iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 10 **Issue:** VI **Month of publication:** June 2022

**DOI:** https://doi.org/10.22214/ijraset.2022.44635

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538*
*Volume 10 Issue VI June 2022- Available at www.ijraset.com*

# IV Drip Monitoring and Control System

Sumalatha Bandari[1], Gauri Deshmukh[2], Pooja Pawar[3], Rutuja Yadav[4], Komal Jagadale[5], Dipti Chavan[6]
[1]*Assistant Professor, Department of CSE, AGTI's DACOE, Karad, India*
[2, 3, 4, 5, 6]*B.Tech. Student, Department of CSE, AGTI's DACOE, Karad, India*

***Abstract:*** ***Intravenous Drip System is used mainly in hospitals for patients who were dehydrated, nutrient deficient or unable to take medications orally. In our current medical care system, monitoring of patients in a hospital throughout the day is a tiresome process. Sometimes doctors or nurses are too busy, so they cannot monitor each patient. This causes many problems. The health related work should be done properly and with accurate manner. An example of such type of work in our hospital is injecting saline or intravenous fluids into the vein of patient. If the drip system is not monitored on time, it will cause problems like back-flow of fluid, blood loss etc. In order to reduce the workload of nursing staff and to overcome such critical situation in the area of an intravenous drip monitoring system, we proposed a system called IV Drip Monitoring and Control System.***
***Keywords: Intravenous, Monitoring, Controlling, Therapy, IoT, Backflow, Patient, Nurse, Hospital***

## I. INTRODUCTION

Internet of Things (IoT) has changed people's lives in many areas, especially in healthcare sector. It has enabled devices which made remote monitoring in the healthcare sector possible. It has the potential to keep patients safe and healthy, and empowering doctors and nursing staff to deliver high quality care. One of them is Automated Intravenous Drip System (IV Drip). Monitoring patients during IV therapy is still a challenging problem. In our current medical care system, we manually do all this monitoring task. We need to alert the medical staff about the drip level in a saline bottle that is being injected through the patient's vein and the patient condition on a real time. Intravenous therapy is treatment that infuses intravenous solutions, medications, blood samples directly into a vein. IV therapy is an effective and fast way to administers fluid and medications treatment in emergency situations, and for patients who are unable to take medications orally. Approximately 80% of all patients in the hospital will receive intravenous therapy. The main perk of IV is that the fluids can be delivered in the fastest mode throughout the body and immediate effect of the medication can be achieved [5]. The flow measurement and control system can be developed by using flow sensor the output of the sensor which is in the form of pulses is given to the arduino NodeMCU controller. It gives the signal to gear motor valve through L293D IC driver. Hence to assure the safety of the patient during IV period there is need to develop an efficient health monitoring system. This can be achieved with proposed idea of IV fluid level indicating system where IR sensor, RF transmitter, receiver and buzzer are used to provide indication either bottle is empty or not. This is going to reduce the stress in continual monitoring by the doctor or nurse at an affordable cost.

## II. LITERATURE REVIEW

A remote drip infusion monitoring **s**ystem employing Bluetooth by Hikaru Amano [1].This system consists of several infusion monitoring devices and a central monitor. The infusion monitoring device employing a Bluetooth module can detect the drip infusion rate and an empty infusion solution bag, and then these data are sent to the central monitor placed at the nurses' station via the Bluetooth. The central monitor receives the data from several infusion monitoring devices and then displays graphically. Therefore, the developed system can monitor intensively the drip infusion situation of the several patients at the nurses' station.

Intravenous drip meter & controller by Raghavendra B [2]. In this system, IV drip usage and a solution is proposed to enable monitoring and control of IV drip based on sensing of drops falling through the drip chamber. Such a device will potentially reduce complication and provide peace of mind to users of IV drip system. Here embedded system technology was used and system was run without a regulator to save battery power. The device displays the flow rate and also has alarms which operate when the rate deviates from pre-set value. A power management circuit along with a battery will be used to provide power to various components and circuits.

