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IoT Based Smart Saline Monitoring and Automatic Alert System

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ABSTRACT: During recent years, due to the technological advancements many sophisticated techniques have been evolved for assuring fast recovery of the patients in hospitals .Need for good patient care in hospitals, assessment and management of fluid and electrolyte is the most fundamental thing required. Almost all hospitals and nurses are responsible for monitoring the electrolyte's bottle level. But unfortunately most of the time, the observer may forget to change the bottle at the correct time due to their busy schedule .To overcome this critical situation, an IoT based automatic alerting and indicating device is proposed where the sensor is used as a weight sensor. It is based on the principle that the sensor output changes when fluid weight is below a certain limit. When Fluid weight is low, will alerts the observer through the display or/and mobile phone at the control room indicates the room number of the patient for quick recovery Hospital uses simple electrolytes bottles with no indication, it may create a problem to patient because the reverse flow will start, blood start to flow from body towards bottle.Such monitoring system can be useful in small, medium and large size of hospitals and also it useful during home care. If such a monitoring system is built, it will decrease the chances of a patient's hazards and increase the accuracy of health care in hospitals. Such data can also be sent to nurses and/or doctor`s mobile and they can start or stop the fluid and also monitor fluid condition. Hospital staff, the constant need to manually monitor the level of bottles is avoided. This is of high advantage to the patients especially during night times. This system also avoids the fatal risk of air bubbles entering the patient's bloodstream, which is a serious threat as air bubbles in blood can cause immediate death. Such a device will create assurity of non-harm condition to patients.

KEYWORDS: IOT(internet of things), GSM(global system for mobile), Arduino,Weighing mission,Saline

I.INTRODUCTION

Saline solution is used in the hospital whenever some energy needs to be supplied to the patient in the form of liquid. But there are some issues with this saline injection process. As there is more quantity to be injected it takes time to complete this process. In this injection process, continuous monitoring is required, where it is difficult in many hospitals. The monitoring staff may forget about the patient. This forgetting may result in serious danger to the patient. When the saline bottle is about to empty the blood from the body of the patient flows back into the bottle. This flowing back of blood causes serious damage to the patient. The patient might be in a situation of unable to check his own saline bottle level.

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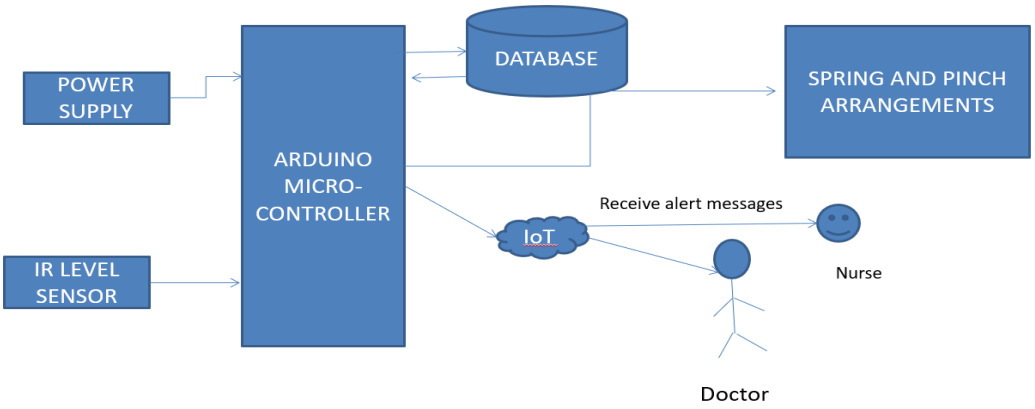

