At the same time alert messages are sent to the nurses and doctors via IOT. A time limit is set for the buzzer to ring the alarm. Within this time limit if the patient is still not attended and the saline in consumed fully, then the DC Motor comes into play (as shown in Fig.3). Now as per the instructions given by the arduino micro-controller to the DC Motor, the spring will be stretched and the clamp will move forward. As the clamp moves forward the intravenous tube will be pinched will be avoid the reverse flow of blood in the tube.

Algorithm For Working Of System:

1. Get 5 voltage power supply from battery.
2. Pass 5 voltage to IR sensor.
3. if (volume_of_solution ==70 ml)
    - 3.1 Drop Voltage
    - 3.2 Ring buzzer for 5 minutes
    - 3.3 Send alert message to nurse
4. else if (volume_of_solution < 70 ml OR time>5 minutes)
    - 4.1 Increase spund of buzzer
    - 4.2 Send alert message to Doctor.

## VII. Conclusion

This proposed system will reduce the manual effort. It requires very less human intervention as the system is completely automated. The system is very advantageous at night time since there will not be any need for continuous monitoring of saline level by humans. This system can be used in home as well, at an affordable cost because the automated system does not involve any recursive costing components.

This system helps to reduce operational cost as well. Patients can be monitored in real time without the need for frequent visits by the doctor or nurses. Since the patients are monitored on continuous basis, the chances of reverse blood flow is controlled and the patient's life is not at stake because of any carelessness. This eventually helps reduce human errors. By implementing such a system, patients will also be rest assured, which inturn will help them get well more quickly.

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