

Smart Drip Using Arduino Microcontroller

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DOI: <https://doi.org/10.26438/ijcse/v7i6.822829> | Available online at: www.ijcseonline.org

Accepted: 12/Jun/2019, Published: 30/Jun/2019

Abstract— During recent years due to the technological advancements many sophisticated techniques has been evolved for assuring fast recovery of the patients in hospitals. For good patient care in hospitals, assessment and management of patient's fluid in the drip is the most fundamental thing required. All most in all hospital, an assist/nurse is responsible for monitoring the fluid level continuously. But in the government hospitals due to the unavailability of enough number of nurses, observing this fluid is a great headache to the hospitals. Our smart drip using Arduino microcontroller will overcome the complications like infiltration, hematoma, air embolism, blood backup in tubing, extra vascular Injection, Intra-arterial Injection etc. It will detect the emptying of drip bag with the help of Ultrasonic sensor. To overcome this critical situation, we develop a smart drip using arduino with automatic alerting and indicating system is proposed where Ultrasonic sensor is used as a level sensor. Whenever the fluid becomes low, it will send an alert message to the nurse rooms and also nurses can monitor the LIVE level graph in their computer. This technology reduces the work of the nurse rather than keep on looking of an IV Fluid system. one of the best advantages of our project is that the ease interface with users that functionally can be managed by means of an alert message.

Keywords—Arduino Microcontroller, Ultrasonic Sensor, Drip

I. INTRODUCTION

India is placed 154 position in attention among 195 developing countries in worldwide consistent with the National Health Policy a pair of 017 aims to boost public attention expenditure to 2.5% of GDP from current one.4% with quite simple fraction of these resources going towards premier attention. it's still the most important employment supply and a major piece of the socio- economic development of Republic of India. Attention is very central to India's progress. The expansion of health facilities has been unbalanced Republic of India. Automation in attention is Associate in Nursing rising field unknown to United States. In current era, there's no time for children to target attention because it needs longer and work. In terms of business, it's abundant profit. By introducing automation, time and stress is Automation in attention is Associate in Nursing rising field unknown to United States. In current era, there's no time for children to target attention because it needs longer and work. In terms of business, it's abundant profit. By introducing automation, time and stress is reduced in Nurse/Monitoring person. As we tend to are moving to a way forward for health care, we've got to save lots of person health There are several disadvantages within the attention system like infection management thanks to assessments of doctor, attack thanks to clot of Air embolism in flow of blood in blood vessel fluid, medication errors thanks to surgery and clinic several. This project helps to rectify those issues and hopes kids to target attention because its rising field that are needed for the longer term. Intravenous medical care is that the infusion of fluid substances directly into a vein blood vessel merely means that "within vein". IV system could also be wont to correct fluid imbalances, to deliver machines, for transfusion or as fluid replacement to correct. This way is the fastest way to deliver medicines or fluids. Therefore, it is necessary to monitor treatment through IV therapy. Our project is aimed in automating the intravenous fluid monitoring system using Arduino Uno R3. IV volume and fluid level can be precisely controlled. Also human can contact the system through GSM (Global System for Mobile communication). In IV fluid monitoring system is failed to disconnect the drip system to patient, Air-in line sensor will be activated. All most in all hospitals, assist/nurse is responsible for monitoring the IV fluid level system. But unfortunately, the observer may forget to change or stop the drip bottle at correct time due to their schedule. This may leads to several problems to the patients. Our project is overcome for this critical situation. This technology reduces the work of the observer. As the population growth increases day by day, so the need for healthcare system is also increases. It is essential thing for everyone in this world to take care of their health properly. Maintaining patient's safety is the top most priority to be given in all hospitals. Now days, many automatic health monitoring devices are developed to ensure patients safety and to reduce the stress of the doctors and nurses. Such device introduces a drastic change in medical field for monitoring the patients' health. IOT plays a major role in health monitoring system. IV period is still a

