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Smart drip monitoring system using node MCU

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ABSTRACT

All most in all hospital, an assist/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, an IoT based automatic alerting and indicating device is proposed where sensor is used as a level sensor or weight sensor. Need for good patient care in hospitals, assessment and management of fluid and electrolyte is the most fundamental thing required. In this project, the level of glucose in the glucose trip bottles that are used in the hospitals is measured Microcontrollers and load cell interface and Wi-Fi systems where employed to make this system more efficient. This system gives a solution to manage time and reduces man power in drip monitoring process. The proposed method measures the capacity in glucose drips and sends these through Wi-Fi. This system sends notification to the authorized floor -in- charge or nurse through mobile application and a display will be mounted in every kit which will show the instantaneous value of glucose in each drip.

INTRODUCTION

Automation in healthcare is an emerging field unknown to us. In current era, there is no time for youngsters to concentrate on healthcare as it requires more time and work. In terms of business, it has much profit. By introducing automation, time and stress can be reduced in Nurse/Monitoring person. As we are moving to a future of health care, we have to save person health. There are many disadvantages in the healthcare system like infection control due to assessments of doctor, heart attack due to clot of Air embolism in backflow of blood in intravenous fluid, medication errors due to surgery and clinic respective. This project helps to rectify those problems and hopes youngsters to concentrate on healthcare as it as emerging field which is required for the future [1].

The main objective of this paper is to design an automated system that reduces the manual power required for drip monitoring process in hospitals. This process is selected to automate because of the backlogs found as a result of the flaws made by humans during the monitoring process. The delay that happens during this process may lead to reverse blood flow and sometimes leads the patient's health to critical condition. The proposed system aims to design an automated system which calculates the weight of the electrolyte/drip solution instantaneously and sends the data to the authorized person through a mobile application [2].

- INDEX: Node MCU, Load cell interface
- HX711, Load or weight cell, OLED display, android application and a smart phone.

RELATED WORK

- Name by "Survey on automatic flow control in drip" by Arjun Udayan, Sachu R Kurup, Sharook H, and C.Jeyanthi in 2016 for controlling the drip.
- Name by "Intravenous drip monitoring system" by M. Anand, M. Pradeep S.Manoj, L.Marcel Arockia Raj, and P.Thamaraikani in 2016 for monitoring intravenous fluid flow.
- Name by "Smart real time healthcare monitoring and tracking system using GSM"- Kahtan Azit, Saed Tarapiah in 2016 for

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designing a system to monitor from even from distance.

- Name by "IOT based saline level monitoring system by KhusbooVaishnav, Neha swamy, Madhuri patil.

PROPOSED WORK

The proposed paper consists of an automated system built by microcontroller node MCU, load cell, load cell interface and OLED display. Microcontrollers, load cell, load cell interface and OLED display comprise the proposed system. As discussed above the drip and be monitored from particular distance by means of smart phone application. Hence a Node MCU (Microcontroller Unit) ESP8266 is chosen, since it has an inbuilt Wi-Fi module, Ethernet port and https port. Load cells measures the drip instantaneously, the node MCU converts the analog signal in to digital signal, the load cell interface module amplifies the analog signal from the load, and the OLED display displays the battery percentage for each and every instant. The mobile application can be supported in smart phones with android version up to 8.0 [3-6].

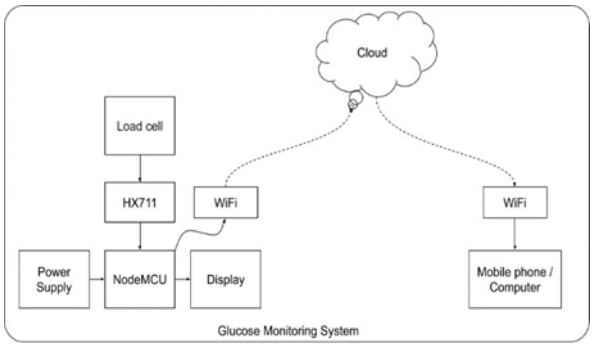

Figure 3.1 Block diagram of proposed work

As shown in the figure 3.1 primarily a weight cell or load cell is used which has two extensions in the form of wires which is connected to the node MCU. The weight cell or load cell brings out the weight of the saline bottle hanging over the weight cell in the form of analog signal. To amplify this signal a load cell interface is connected between Node MCU and weight cell. A primary power supply is given to the kit using HW battery. The Wi-fi module in the node MCU is connected with a local server and all such data regarding the saline bottle or drip system will be updated instantaneously. A web application is developed and connected with the server and data will be updated every instant.

