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IOT BASED SMART SALINE BOTTLE FOR HEALTH CARE

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Abstract - *During recent years, due to the technological advancements many sophisticated techniques has 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. All most in all hospital, and nurse is responsible for monitoring the electrolyte's bottle level. But unfortunately most of the time, the observer may forget to change the bottle at correct time due to their busy schedule .To overcome this critical situation, a IoT based automatic alerting and indicating device is proposed where sensor is used as a weight sensor. It is based on the principle that the sensor output changes when fluid weight is below 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. In, Hospital ICU, CCU, NICU most of all department of hospital required such kind of automatic monitoring and indication system. Also Health care industries will one of the users. 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 builds, it will decrease the chances of patients hazards and increases the accuracy of health care in hospital. Such data can also send to nurses and/or doctor`s mobile and they can start or stop the fluid and also monitoring fluid condition, such things required security password also. 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.*

***Key Words*: Weight sensor, load cell, electrolyte bottle, air bubble, indication system.**

1. INTRODUCTION

Saline solution is used in the hospital whenever some energy needs to be supplied to the patient in 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.

1.1 Site visited

We have visited Chinmayi Hospital, Kankipadu. They were having a serious problem regarding the continuous monitoring of the infusion bottle. They also have cases where backflow has happened. we have identified this problem as the major issue they were facing. We have interacted with the hospital Management team and with some of the Doctors and Nurses. After a healthy discussion with the hospital staff, we came to know what problems they are facing frequently. We found that there are some problems that are needed to be eliminated in order to provide proper patient care in hospitals as patient care is a crucial part of the hospital sector. So we concentrated more on the problems that affect patient care.

2. LITERATURE REVIEW

By using a rubber band mechanism in which rubbers are used and variuos 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 device where IR sensor is used as a level sensor.IR sensor output voltage level changes when intravenous fluid level is below certain limit. The comparator continuously compares the IR output with 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 contented information and buzzer starts ringing for alerting the nurses and doctors in the hospitals. A time limit will be set for ringing of the buzzer [3].

Implemented framework comprises of different sensors and devices and they are interconnected by means of remote corre-spondence modules. The sensors data is 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 patient. 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 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 [5].

3. PROPOSED SYSTEM

In the proposed system we have used different electronic components like Arduino Uno, LCD (16 X 2), Load Cell, Breadboard, Hx711 module, I2C module, GSM 900A.

We designed and developed the entire idea into a device, where we integrate all the mentioned components into a single unit.
Different wires in Load cell: Excitation+(E+) or VCC is red,
Excitation-(E-) or ground is black, Output+ (O+), Signal+ (S+) + or Amplifier+ (A+) is white, Output-(O-), Signal-(S) + or Amplifier-(A-) is green.
HX711 is connected to Arduino Uno through VCC to 5V, GND of HX711 to GND of Arduino, SCK of HX711 to D5 of Arduino, DT of HX711 to D6 of Arduino.
Load Cell is connected to HX711 through E+:RED, E:BLACK, A- : WHITE, A+ : GREEN.Entire Connection is shown below in Fig 1.

All the components are connected as shown in the block diagram Fig 2. Initially, we connect the load cell to the Arduino through the HX711 module.HX711 module is useful in detecting the loads that are placed on the loadcell. The saline bottle is hanged to the loadcell using a hook. Loadcell detects the weight of the Saline bottle and displays it on the LCD. We initially set some particular threshold in the code written. If the weight of the Saline bottle reaches the threshold, Our system sends SMS to the hospital management. This mechanism of sending SMS is done through GSM which is connected to the Arduino. In the SMS sent we can see the room number and current level of the Saline bottle.

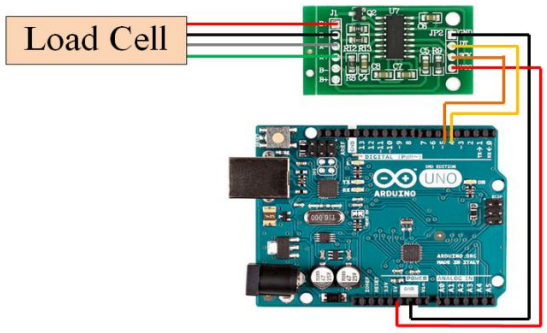

Fig-1: Connection of HX711 to Arduino UNO and load cell to HX711.

