SALINE LEVEL MONITORING SYSTEM

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Abstract : As the world's population is increasing, the need for health prevention is also increasing day by day.. The major and fundamental requirement of hospitalized patients is that every patient should be provided with better treatment and observation and should be supplied with the correct amount of vital nutrition at the correct time. Among the various treatments, saline therapy is the most important treatment that many patients receive from hospitals. The bottle of saline is fed to the patients to treat dehydration and thus improve their health. In hospitals, whenever saline is fed to patients, the patient needs to be continuously administered by a nurse or a caretaker. But unfortunately, some critical situations occur and due to the negligence towards the saline completion and busy schedules of the responsible doctors, nurses, or caretakers, a huge number of patients are being harmed. Hence, to prevent the patient's health and to provide maximum health safety invented a system called saline level monitoring system. In this system, an IOT-based automatic indicating device where a load sensor is used as a level sensor. The sensor's output voltage level changes when the intravenous fluid level is below a certain limit. When the saline drops down to a certain low level then an alert is sent to the nurses that the saline fed to the patient is over with all the details of the patient. The difference in weight is used to sense the amount of saline present in the bottle and hence is used to send a notification to the attendant or the nurse's room through GSM or the buzzer will be alarmed by far when its in the worst condition of liquid level in below average level.

Keywords— automatic indicating device , load sensor , GSM , ARDUINO ,Buzzer.

I. INTRODUCTION

Whenever saline is fed to any patient, he/she needs to be constantly monitored by a nurse or any relatives. Most often due to negligence, inattentiveness, a busy schedule, and a greater number of patients, the nurse may forget to change the saline bottle as soon as it is consumed. Therefore, there is a need of developing a saline-level monitoring system that will reduce the patient's dependency on the nurses or caretakers to some extent. In this system, an IOT-based automatic indicating device where a load sensor is used as a level sensor. The sensor's output voltage level changes when the intravenous fluid level is below a certain limit. When the saline drops down to a certain low level then an alert is sent to the nurses that the saline fed to the patient is over with all the details of the patient. The difference in weight is used to sense the amount of saline present in the bottle and hence is used to send a notification to the attendant or the nurse's room.

II. RELATED WORK

A. **Automatic and low cost saline level monitoring system using wireless bluetooth module and cc2500 trans receiver**"
Traditional methods used for health care are becoming obsolete due to increase in population. Current health care system requires manual care takers and their heavy duties which is very time consuming job. Innovative health monitoring systems are required with less human intervention which will be available at low cost in rural as well as urban areas. Engineering technologies are getting coupled with medical field to solve this problem. Sophisticated health monitoring systems are getting developed with the help of electronic components such as sensors, PLC ,micro controllers etc. with easy interfacing. This paper mainly focuses on providing advanced saline level monitoring system. The idea is to provide cost effective, reliable and automatic saline flow monitoring system which can be easily implemented in any hospital and can be easy for doctors as well as nurses to monitor the saline flow from a distance. The proposed system eliminates continuous on sight monitoring of patient by nurses or doctors. Due to the use of microcontroller ATMEGA 328, wireless module CC2500, Bluetooth module and IR sensors, the system can be made available at very low Advanced Automatic Saline Level Detection & Patient Monitoring System. The same circuit can be reused for another saline bottle giving only one time investment.

B. "Automatic Saline Level Monitoring System Using Microcontroller ATMEGA 328"

This paper proposes an automatic, low cost saline level measurement system using microcontroller ATMEGA 328.The main building blocks of the proposed system are microcontroller ATMEGA 328, Bluetooth module and IR sensors. The system contains two LEDs. The status of the saline can be given in two forms that are normal status and warning status. When the saline level is normal, then green LED blinks and when the saline level is below the critical value then red LED will blink. When red LED blinks then buzzer starts ringing and nurse will get notification through mobile with the help of Bluetooth module. At present, there is no such valid system for saline level monitoring. Proposed system reduces efforts of nurses and it is very cost effective as the same circuit which is used for the saline bottle can be reused for another bottle. It can also be easily implemented in rural hospitals.

C. ,"Smart Saline Level Indicator cum Controller".

Most often due to negligence, inattentiveness and more number of patient's, the saline is totally consumed .Initially, this might be inferred as a small or casual phenomenon. But the consequences are often fatal. Just after the saline finishes, blood rushes back to the saline bottle due to difference in blood pressure and pressure in the empty bottle. The device aims at trouble-shooting the above mentioned problem effectively .By means of this the nurse can monitor the amount of saline even in the control room. When the level of saline dips below a certain level a red LED would glow along with a buzzer sound to alert the nurse. If due to some reason the nurse is still unable to attend the patient immediately then arrangement is made to squeeze the saline pipe till it is fully flattened so that the reverse flow of blood into the saline bottle is discontinued. This process is highlighted by a blue LED .Another important feature is added to the device in which by means of a backup battery, the device can also operate for some time even when there is power failure.

