Retraction

Retraction: IoT Based Automatic Monitoring and Control System (J. Phys.: Conf. Ser. 1916 012087)

Published 23 February 2022

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

Retraction published: 23 February 2022
IoT Based Automatic Monitoring and Control System

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Abstract. This paper is of systematic review is to analyze this research done on the period of time activity or trailing of the number of intravenous fluid (IV) level during a saline bag and additionally to watch the heart rate and temperature level of the patient. This technology provides health service for patients, particularly who are in intensive care Unit(ICU). Among the varied treatments, the saline medical aid, heart rate and temperature watching is that the most significant treatment that a lot of patients receive from the hospitals. According to this paper, an IoT based mostly system has been enforced which will monitor the heartbeat and temperature and live or track the number of IV fluid level from the output given by a hardware system consisting of a NodeMCU and pulse sensor and temperature sensor. Further, an alert system is value-added that is executed if the IV fluid level goes below the permissible level given within the devised algorithmic rule. The alert message is received by the doctor through associate degree alarm sound by using buzzer and additionally value-added to it, if the heart rate or temperature level goes above or below the permissible level the light can blink on the monitor to point the seriousness level of the patients. By this example the doctors will access the heartbeat rate, temperature and IV fluid level information of the patient from any location. The nurses or the duty doctor obtainable at the hospital will monitor the on top mentioned information of the patient within the serial monitor through the period of time watching system. The period of time watching is completed via Google platform, this platform is safer to store the main points. The on top of mentioned information and different personal details of the patient area unit keep within the cloud, this may be utilised for future studies on the health condition of the patient. The example is realised using NodeMCU, pulse sensor, load cell, temperature sensor, and Google Platform.

Keyword: IV fluid, patients monitoring, alert system

1. Introduction
Now a days, the unwellness has accumulated by surprising rates. The research were done in the World Health Organization (i.e. WHO) nearly 3 million folks were injured and killed in the road accident. Road traffic injury claimed concerning 2500 folks lives on a daily basis in 2015. Besides such misfortune, common diseases cause the patients to induce admitted into hospitals. It, so generally create the medical workers troublesome to stay serious check on every patient who are given saline should continuously monitor and to check the pulse and temperature of the patients.
This causes the lack of medical caregivers who needed to require care from nurse because staying in bed like inspecting and replacement their IV fluid baggage once those who get change posture to lowest level [1]. Once this happens, flow of blood in reverse direction could happen because of the
increasing pressure within the IV bag or if heart rate or temperature goes down that is additionally could prove unsafe to the involved patient. A study reveals that seventieth of patient died because of carelessness of the tending suppliers.

To avoid this, numerous research centered have come back up with ideas to automatically examine the quantity within the saline bag, heart rate and temperature of the patients and conjointly to predict the IV fluid level and heart rate are going to be observance ceaselessly in order that the nurse doesn’t ought to physically visit the patient till any circumstance cause. This may facilitate decrease the nurses’ work to a definite level and increase their productivity. As the world population keeps growing at the speed of quite ninety billion p.a., quantitative relation of sick folks to healthy folks conjointly will increase [2].

The nurses operating in tending facilities are in control of keeping, monitor of the heart rate, temperature and track of the IV bag. However, this kind of resolution becomes a tangle if the amount of patients is additional. This ultimately inconceivable for the caregivers to offer sufficient time for every patient and because of the situation, the fluid level falls below the tolerable limit which ends up with back flow of blood from the bloodstream. Its incorporate economical and sensible thought to dead track the quantity of saline level within the saline bottle in the period of time. This method will add unison with the caregivers and might increase the standard of tending that a care givers offers a patient and makes it minute frantic for a nurse to supervise all the patients saline bag. Suppose if the temperature or heart rate goes above or below the determined rate it ends up in heart failure or another effective risk can cause to the patients [3].

During this system, IOT primarily based automatically indicating device wherever Infrared sensor is employed as a fluid level indicating sensor. The output voltage level of IR sensor changes once IV fluid level is in minimum amount. Once the output is low then the system automatically ensures the nurses by giving buzzer alarm. Once the saline drops right down to a definite minimum level then Associate in Nursing signal is generated to alert the caregivers that the IV fluid given to the patient is over [4].

The distinction of weight is employed to predict the quantity of saline within the bottle, thus is employed to supply an sounding alarm within the indicator board at helper or nurse space. If the nurse fails to attend the patient at once then a motor arrangement is finished that suppresses and flattens the saline tube. This prevents the upward flow of saline from the veins to the bottle and within the same manner the heart, heat and temperature device are placed to watch the temperature or heart rate of the patients if it goes above or below the involved rate then the red led can blink within the monitor screen on the involved patients name [5].

The main objectives of this system are listed below as follows:

1. To overcome drawbacks in manually controlled saline system, heart and temperature rate.
2. To provide greater accuracy than manual saline flow rate of control system, temperature and heart rate.
3. To avoid harms cause to patient health due to negligence towards careless of the nurses.
4. To make the above said monitoring automatic and to inform the doctor/nurse spontaneously for patient safety.

2. Literature Survey
“A systematic review on real-time automated measurement of IV fluid level” by ParthaPratimRay, NishantThapaappraised that saline level is detected by load cell and IR sensor, data from the load cell and IR sensor are sent to the microcontroller. Bluetooth or WiFi module will transfer the data to
cloud through WiFi and the same data or information will be sent as notification for nurses or doctor about the lower of saline level through mobile phone, tablets or personal computer etc [6-7].

“Development of Intelligent and Smart Saline Bottle” [8] found a model to indicate the level of saline bottle with three colors of LED light, used to indicate level of fluid; Red LED will be indicated if the fluid goes beyond the threshold level; Yellow light will indicate the medium level of the fluid; Thinkspeak, Anaconda IDE is used to predict the data of fluid level. All these are under Linear Regression of Machine learning and the data are stored in cloud, the data received will be displayed in the excel sheet for doctors view.

“Body temperature measurement for remote health monitoring system” [9] discovered the design and to track the body temperature that can be observed by the doctor in real time as well as data can be stored and indicated by the buzzer alarm via the internet in their paper “Body temperature measurement for remote health monitoring system.”

“Body temperature monitor and alarm system used in hospital based on 1-wire and wireless communication technology”, ”Body temperature control and alarm system used in hospitals based on 1-wire and wireless communication technology” is to monitor the body temperature, where the sensor attached to the body can capture and process body temperature signals, while the SCM AT89C52 processes the measurement signal, drives field display, and even performs disturbing equipment functions [10-13].

“Heartbeat Monitoring Using IOT” [14] is to monitor the heartbeat of the patients using Node MCU and AFE4490 Pulse oximeter to measure the pulse rate where data are transmitted to the Node MCU. Fingerprint sensors is used for the detection and store the fingerprint of the individual. Arduino Uno is used as the storage unit to store the data.

“IoT Based Remote Heartbeat Monitoring” [15] has made sensors to interact, collaborate and share experience. PPG Sensor is used to transmit the heartbeat data to the Node MCU. During the abnormality of the pulse rate the LED is used to display. The results are collected from the Node MCU and monitored using the cloud Thinkspeak.com. A LCD is also used to monitor the heartbeat. This method is secured and continuous monitoring can be done.

3. Methodology
A simple image is shown of the proposed method in the figure and the components are to be discussed in this section. Stethoscope and Electrocardiogram are expensive but are commonly used to measure the heartbeat. The pulse sensor is not much expensive and the heartbeat can be measured easily. Photo Phlethysmography (PPG) is the principle used for the pulse sensors and the temperature is measured with the help of the temperature sensor(DS18B20). DS18B20 gives us digital values as it can be easy for measurement an calculation process [16]. The IV fluid is easily predicted with the load cell and the IR sensors.

When there is flow in the IV fluid the level of fluid in the saline bottle will be reduced during the flow of IV fluid and predicted with respect to the weight in the load cell and drip rate sensed by the IR sensors. The pulse sensor, temperature sensor, load cell and IR sensors are interfaced with the Node MCU ESP32 is connected to Wi-Fi for internet access and programmed to upload the data to the Google sheets. As the liquid flows from the saline bottle the end time of Intravenous Fluid at the saline bottle will be predicted and displayed on the Google sheet, the temperature and pulse rate will alongside be monitored on the Google sheet as shown in the figure 1. The values in from the sensors to the Google sheet will be updated every 30 seconds. To avoid the backflow of the blood when the liquid in the saline bottle is reduced to minimal amount the buzzer will indicate it [17]. The Google
sheets are only used for monitoring the temperature, pulse rate and prediction time of IV fluid, for indication of abnormality the buzzer will produce sound for indication of abnormality and produces alert to the medical professionals and its set for each person as condition of patients gets varied and not similar for everyone.