challenging issue. Intravenous therapy infuses liquid substances directly into a vein where Intravenous y means "within vein". It is commonly referred to as a drip. Whenever a drip is fed to any patient, he/she needs to be constantly monitored by a nurse or any relatives. Most often due to negligence, inattentiveness, busy schedule and more number of patients, the nurse may forget to change the drip bottle as soon as it is totally consumed. Just after the drip finishes, blood rushes back to the drip bottle due to difference in blood pressure and pressure inside the empty drip bottle. This may cause backflow of blood to drip bottle from their vein. This result in the reduction of haemoglobin level of patients and may also lead to death. Assure the safety of the patient during IV period is essential. Therefore; there is a need of developing a drip level monitoring system which will reduce the patient's dependency on the nurses or caretakers to some extent. This can be achieved with the proposed idea of IOT based smart system in hospitals where Arduino, Ultrasonic sensor, WI-FI Adapter and Motor are used to make it.

II. RELATED WORK

There exist a lot of researches and studies related to smart iv systems using IR sensor and many other technologies. The main aim of all is to achieve better care and attention to the patients' healthcare system more efficiently so that it can reduce the chances of back flow of blood. In this section, several papers are studied comparatively for better analysis and implementation of the project.

D.Janani et.[1] proposes "Wireless Saline Bottle Level Indicator for Hospitals", In this method Saline is a key ingredient as a part of intravenous solution that delivers water to patients in hospitals and clinics. Professional nurses, doctors or the care takers of the patient are responsible for the patient taking intravenous solutions. There is no such automated system that helps to detect the critical level of saline. More over this paper also helps in controlling the reverse flow of blood into the saline and is not restricted to just informing the care takers of the critical level.

R.Vasuki et. [2] Proposes "A portable monitoring device of measuring drips rate by using an intravenous (IV) set". In this method the IV set is attached to the drips chamber. The flow sensor is used to detect each drops of IV set. For each drop, the beam of light is broken at each time and that is transmitted and received by IR sensor. This provides a change in sensor output and comparator gives a pulse output for each drop. The drip rate is indicated using the LCD with which the observer can identify the volume of fluid in IV set. If the device is not sensed for 45 seconds it will give an C.C.Gavimath et.[3]proposes an method of "Design and development of versatile saline flow rate measuring system and GSM based remote monitoring device". In this device an indigenously developed sensor is attached to the neck of the drips bottle. For every drop of the saline, the signal conducting circuit produces one pulse. The signal conditioning circuit consists of a multivibrator, comparator and phototransistor. The 8051 microcontroller is used to count the pulse in unit time. This will resemble the flow rate. Through GSM technology the information about the flow rate is send to the observer's mobile. The cost of this device is high.

R.Aravind et. [4] Proposed a paper, "Design of family health monitoring system using wireless communication". This is an ARM based embedded system through which the data of the patient is transmitted and received via zigbee or RF transmitter and receiver. Then the information is stored as database and send to GSM. The database consists of all the details about the patient health conditions such as temperature, blood pressure and heartbeat by using visual basics. This makes the residential people to check their health by themselves but computer should need an IE. But it is not suitable for illiterate people for whom it is very difficult to operate and understand.

Hikaru Amanand et [5] Proposed a paper, "A remote drip infusion monitoring system employing Bluetooth", developed a remote drip infusion monitoring system for use in hospitals. The 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 them. Therefore, the developed system can monitor intensively the drip infusion situation of the several patients at the nurses' station.

Xinling Wen et.[6] Proposed a paper "Design of Medical Infusion Monitor and Protection System Based on Wireless Communication Technology", A medical infusion monitor and protection system is designed based on technologies of photoelectric monitor, modulation demodulation, single chip microprocessor (SCM), and wireless communication, etc. The infusion signal is collected by infrared photoelectric conversion characteristic. SCM AT89C51 processes monitor data and control area infusion speed and controls wireless transceiver nRF905 to constitute wireless communication system to transmit data. Through the serial interface MAX487 connected main controller with each control node, upper PC can monitor and control each node in real-time and renew control-schemes. Experiments shown that the rate of infusion speed monitor error is less than 2 drop every minute, and stability time is faster, which effectively completes intelligent infusion system monitor and

alarm.