Node MCU

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially was based on the ESP- 12 module of the ESP8266, which is a Wi- Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in Riot applications.

Load cell interface

HX711 is a precision 24-bit analog- to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor. The input multiplexer selects either Channel A or B differential input to the low-noise programmable gain amplifier (PGA). Channel A can be programmed with a gain of 128 or 64, corresponding to a full- scale differential input voltage of ±20Mv or ±40Mv respectively, when a 5V supply is connected to AVDD analog power supply pin. Channel B has a fixed gain of 32. On chip power supply regulator eliminates the need for an external supply regulator to provide analog

power for the ADC and the sensor. Clock input is flexible. It can be from an external clock source, a crystal, or the on- chip oscillator that does not require any external component. On-chip power on-reset circuitry simplifies digital interface initialization. There is no programming needed for the internal registers. All controls to the HX711 are through the pins.

Load cell

A load cell is a transducer which converts force into a measurable electrical output. Although there are many varieties of load cells, strain-gauge based load cells are the most commonly used type. Pneumatic load cells are sometimes used where intrinsic safety and hygiene are desired, and hydraulic load cells are considered in remote locations, as they do not require a power supply. Strain gage load cells offer accuracies from within 0.03% to 0.25% full scale and are suitable for almost all industrial applications.

OLED display

An organic light-emitting diode (OLED or Organic LED), also known as an organic EL (organic electroluminescent) diode, is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound that emits light in response to an electric current. This organic layer is situated between two electrodes; typically, at least one of these electrodes is transparent. OLEDs are used to create digital displays in devices such as television screens, computer monitors, and portable systems such as smartphones, handheld game consoles and PDAs. A major area of research is the development of white OLED devices for use in solid-state lighting applications. Hvj app can run in all android mobiles with android version up to 8.0. This application displays the instantaneous data like sensor calibration, battery span, drip level and its flow. This application completely a secure one and at the same time data can be retrieved at any time even from distance [1-5].

PROPOSED MODELLING

The superior aim of our project is to automate the existing system and to increase the efficiency of the monitoring system by reducing the complexity when it is applied to overcome distance and to increase the clarity in collecting the health data [6].

CONCLUSION

IOT is one of the emerging internet technologies in upcoming years. Most of the devices were handled by IOT. This is because it is easier and convenience to handle. This project aims to develop a system that monitors the drip by means of measuring its content continuously and this system is made to monitor it even from distance by means of a mobile application. This system can bring a solution to the monitoring process.

RESULT

The level of the solution in the drip is shown in the display of the hardware kit and also display in the hvj application in the mobile. The figure 6.1 shows the hardware kit of the proposed project and the figure 6.2 shows the internal connection. Finally, the figure 6.3 shows the result that has been displayed on the android application. It is android mobile application which is specially designed and exclusively used for this project alone. This application

Figure 6.1 hardware kit

Figure 6.2 internal connection

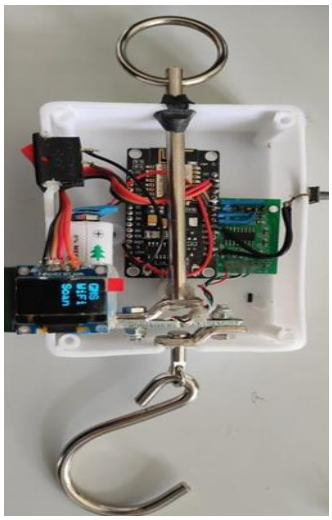

Figure 6.3 result in android application

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