Fig. 1. Block diagram of smart saline using IOT

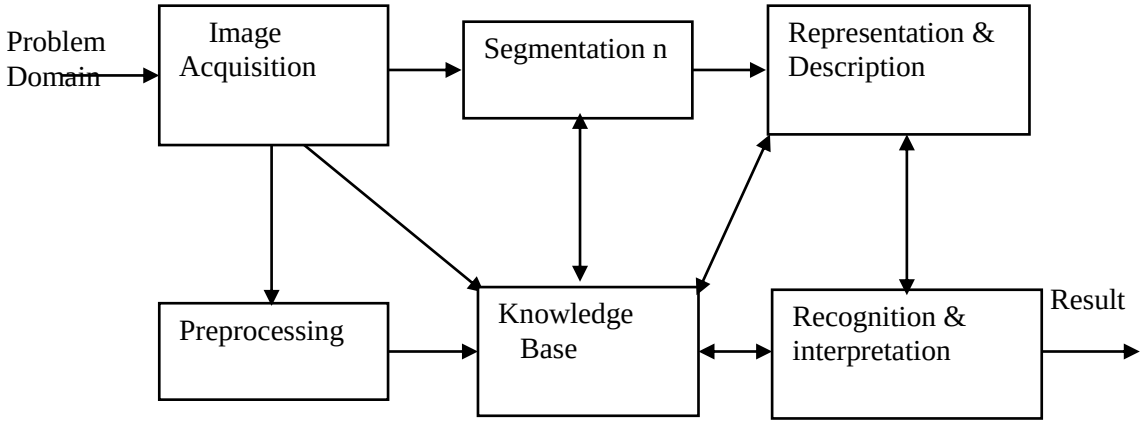

FIG 1.2 BLOCK DIAGRAM OF FUNDAMENTAL SEQUENCE INVOLVED IN AN IMAGE PROCESSING SYSTEM

II.LITERATURE SURVEY

By using a rubber band mechanism in which rubbers are used and various software as well as hardware is used. The rubber band mechanism helps to easily detect the levels of saline water and the LED lights of the IR sensor glows accurately at each level of the saline bottle. Firstly while the saline bottle is feeded to the patient, the starting level will be completely full so the obstacle will cut the light rays of first IR sensor and the first LED of the IR sensor will be glown and the automatic alert message of partially filled bottle will be sent to the nurse [1]. This paper highlights RF based automatic alerting and indicating devices where IR sensor is used as a level sensor.IR sensor output voltage level changes when intravenous fluid level is below a certain limit. The comparator continuously compares the IR output with a predefined threshold. When the transceiver output is negative then the Arduino controller identifies that the fluid level is too low and it alerts the observer by buzzer and LCD at the control room indicating the room number of the patient for quick recovery [2]. The critical level which is sensed by the IR sensors. This sensed output is sent to the microcontroller which scans the database for retrieving the content information and buzzer starts ringing to alert the nurses and doctors in the hospitals. A time limit will be set for the ringing of the buzzer [3]. The Implemented framework comprises different sensors and devices and they are interconnected by means of remote correspondence modules. The sensor data has been sent 12 and received from nurse or doctor end utilizing Internet connectivity which was enabled in the Node MCU module-an open source IoT plat-form. This system is used to observe the condition of patients. The data can be viewed on the Thing Speak app or any web page. The nurse can observe all the levels, or the range that is performed [4]. Generally saline bottles contain 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 the IR receiver. IR receiver signals the arduino microcontroller about

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this condition. The arduino microcontroller sets the alarm buzzer ON by passing Radio Frequency to the buzzer [5]..

III.EXISTING SYSTEM

In the existing scenario of a health care management system, Arduino microcontroller is used for the processing and programming. To check the critical level of saline they are using IR sensors. The IR sensor was also sensing the saline completion status.
In the previous system clamp is attached with the spring to pinch the saline pipe to stop the reverse flow of the liquid. There was an LCD in the control room which showed the number of patient rooms for the quick recovery**.**

Disadvantages of existing system:

- Unavailability of doctors,nurses due to large number of patients.
- Time consuming.

