

SALINE LEVEL MONITORING USING IOT

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Abstract:

This paper deals with 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. The system can be made available at very low cost. The same circuit can be reused for another saline bottle giving only one time investment.

Index Terms – Arduino microcontroller, Esp8266 (wifi module), Load cell, Load cell amplifier (HX711 IC, GSM Modem, Internet of things (IOT).

I. INTRODUCTION

The lack of care persons with sufficient skill in hospitals and their heavy duty become a social problem in the modern world. We should develop low cost health monitoring systems available to every hospital in the days to come. Various engineering designs are carried for the benefit of hospital facility enhancement. A number of health monitoring sensors for humans in bed have been developed. Monitoring heart rate by an air pressure with an air tube in mattress in bed is also developed. System of systems using non- contact sensors is described by Yutaka HATA. Heart attack symptoms are also detected using mobile phone and wearable sensors. The objective of this work is to help the life of a patient by developing an automatic and cost effective saline monitoring system. The saline is injected into the blood stream based on Physiological conditions like heart beat, temperature, pulse rate, body weight, blood pressure etc. of the patient. The technology is rather changing beyond ones imagination. The idea here is to develop an automatic saline monitoring. It is an advanced and automatic saline monitoring system helpful for the doctors to monitor the saline from a distance. This reduces the continuous on-site monitoring by the doctor or nurse. It also helps in indicating the saline level and gives the alarm when the bottle is about to empty. Whenever a patient is fed with saline bottle he/she needs to be monitored continuously. If not it will hamper the health of the patient. Smart saline monitor will monitor the level of the fluid continuously and display the fluid level in an application. When the saline level is lower than a certain threshold level a continuous notification will be sent to the user and a SMS will be sent offline through GSM modem as alert to the caretaker.

II. ABOUT INTERNET OF THINGS

The Internet of Things (IOT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data. The IOT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of about 30 billion objects by 2020. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to areas such as smart cities. "Things", in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring, or field operation devices that assist fire fighters in search and rescue operations. Legal scholars suggest regarding "Things" as an "inextricable mixture of hardware, software, data and service".

These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include home automation (also known as smart home devices) such as the control and automation of lighting, heating (like smart thermostat), ventilation, air conditioning (HVAC) systems, and appliances such as washer/dryers, robotic vacuums, air purifiers, ovens, or refrigerators/freezers that use Wi-Fi for remote monitoring. As well as the expansion of Internet-connected automation into a plethora of new application areas, IoT is also expected to generate large amounts of data from diverse locations, with the consequent necessity for quick aggregation of the data, and an increase in the need to index, store, and process such data more effectively. IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems. The term "the Internet of Things" was coined by Kevin Ashton of Procter & Gamble, later MIT's Auto-ID Center, in 1999

III. EXISTING APPROACHES

In the present healthcare measurers, professional nurses are responsible for managing, monitoring and providing care to patient receiving saline. Roller clamp is used for manually controlling the saline infusion rate at the hospitals. If roller clamp rolls in one way, it compresses the intravenous tube more tightly which make tube more thin and allow saline fluid to flow through at a slower rate. on the off chance that it is come other way, it extricates or discharges the saline tubing which makes the cylinder less dainty and enables the saline liquid to move through at a quicker rate. It relaxes or discharges the saline tubing which makes the cylinder less flimsy and enables the saline liquid to course through at a quicker rate. In the present world, there is no such observing framework which will diminish the reliance of the patients on the medical caretakers, specialists and would likewise diminish the requirement for the attendants to go to patient's bed each time to check saline dimension status of every patient. Along these lines, there is requirement for advancement of IoT based saline level monitoring system.

IV. PROPOSED MEHODOLOGY

A.SYSTEM REQUIREMENTS

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.

BUZZER

Buzzer is an audio signaling device. Buzzer will alert the nurses, caretakers and doctors when saline reaches the critical level and for replacement of saline bottle.

LCD

A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

ESP8266 WIFI MODULE

The ESP8266 Wifi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wifi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

THINGSPEAK

ThingSpeak is an IoT analytics platform service that lets you collect and store sensor data in the cloud and develop Internet of Things applications. The ThingSpeak service also lets you perform online analysis and act on your data. Sensor data can be sent to ThingSpeak from any hardware that can communicate using a REST API or using MQTT protocol.

ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove.

V. PROPOSED SYSTEM ARCHITECTURE

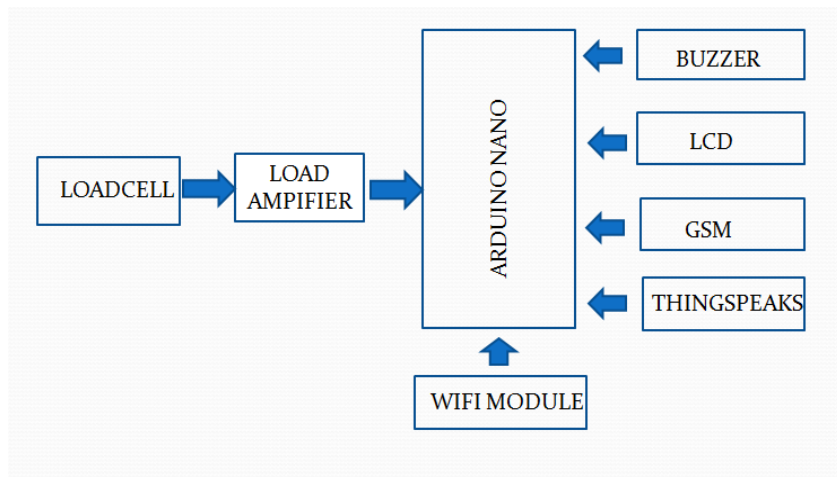


FIGURE 1: SYSTEM ARCHITECTURE

C.SYSTEM WORKING

Our ultimate theme of the project is to reduce the onsite monitoring and effective acknowledgement of the saline level. So the system works accordingly, whenever a saline bottle is placed on the load cell a strain is developed and this causes vibrations in the elastic membrane of the cell which effects the resistance in the weight stone bridge and these ultimately generates the electrical signals and these are fed to the Arduino Nano. The obtained signals are of digital values and these are calibrated to the precised measurement standards. Simulation of the source code is obtained by Arduino IDE software the code once uploaded will be simulated and results can be obtained through serial monitor and furthermore this data can be accessed through cloud platform using ThingSpeak and whenever the saline weight reaches the threshold limit ThingSpeak sends the notification to the widget bar. Through which nurse or the care taker can be alerted. SMS will be sent as alert to the nurse using GSM and even the results will be displayed on LCD.

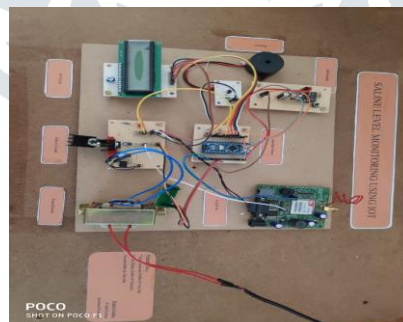


FIGURE 2: HARDWARE SETUP OF THE PROJECT

VI. RESULTS & DISCUSSION

We have obtained the following results.

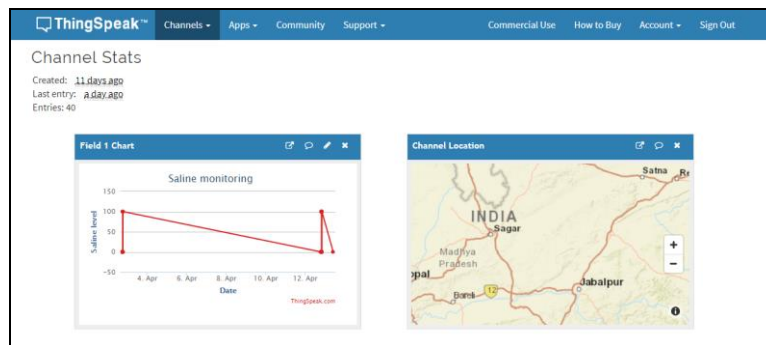


FIGURE3: OUTPUT FROM THINGSPEAK PLATFORM

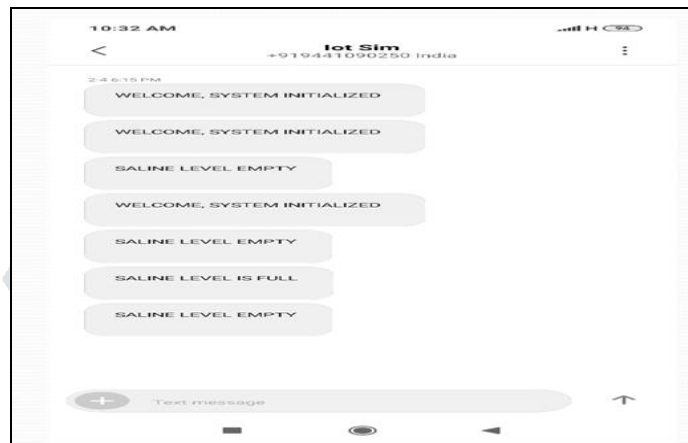


FIGURE4: OUTPUT FROM GSM



FIGURE5: OUTPUT FROM DISPLAY

VII. CONCLUSION

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.

VIII. FUTURE SCOPE:

The further work for this project can be enhanced by reverse flow mechanism which gives an alert when blood reverses in to the saline bottle using dc motor and notch.

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