Data collected from temperature sensor, pulse sensor, load and IR sensors are stored in the Google cloud which can be retrieved and viewed if necessary in future. Each patient will be given a Google sheet where only medical professionals and allocated person can view the sheet. This creates transparency between the doctors and family of the patient. This methodology can be also done at home where doctors can view the patients’ health through their gadgets or personal computer.

Figure 1. Block diagram

Node MCU:
Node MCU microcontroller is an open source microcontroller. The Node MCU ESP8266 micro-controller will be used as processing and programming unit for sending instructions to the micro servomotor, buzzer and the database. An ESP-8266 chip is mounted on it which enables the ending of data to cloud servers through WI-FI. Node MCU is a combination of node and microcontroller. The term "Node MCU" strictly speaking refers to the firmware rather than the associated development kits. Node MCU is an open-source based firmware and development board specially targeted for IOT based Applications [18]. In this, firmware is based on ESP266 WI-FI SOC and hardware is based on the ESP-12 module. Node-MCU has 128 kb RAM and 4MB of Flash memory is used to store data and programs.

Load Sensor:
A load cell is a force sensing module is designed with metal structure. Types of load cell and circuitry is used, the electrical signal act as a voltage change, current change or frequency change. Load cell is used for measuring the weight of the saline bottle. Load cell output will be analog in nature. The output of the electrical signal in load cell is very small. Load cell has many types. The load cell amplifier attached with the load cell to find the weight of the saline bottle. By using the load cell, the level of liquid present in the bottle can be calculated.

IR Sensor:
To emit or detect radiation, an infrared is used with the aid of an emitter and receiver LED.
Its aim is to detect nearby objects. When an obstacle is detected and the receiver LED receives the signal, it is reflected back. The droplet from the saline bottle is detected using an infrared sensor. When the saline level in the bottle reaches a critical level, an IR sensor detects voltage changes [19]. It will be located near the saline bottle’s neck, at the vital level of the saline bottle. The sensor’s output is processed to determine if the saline bottle is empty, and an alarm sound is produced.

**Temperature Sensor:**

The body temperature is measured using a temperature sensor. To measure body temperature, the sensing part is made up of several thermocouples on a silicon chip. To take the temperature, the sensor is mounted on the rectum, earlobe, or armpit. The data was sent to the cloud through a temperature sensor that detected the body temperature [20].

**Pulse Sensor:**

With the help of a heart rate monitor, you can keep track of your heart rate. A heartbeat sensor is a piece of electronic equipment. Manually monitoring the pulse at the wrists or neck is the easiest way to assess heart rate. The heart rate is directly proportional to the blood volume within the fingertip. To obtain a visual signal, the sensor output is processed by appropriate electronic circuits (digital display). The light-emitting diode and ambient light sensor are attached on the first surface of this sensor. When the LED is placed on the vein, it begins to emit light. A pulse sensor is attached to the body in emergency situations so that the nurse can track the patient’s pulse rate in front of the monitor figure-2.

![Figure 2. Flow Diagram](image)

**Figure 2. Flow Diagram**

4. **Algorithm**

Step 1. Start
Step 2. Connect the sensors to Node MCU.
Step 3. Check the patients health parameter such as temperature, IV fluid count and pulse rate.
Step 4. Setup Wifi connection in both.
Step 5. Continuously monitoring the patients.
Step 6. Checking whether the condition is normal or abnormal.
Step 7. Send indication to medical staff whenever anomaly rises by Buzzer alarm.
Step 8. Collect the data and store it into Google sheet.
Step 9. Display the predicted data.
Step 10. Stop.

The hardware implementation of the patient monitoring system as shown in figure 3 that includes the load cell, temperature sensor and pulse rate sensor are connected along with Node micro controller unit in with is an IoT device through which the real time sensor data is obtained and the it is been stored in an excel sheet as shown in figure 4 for further processing. Continues monitoring of the sensor values is done and further abnormality is measured then it indicated by means of buzzer.

Figure 3. Hardware implementation of patient monitoring system
5. Conclusion

Health monitoring system is one of the most important key issues concerning the medical facilities. This paper incorporates a system through which one of the very important issues of saline level monitoring, pulse rate, temperature rate is resolved. This method can be further applied to particular patients and the data can be segregated based on the type of diseases the patients are occurred and then stored in a google database. It would be a very flexible and easy automated system in terms of health monitoring and thereby it reduces the amount of human involvement and also the errors and casualties.

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