I. METHODOLOGY

3.1. PROPOSED SYSTEM

Intravenous medical care could be a process within which liquid substances (medications) are unit directly entered into the vein through associate degree IV tube and needle is inserted into the patients vein. Now days, several automatic health observance devices are unit developed to confirm patients safety and to scale back the strain of the doctors. These sterile solutions (sodium and dextrose) containing necessary nutrients to support the human life that is injected into the patient's body through a tube connected to the needle. Because of lack of caring, several issues can arise like blood loss, flow of blood through associate degree IV tube to beat this example, our planned system to develop the IV fluid observance system mechanically sends a message to the nurse through GSM technology and automatically turned off the flow of a liquid from the IV system by using the motor attached to the tube.



Fig: 1 Intravenous Theory

Drip level of the patient is continuously monitored and displayed on the display. This technology reduces the work of the nurse instead of keep on watching of an IV fluid bag. In the IV fluid system crossed the set point of the Arduino Uno R3, assist/nurse can get the alert through SMS which will be received.

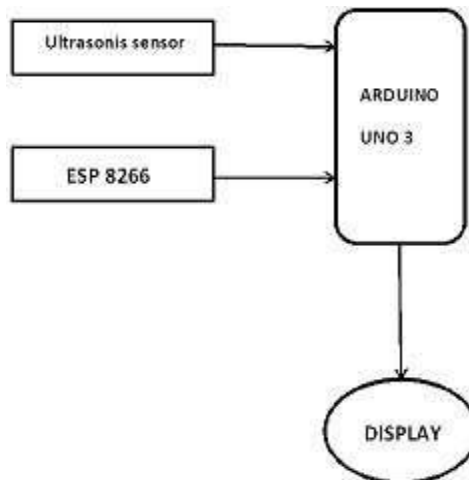


Fig: 2

3.2 OBJECTIVE OF PROPOSED SYSTEM

The main objective of our system is to develop the Intravenous drip monitoring system by using Arduino controller. This project organizes:

- To achieve a low cost and safety healthcare in Intravenous drip system.

- To monitoring the fluid level by the sensor.
- To provide Ease of accessibility for observer/ Nurse.
- To ensure safety and health conditions by IV drip monitoring system.
- Temperature sensor helps to detect the patient conditions exactly

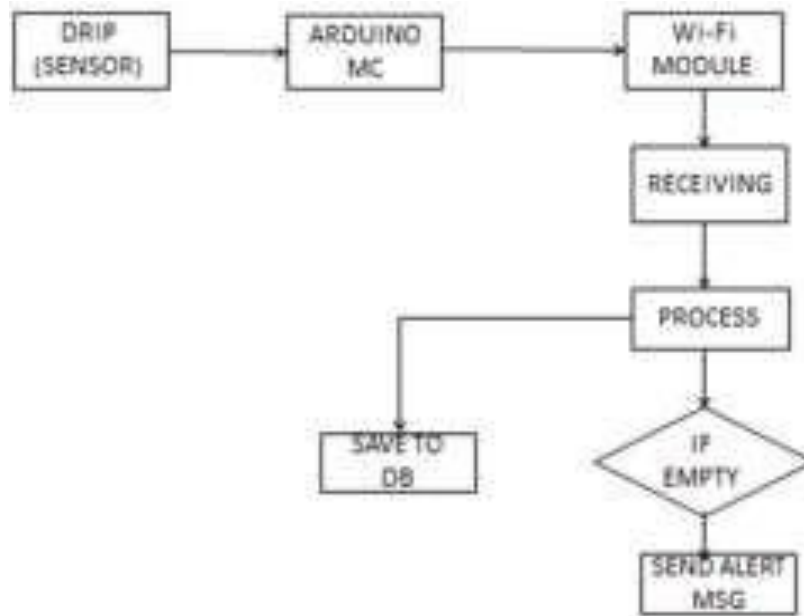


Fig: 3

3.3 ARCHITECHURE OF PROPOSED SYSTEM

WORKING PRINCIPLE

The automation circuit is built around the Arduino Uno R3. The liquid level of the patient is continuously monitored and displayed on the display which is placed in the nurse /assistant room . According to the pulse and blood pressure of the patient the flow of IV fluid is increases and decreases vice versa. This technology reduces the work of the nurse instead of keep on watching of an IV fluid bag. In the IV fluid system crossed the set point of the Arduino Uno R3, assist/nurse can get the alert through SMS which will be received through Wi-Fi module.