Intravenous Drip Monitoring System by M. Anand [3]. In this system, the IV fluid monitoring system automatically sends a message to the nurse through GSM technology. This technology reduces the work of the nurse instead of keep on watching of an IV fluid system. The automation circuit is built around the Arduino Uno R3; Solenoid valve is used to cut off the fluid drip system. The control system can be better in time consumption; the system can easily control the hardware by use the arduino controller. This project provides the advantages for nurse/assists in healthcare system and control of notice board generally.

Intravenous Drip Monitoring System for Smart Hospital using IOT by Ms. Sincy Joseph [4]. In this system, the focus on controlling of flow rate manually by making use of a mobile app and monitor level of IV fluid in the bag and give warning to the medical personnel to change the bottle. If abrupt changes are coming, it will alert the medical personnel by buzzer technique. The system uses Arduino-ATMEGA328 microcontroller, Bluetooth module, IR fluid level sensor. Here developed the hardware such as Arduino embedded with sensor to fetch data like fluid level, patient physical parameter such as BP, Temperature, Heart rate etc.
Design and Development of IOT enabled IV infusion rate monitoring and control device for precision care and portability by Mohammed Arfan [5]. This paper proposes a drip monitoring and control device that fits on the existing Intravenous setup. Normally, doctors and nurses use their experience to estimate the time required for a drip bottle to be empty and for setting drip rate. This makes the IV infusion method to be vulnerable to human error and there are also other risks like back flow of blood and many others if not attended when empty. This paper proposes an IoT monitoring and control platform for IV infusion setup which enables doctors and nurses to monitor as well as control the IV infusion setup wirelessly while keeping the cost low and making the device highly reliable.

## III. EXISTING SYSTEM

In the previous system, a nursing staff required continuous monitoring of the saline bottle level to avoid backflow of blood from the patient to the saline bottle. Previous system uses a roller clamp mechanism for controlling the flow rate of the intravenous fluid. If the nursing staff delays to notice the flow rate, then it will lead to backflow of blood from patient which is risky.

## IV. PROPOSED WORK

This system eliminates continuous visual monitoring of the patient by nursing staff from distinct places. It is realized that mass flow rate, level of the IV fluid and the patient body condition needs to be monitored at every time. However it is based on the decision of the doctor or the nurse, at what flow rate, the fluid is to be injected based on patient condition. In our proposed model, we are concentrating on both controlling the flow rate manually by making use of a mobile app, monitor level of IV fluid in the bag and give warning to the medical personnel to change the bottle. For monitoring of individual state, this system will steadily monitor fluid level in the IV bottle while injecting. If abrupt changes are coming, it will alert the medical personnel. For alerting, the system will use a buzzer technique and messaging facility. We aimed to bring the technology closer to common people in hospital and society.

## V. METHODOLOGY

Using this system, the nurses can monitor the amount of saline even in the control room using an application. Here, a load sensor is used to determine the status of liquid in the bottle whether it is normal or warning status. The output obtained from the sensor is then processed to check whether the saline bottle is empty or not and displayed on the LCD display. When the level of saline drops below a certain level; the application will notify the user. The bottle level sensor with load cell is used to measure the saline level. The content of saline in a normal saline bottle is 500 ml. The saline bottle 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 bottle when the liquid reaches the critical point.

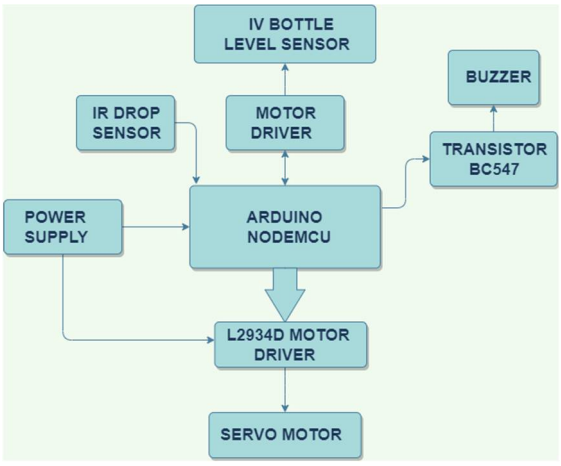



Fig. 1: Block Diagram

The system is electrically powered and a voltage of 9V is required to power the system. As soon as the saline bottle is hung on the stand and attached to the sensor via a hook, an initial weight reading of the bottle is recorded in the database designed by the micro-controller. The load cell in the IV bottle level sensor senses the weight at regular intervals. The same is updated in the database regularly. As soon as the read value of the load reaches 30% of its initial value recorded in the database, a notification is sent to the respective nursing staff.