III. PROPOSED SYSTEM

Using our proposed system, the nurse can monitor the amount of saline even in the control room using an application i.e. IOT app. We have used a load sensor to determine the status of the liquid in the bottle whether it is normal or warning status. The output obtained from the sensor is processed to check whether the saline bottle is empty or not. When the level of saline dips below a certain level, a red LED will glow. The HX711 sensor with load cell is used to measure the saline level. The content of saline in a normal saline bag is 500 ml. The saline bag is replaced by another when the saline falls below 50 to 100 ml. The critical level of saline is set to 70 ml which is between 50 to 100 ml so the nurse can change the saline bag when the liquid reaches the critical point.

The system proposed is electrolyte independent and can be used with all sizes of electrolyte bottles. The system is electrically powered and a voltage of 9V is required to power the system. As soon as the electrolyte bottle is hung on the stand and attached to the sensor via a specially designed 3-d printed hook, an initial weight reading of the bottle is recorded in the database designed by the microcontroller. The load sensor senses the weight at regular intervals. The same is updated in the database regularly. As soon as the real value of the load reaches 30% of its initial value recorded in the database, a notification is sent to the respective authorities nurses/control room with the details of the patient.

The sensor keeps reading the weight of the bottle and the red LED starts blinking as soon as the weight of the bottle further decreases to 30 percent of its initial weight. The buzzer will be alarmed by far when its in the worst condition of liquid level in below average level.

A. Software and Hardware Requirements

1) Software Requirements:

- Embedded c
- ARDUINO IDE Compiler

2) Hardware Requirements:

- ARDUINO NANO
- 16X2 LCD display
- Power supply
- Load cell
- Hx711
- LCD
- Buzzer
- GSM

BLOCK DIAGRAM :

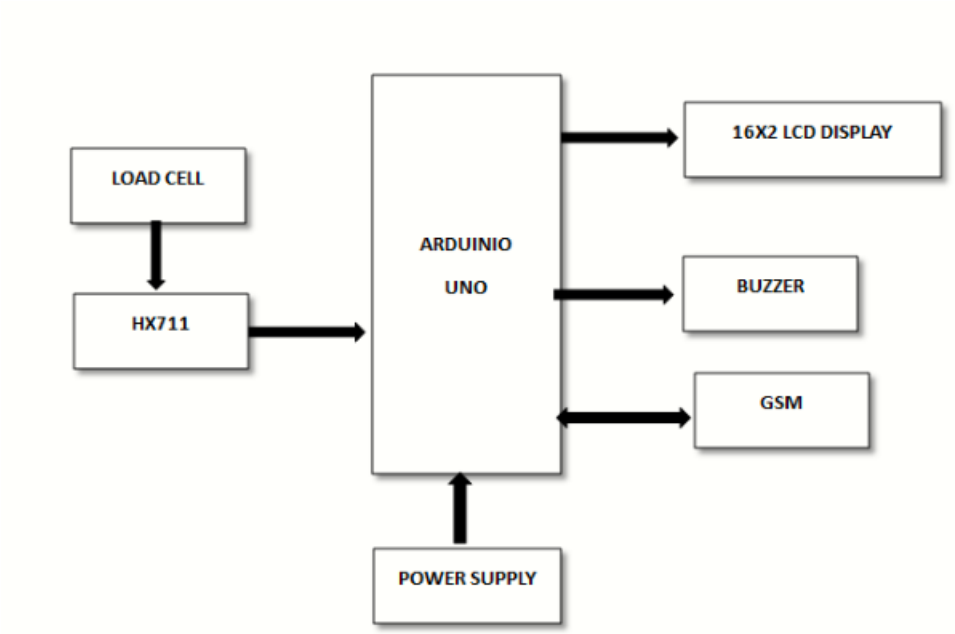


FIG 1: BLOCK DIAGRAM

B. System design

Arduino Microcontroller:

Arduino microcontroller is an open source microcontroller utilized in building advanced gadgets and intuitive articles that controls and faculties objects in physical world. It is utilized as a handling and programming unit for sending guidelines to the things

Buzzer:

Buzzer is an audio signalling device. It alerts the nurses as soon as the bottle gets emptied.

LOAD CELL:

A load cell is a sensor or a transducer that converts a load or force acting on it into an electronic signal. This electronic signal can be a voltage change, current change or frequency change depending on the type of load cell and circuitry used. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. The electrical signal output is typically in the order of a few milli volts and requires amplification by an instrumentation amplifier before it can be used. The output of the transducer can be scaled to calculate the force applied to the transducer.

.LOADCELL AMPLIFIER :

The Load Cell Amplifier is a small breakout board for the HX711 IC that allows you to easily read load cells to measure weight . By connecting the amplifier to your microcontroller you will be able to read the changes in the resistance of the load cell, and with some calibration you'll be able to get very accurate weight measurements. This can be handy for creating your own industrial scale, process control or simple presence detection.

GSM MODEM :

Global system for mobile communications (GSM) is the world's most popular for standard Mobile telephony systems.

Power supply:

A power supply is used to provide power to the load cell, Arduino, and GSM module.

The proposed system operates as follows:

The load cell is attached to the bottom of the saline bottle, and the output of the load cell is connected to the Arduino.

The Arduino is programmed to process the load cell data and convert it into the volume of the saline solution using a calibration factor. The Arduino is also programmed to send alerts to the GSM module via a serial communication protocol when the saline levels fall below a predetermined threshold.

The GSM module is connected to the Arduino and is programmed to send alerts to healthcare staff via SMS when the saline levels fall below the predetermined threshold.

The power supply is connected to the load cell, Arduino, and GSM module to provide power to the system.

When the saline levels fall below the predetermined threshold, the Arduino sends an alert to the GSM module, which in turn sends an SMS alert to healthcare staff.

Healthcare staff can then take appropriate action to replace the saline bottle and ensure that patients receive timely and appropriate medical care.

Overall, the proposed system offers a simple and effective solution for monitoring saline bottle levels in medical settings, and can help healthcare staff to ensure that patients receive the appropriate care they need

RESULTS AND DISCUSSION :

Hardware module:

Fig 1.2

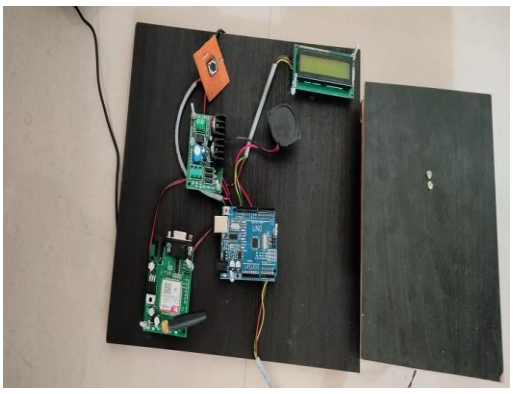
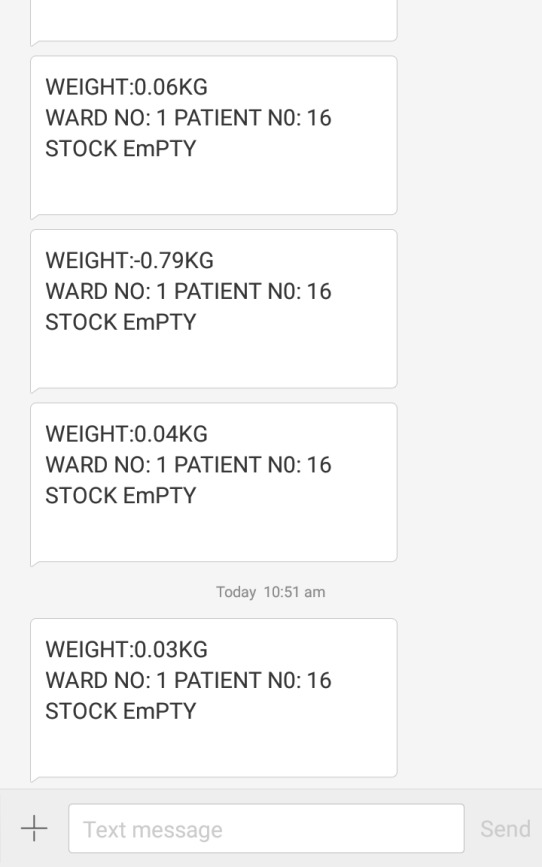


Fig1. 3



RESULTS: FIG 1.4 Final result

IV.CONCLUSIONS :

Smart Saline level indicator for patient safety is a low cost, low power consuming and highly efficient device that can be used for monitoring the amount of saline present in the bottle. It is often noted that there is someone present constantly to monitor the patient fed to a saline as a slight carelessness can cause fatal accidents. The device is a fully automated the process with requirement of almost no supervision externally. This helps to get rid of human errors and also provides a very reliable and highly efficient device for medical use. The main highlight of the device is its cost-effectiveness without compromising with performance. In the long run we get guaranteed patient safety and minimum human interference. With the large magnitude of research and development carried out in the embedded system market it's only apt that the ever growing medical sector gets a technology boost. This device aims to bring about a revolution in the common medical sector which is sadly very primitive and risky. Considering that there is a life and death involved in majority of the cases it's high time the saline level indicator for patient safety is implemented on a large scale basis.

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