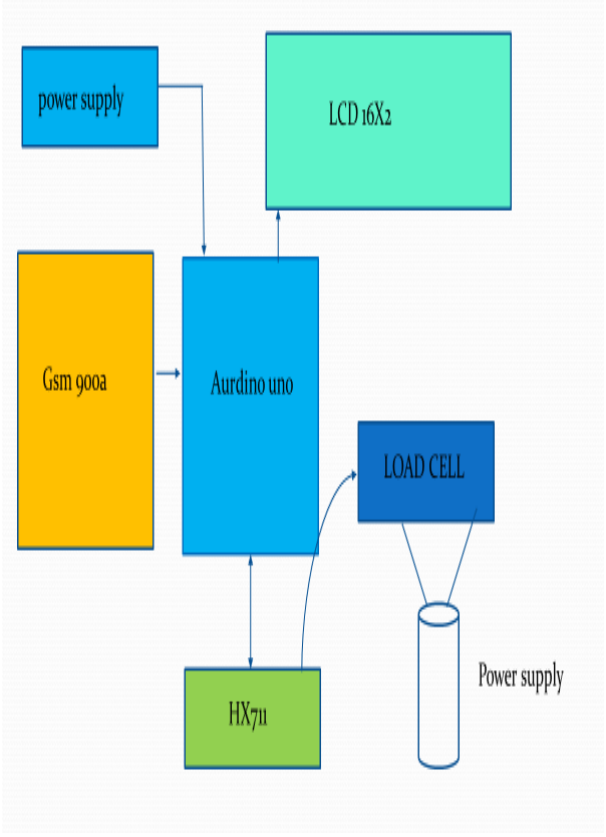

Fig-2: Block Diagram of proposed system.

The entire source code for both the application was present the github repositories.

[1] https://github.com/karthikmaddala/Saline-level-monitoring-system/ sketch_feb03b.ino.

4. IMPLEMENTATION

4.1 Output Screenshots

Fig-3: Whole Setup

Fig -4: Initial Weight of Bottle

Fig-5: Weight of the Bottle after some water dripped

Fig-6: Threshold Reached Signal

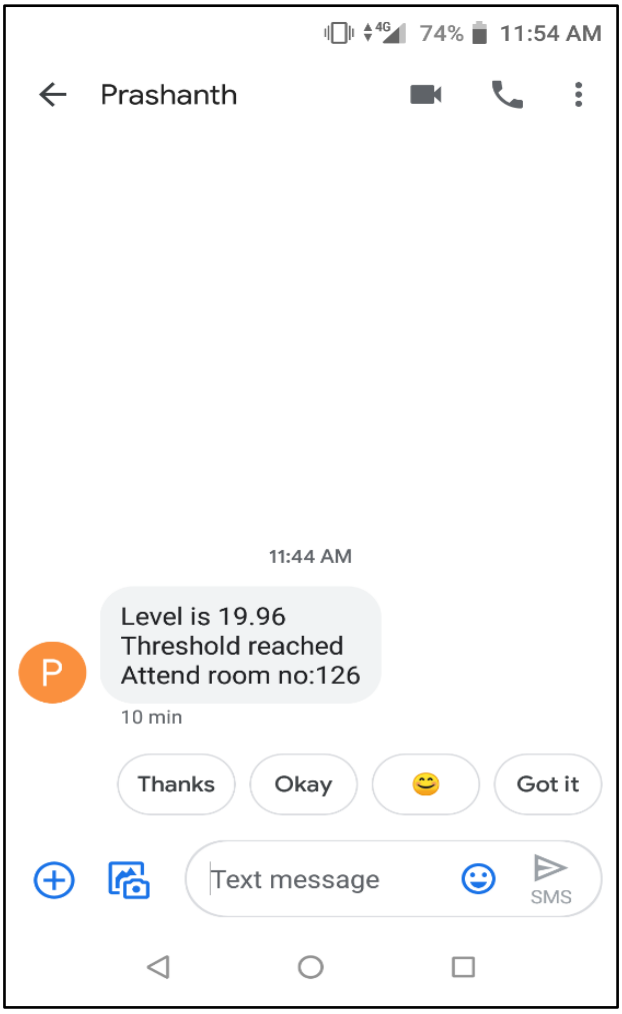

Fig-7: SMS Received

5. ADVANTAGES

This particular system have following advantages:

[1]Everytime it is not necessary to watch a patient who is injected Saline bottle. Continuous monitoring of bottle is not required.

[2]As our phone gets SMS the staff get alerted Immediately. There is no chance of backflow.

[3]Man power can be reduced.

6. 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.

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