Typical function:

- Patients Entry
- Hardware Setup For Fetch Values From Hardware & Processing
 - Graph viewing and Alerting sending Patients Entry

The Patient Entry module handle various enquiries or details about the patients admission and discharge details, bed census, and the medical details within the hospital. After login to the smart drip system they can enter the details about the patients in the patient entry section. Most important thing in this section is to enter the drip id to identify the drip of each patient easily also can get the details different patients.



Fig: 4

Hardware Setup For Fetch Values From Hardware & Processing

In the smart drip system we use the ultrasonic sensor for detecting the level of the drip in the dripbottle. The Ultrasonic sensor is connected with Arduino microcontroller using 8 and 9 pins which read the values .the use of the 8 pin is GND (Ground) – There are several GND pins on the Arduino, any of which can be used to ground your circuit and the 9th pin in the Arduino microcontroller is used Vin (9) – This pin also can be used to power the Arduino board from an external power source, like AC mains power supply hen by Using ESP8266 Wi-Fi adapter to send the read values to the nurse or the administrator.



Fig:5 Hardware setup



Fig:6 Connection of Arduino

Graph viewing and alerting sending

The sensing of the Level of bottle is taken initially and the bottle without fluid is taken as the set point. When the fluid reaches the value same as the set point and the sensor provide the signal and the programmable IC starts working. At the same time the motor starts rotating and the valve will be closed at the same time an alert message send to the nurse/assistant and also display the level of the drip as graph in nurse room.



Fig:7 Initial level of drip



Fig:8 Empty level of Drip

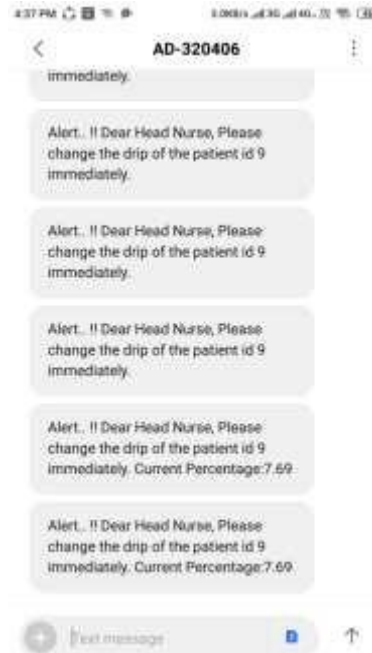


Fig:9 Alert Message

II. DATAFLOW DIAGRAM



Fig. 10

III. RESULTS AND DISCUSSIONS

This Smart Drip Using Arduino Microcontroller and Ultrasonic Sensor are developed for the healthcare system of the Patients. In this system the ultrasonic sensor is connected with normal drip bag or drip bottle ,the principle of ultrasonic sensor is it emit ultrasonic rays it will incident in the water and reflected back to the sensor according to that we can measure the level of the fluid By using Arduino microcontroller the measure values which is sensed by the ultrasonic sensor is send as alert message to the nurse/assistant through ESP8266 WIFI module and display the level graph on the monitor continuously. Already we set a set point in the drip bottle when the drip bottle when the fluid reaches the set point then an alert message is send to the nurse/assistant. The control system can be the 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

IV. CONCLUSION & FUTURE SCOPE

The proposed Arduino based indicating device acts as an assist to nurse and doctors in monitoring the patients. This also reduces the stress of repeated checking about the status of Drip set. It also has an appreciable advantage such as small size, affordable cost, and high accuracy, easy handling and completely automated. Certainly, this device reveals a good change in medical field especially in patient monitoring system with less initial investment if implemented in real time work.

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