The sensor keeps reading the weight of the bottle and the LED's starts blinking as soon as the weight of the bottle further decreases to 30 percent of its initial weight. If further no one attends to the patient, and the saline gets fully consumed without being disconnected or refilled manually, the microcontroller powers the DC motor. The motor actuates the screw-powered clamp, which disconnects the patient with the electrolyte bottle and Buzzer also start to ring, after three times ringing it stops automatically.

## VI. MODELING AND ANALYSIS

| COMPONENTS | SPECIFICATIONS |
|---|---|
| NodeMCU ESP8266 | Microcontroller : Tensilica 32-bit RISC CPU XtensaLX106 Operating voltage : 3. 3 V Input voltage e: 7-12 V |
| Load Cell | Capacity : 5kg / 11 lbs Maximum excitation voltage : 10V DC Rated o/p : 1. 2 +/- o. 1mV/V |
| Servo Motor | Operating voltage : +5 V Operating speed : 0. 17 s |
| Buzzer | Rated voltage: 6V DC Operating voltage: 4-8V DC |
| IR Sensor | Operating voltage: 3-6V Current: at 3.3V: 23mA at 5V:43mA |

NodeMCU ESP8266: The NodeMCU (Node Micro Controller Unit) is open source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The NodeMCU ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK that makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

## VII. RESULT AND DISCUSSION

The IV Drip Monitoring and Controlling System is designed and tested successfully. As shown in Fig. 2, the system includes NodeMCU ESP8266 Controller, Load Cell, Servo Motor with clam, Saline Bottle, Buzzer, and External Switch.

Fig. 2: Prototype of IV Drip Monitoring and Control System

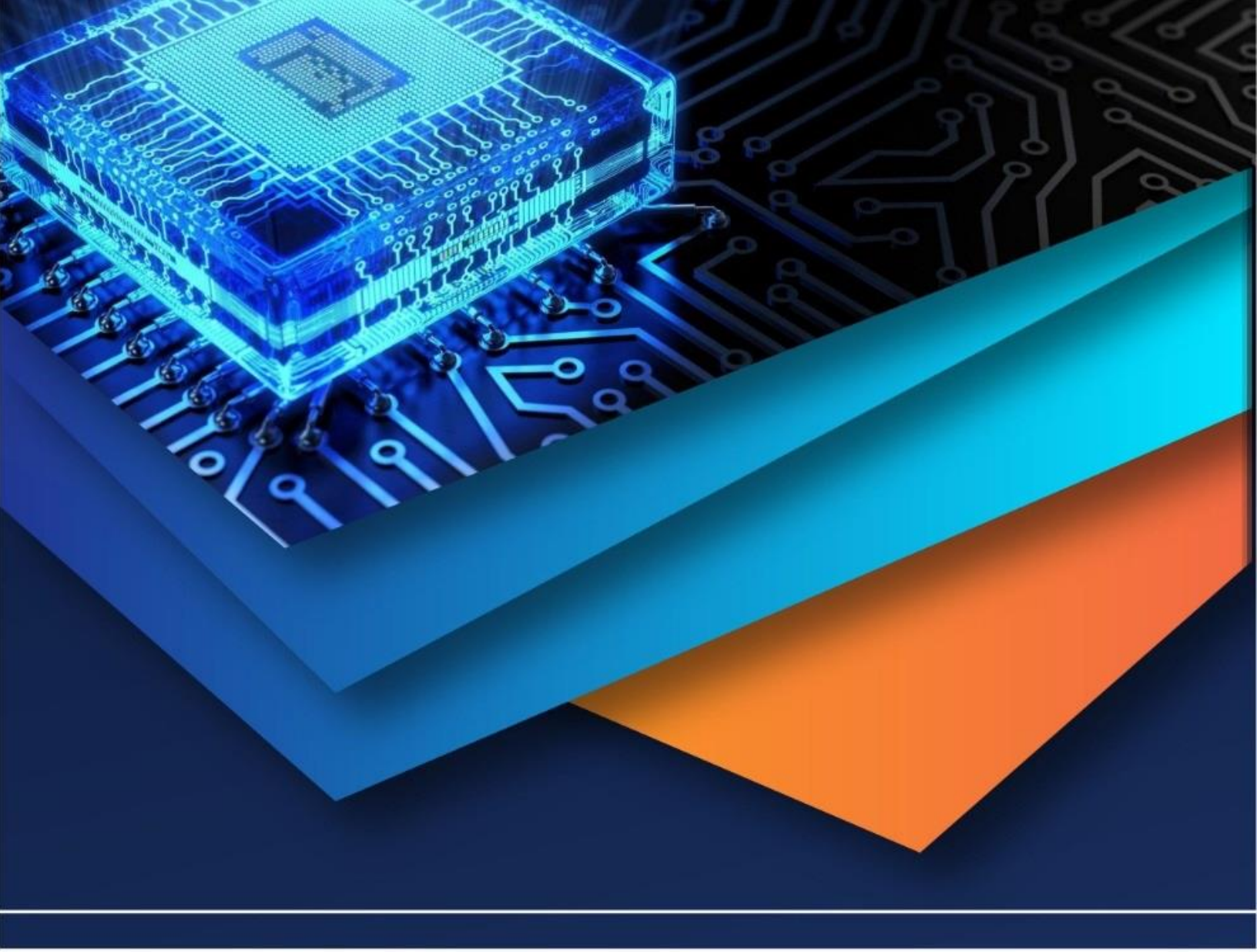
The system is designed to capture the changes in the level of saline bottle and determine the level of saline bottle. When the determined level is less than predefined threshold weight, then the buzzer sounds to notify the nursing staff.