IV.PROPOSED SYSTEM

In proposed system saline is automatically monitored by using the Internet of Things. We are using most of the hardware devices which are connected to Arduino Nano microcontrollers. The hardware devices include - Power Supply, NRF Module, Load Sensor, HX711, EEPROM, LED, Buzzer etc. All these devices fixed into Arduino to monitor saline. Here we are using a load cell, is used to measure the weight of saline which generates analog signals that can be transmitted to HX711. HX711 receives analog signals from the load cell and it amplifies those signals and transfers them to the microcontroller. NRF Module is used when the level of saline goes below threshold value then this value is sent over this module to the receiver section. When power goes off at that time, the last load cell value of saline is stored in EEPROM. An Arduino Nano micro controller is attached to the saline stand so that it can easily monitor the level of saline. Buzzer and LED these are output devices which, depending upon the data comes from NRF Module i.e. when level of saline goes below threshold then buzzer and LED will be generated. So, all this information will be stored on the local server of a particular hospital. This information will be displayed on LCD/Android App by fetching all information from the server. It also informs nurses or doctors via generating alert messages on application.

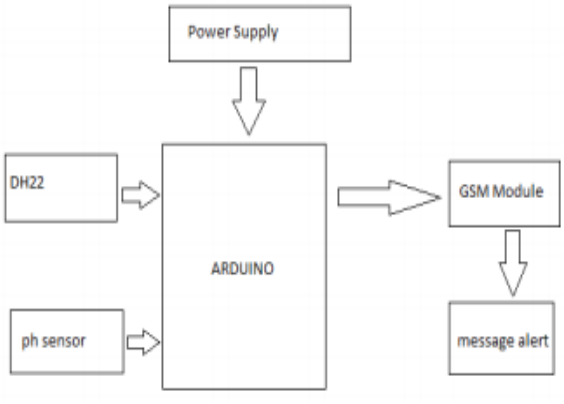

Fig. 2. Block diagram of proposed system

Advantages of proposed system:

- Everytime is not necessary to watch a patient who is injected with a Saline bottle.
- Continuous monitoring of the bottle is not required.
- It is very useful at night time.
- It is a cost effective method.
- Patient life risk is reduced.

V.FUNCTIONALITY

According to this invention, there is. An improved saline level monitoring system for patients, saline bottles Figure 1 illustrates that the patient is lying on the bed due to some illness and an improved saline level monitoring system is attached to the saline bottle. Once the saline solution reaches a certain level the level sensor will activate signals

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to the system to buzz an alarm and prevent the reverse blood flow of the patient and reduce the risk to patients life. Based on the input sensed by the level sensor, the switch will be ON or OFF and the saline flow will be stopped. In normal cases, the switch will be ON indicating, there is enough saline solution in the bottle. When the saline solution reaches at certain level, the level sensor will generate signals to the system to stops the saline flow and buzz the alarm which will indicate the caretaker/doctor/nurses that bottle of saline is about to finish, so that the bottle has to be removed or replaced with the new one.

VI. WORKING

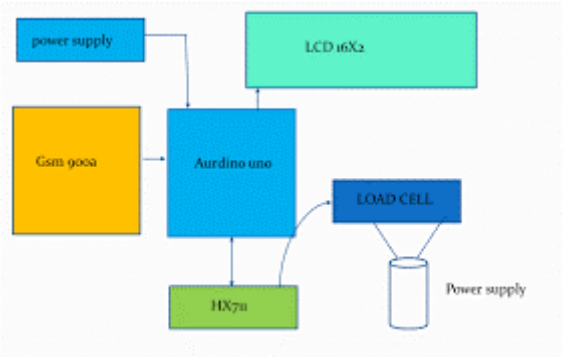
In the present patent, an improved feature has been provided to automatic saline level monitoring, manual-less control!ing & alarming system to take care of hospitalized patients. Basically it works on the principle of level of saline liquid in the bottle. To eliminate human error of monitoring it is connected through Wi-Fi based on-off & alarming systems. The following steps will help in it:

STEP 1: Inbuilt liquid level sensor is provided in bottle. It will provide feedback to perform the next working operation as per the level of liquid. Thushere there is no requirement of human beings to monitor the level of saline liquid.

STEP 2: After getting the feedback from the level sensor of saline as liquid is going to finish, the on-off switch will immediately stop the flow of saline liquid. Thus there is no requirement of human beings & also totally eliminates the human errors and also saves patients life by stopping the reverse blood flow in the bottle.

STEP 3: Moreover, the on-off switch will provide a signal to buzz the alarm through the Wi-Fi connectivity.

STEP 4: It works day & night by 24 hrs. So at any time after getting the alarm one can replace the saline bottle or stop the procedure of the next saline. Thus improved saline level monitoring system full-fills the main purpose of saline level monitoring system innovation through above stated working steps.



Libraries used in sketch:

- The LiquidCrystal library allows an Arduino board to control LiquidCrystal displays (LCDs) based on the Hitachi HD44780 (or a compatible) chipset, which is found on most text-based LCDs. The library works in either 4- or 8-bit mode. #include<LiquidCrystal.h>
- The SoftwareSerial library has been developed to allow serial communication to take place on the other digital pins of your boards, using software to replicate the functionality of the hardwired RX and TX lines. The virtual RX pin is set up to listen for anything coming in via the main serial line, and to then echo that data out the

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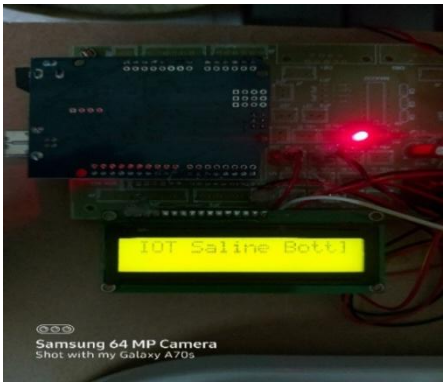
virtual TX line. #include<SoftwareSerial.h>

- The GSM library enables an Arduino board to do most of the operations you can do with a GSM phone: place and receive voice calls, send and receive SMS, and connect to the internet over a GPRS network. The GSM shield has a modem that transfers data from a serial port to the GSM network. The modem executes operations via a series of AT commands. The library abstracts low level communications between the modem and SIM card. It relies on the Software Serial library for communication between the modem and Arduino. #include<GSM.h>

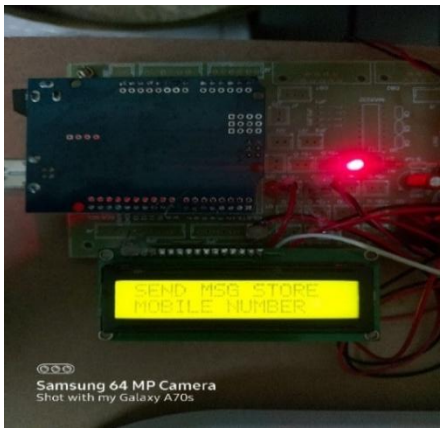
Test case-1:

In this test case,saline bottle status will be checked weather it is full or not.



Test case-2:

In this test case,Arduino system requests mobile number of the user to send a message.



Test Case-3:

In this test case, saline bottle liquid status will be displayed.

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VII. CONCLUSION

Through this project we are able to come up with a efficient solution in the medical field. To conclude, the entire project is about
alerting the medical staff based upon the level of Saline in the bottle. If the Saline level reaches threshold the system automatically
sends the message to the staff. Thus the staff can react and take care of the patient condition.

VIII. FUTURE ENHANCEMENT

This project can also be added to smart card attendance system so that the controller gets the detail of absentee of a faculty and also can send message to doctor about the absence of faculty and alert another faculty to take position of that absented faculty. The flow control mechanism proposed can be modified and used in other fields such as chemical mixing. The devices used in our project can be replaced by any alternative or better mechanism can be used for pressing and the proposed work can be interfaced with keypad for better results. In future, the system can be extended to a distributed wireless network system. The flow control mechanism proposed can be modified and used in other various fields. Furthermore, with the development of embedded hardware, more complex embedded coding can be done. The sending and receiving speed of a security alert message is high, so this can be used to give more kinds of applications in the future.

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