## VIII. CONCLUSION

Intravenous therapy is treatment that infuses intravenous solutions directly into vein. It is an effective and fast acting way to administer fluid in an emergency situation, and for patients who are unable to take medications orally. IV drip system is commonly used in healthcare system, however IV drip system need to be regularly monitored and replaced. In order to reduce the workload of nursing staff and overcome critical situations like backflow of blood, we proposed a system called Automated IV Monitoring and Control System based on IoT technology. The proposed system can overcome a number of problems during the IV therapy, which implies less patient concern and greater efficiency of medical staff with less effort and greater satisfaction.

## REFERENCES

[1] H. Amano, Hidekuni Ogawa, W. Caldwell, "A remote drip infusion monitoring system employing Bluetooth," 2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2012. DOI:10.1109/EMBC.2012.6346356
[2] Raghavendra B, Vijayalakshmi K, Manish Arora, "Intravenous drip meter & controller," 2016 8th International Conference on Communication Systems and Networks (COMSNETS), 2016. DOI:10.1109/COMSNETS.2016.7440024
[3] M, Anand and MM, Pradeep and Manoj, S and Raj, Marcel Arockia and Thamaraikani, P., "Intravenous Drip Monitoring System," 2018 Indo-Iranian Journal of Scientific Research (IIJSR), 2018. DOI:10.2139/ssrn.3536333
[4] Sincy Joseph, Navya Francis, Anju John, "Intravenous Drip Monitoring System for Smart Hospital Using IoT,"2019 2nd International Conference on Intelligent Computing, Instrumentation and Control Technologies(ICICICT), 2019. DOI: 10.1109/ICICICT46008.2019.8993241
[5] Mohammed Arfan, M Srinivasan, Adithya Gowda Baragur, "Design and Development of IOT enabled IV infusion rate monitoring and control device for precision care and portability," 2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA), 2020. DOI: 10.1109/ICECA49313.2020.9297376
[6] Pranshul Sardana, Mohit Kalra, Amit Sardana, "Design, Fabrication, and Testing of an Internet Connected Intravenous Drip Monitoring Device," J. Sens. Actuator Netw. 2019, 8(1), 2; DOI: 10.3390/jsan8010002
[7] Antika Cahyanurani, Sugondo Hadiyoso, Suci Aulia, "Muhammad Faqih4 Design and development of a monitoring and controlling system for multi-intravenous infusion,"2019 International Conference On Engineering, Technology and Innovative Researches Journal of Physics, 2019. DOI:10.1088/1742-6596/1367/1/012075



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY