“SALINE DRIP MONITORING SYSTEM”

Submitted in partial fulfillment of the requirements

of the degree of

Bachelor of Engineering

by

JEANET D’SOUZA	**11**
ADITI PATIL	**48**
SERIN RAJA	**81**

Supervisor:

Prof. JANHAVI BAIKERIKAR

UNIVERSITY OF MUMBAI

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Department of Information Technology

Don Bosco Institute of Technology
Vidyavihar Station Road, Mumbai - 400070

2020-2021

DON BOSCO INSTITUTE OF TECHNOLOGY

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Department of InformationTechnology

CERTIFICATE

This is to certify that the project entitled **"Saline Drip Management System"** is a bonafide work of

Jeanet	**D'souza**	**11**
Aditi	**Patil**	**48**
Serin	**Raja**	**81**

submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of **Undergraduate** in **Bachelor of Information Technology**

Date:30/04/2021

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Project Report Approval for B.E.

This project report entitled **"Saline Drip Management System "**by **Jeanet D'souza, Aditi Patil, Serin Raja** is approved for the degree of **Bachelor of Engineering in Information Technology**

(Examiner's NameandSignature)

1.——————————————

2. ——————————————

(Supervisor's Name and Signature)

1.——————————————

(Chairman)

1. ——————————————

Date:30/04/2021

Place: Mumbai

DON BOSCO INSTITUTE OF TECHNOLOGY

Vidyavihar Station Road, Mumbai - 400070

Department of InformationTechnology

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea / data / fact / source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Jeanet D'souza	**11**
Aditi Patil	**48**
Serin Raja	**81**

Date: 30/04/2021

Abstract

In hospitals, Saline is fed to patients to treat dehydration and thus improve their health. In current health care measures, whenever a saline is fed to any patient, the patient needs to be continuously monitored by a nurse or any caretaker. Almost in all of the hospital, a nurse or caretaker is responsible for monitoring the saline level continuously without any interruptions. Due to the negligence and inattentiveness towards saline completion by doctors, nurses or caretaker of the patients and lack of nurses with sufficient skills in hospitals and their excessive workload, a huge number of patients are being harmed in the hospitals.

Hence to prevent the patient from getting harmed and protect their lives during saline feeding period, the saline level monitoring and control system have been developed. The proposed system comprises of sensors which will act as a level sensor for monitoring the critical level of the saline in the saline bottle and control infusion drop rate from using motor mechanism to increasing and decreasing the saline drop rate. The system will show saline droplet status, saline drop rate and remaining time through app to be develop for convenient to hospital staff member. This proposed system can be utilized efficiently in homes as well as hospitals.

Keywords: Sensor, IOT, Saline Drip, IV Tube, Hospitals.

Contents

List of Figures

Introduction

Internet of Things (IoT) is the network of physical objects comprising of all the devices, vehicles, buildings and the other items embedded with electronics, software and sensors which enables these objects to collect and exchange data amongst teach other. Using this technology, objects are sensed and controlled remotely across existing network infrastructure. This creates opportunities for direct integration of the physical world into computer-based systems. IoT is advantageous in many ways as it leads to automation of daily tasks leading to better quality of life and saves money as well as time. Applications of IoT include a vast number of systems, amongst them, a few are Smart homes, Automated car, Automated doors, Automated Escalators, Automated Hand Dryer.

Similarly IoT plays a major role in health monitoring system. Whenever a saline 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 saline bottle as soon as it is totally consumed. Just after the saline finishes, blood rushes back to the saline bottle due to difference in blood pressure and pressure inside the empty saline bottle. This may cause backflow of blood to saline bottle from their vein. This results in the reduction of hemoglobin level of patients and may also lead to shortage of red blood cells (RBCs) in the patient's blood causing tiredness. Therefore, there is a need of developing a saline level monitoring system which will reduce the patient's dependency on the nurses or caretakers to some extent.

Problem Statement

During recent years, due to the technologies advancements many sophisticated techniques have evolved for assuring fast recovery of the patients in hospitals. Need for good patient care in hospitals, assessment and management of fluid and electrolyte is the most fundamental thing required. Almost in all hospitals, an assistant/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. It is based on the principle that the sensor output changes when fluid level/weight is below certain limit. When fluid level/weight is low, it will alert the observer through the display or mobile phone. Hospital uses simple electrolytes bottle with no indication, if not changed/filled on time the reverse flow will start i.e., the blood starts to flow from body to the bottle.

Such monitoring system can be useful in many Health Care Operations and it will decrease the chances of patient's hazard. Such a device will assure safety of patients and also will be helpful to monitor data and the data can be also stored which will be useful in future.

Scope of the Project

- IR sensor and the Float Sensor will be positioned at the critical level ofthe saline on the saline bottle to sense the critical level of saline as well as saline completionstatus
- Whenever the level of the saline reaches to the pre-defined critical level, then the nurses, caretaker, doctors will be alerted through the buzzer and an alert message will be sent through the use of internet to the concerned nurses and doctors that there is a need for replacement of the saline bottle.
- To design android application to display the result i.e. which room's patient has its saline level low or display the saline level.
- Provide cost effective and automatic saline level monitoring and controlling system which can be effortlessly implemented in anyhospital.
- To Avoid harms cause to patient health due to negligence towards saline completion.

Current Scenario

In current health care measures, nursing professionals are responsible for managing, monitoring and providing care to the patient receiving saline. The roller clamp is used to manually control the saline infusion rate in hospitals. If the roller clamp rotates one way, it compresses the intravenous tube harder, which makes the tube thinner and allows saline fluid to flow through a slower rate. If it is rolled in another direction, it loosens or releases saline tubing, which makes the tubing thinner and allows saline fluid to flow through a faster rate. In today's world, there is no monitoring system that reduces patient dependence on nurses, doctors, and also reduces the need for nurses to go to the patient's bed every time to check each patient's saline status. Therefore, the development of an IoT-based saline level monitoring system isrequired.

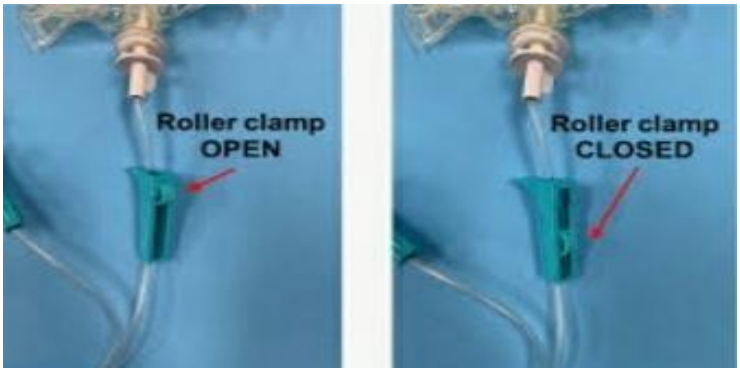

Figure 1.1: Working of Roller clamp

Need for the ProposedSystem

Automation of everything is need of the hour. The basic aim of saline level monitoring is to ease human lives. Saline is fed when patient’s body is dehydrated. Constant monitoring of saline level in the bottle is required.
There is a need for improvement of saline level monitoring in such a way that patient's dependency should not be there either on doctor, nurse or care taker. To develop a saline level monitoring which automatically alert to nurse when the bottle of saline needs to be changed after the saline reaches the critical level. Due to increase in the population, there is a need for improvement in health care. The bottle of saline needs to be changed after the saline reaches the critical level. So new idea called IOT based Intelligent Saline Level Monitoring System is emerged.

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

- To overcome drawbacks in manually controlled salinesystem.
- To provide greater accuracy than manual saline flow rate control system.

- To avoid harms, cause to patient health due to negligence towards saline completion.
- To make the saline monitoring automatic and to inform the doctor/nurse spontaneously for patientsafety.
- To automatically stop the flow after emptying of saline bottle.

Summary of the results and task completed

The study for all the existing systems are been studied. Various advantages and disadvantages of them are understood. The scope and aim of the project is defined. All the required study for implementing the project along with software and hardware requirements needed to build this system is installed. Successfully installed float sensor and IR Sensor components into the system. The float Sensor detects the level and if level is low the buzzer attached, gives alert to the nurse. If unfortunately, the float sensor doesn't work the IR Sensor is deployed for that safety, it will detect the critical level and send signals to the buzzer as needed. The Servo motor is attached to the IV Tube so that to avoid the reverse flow of the blood until the nurse visits the ward. Hence, the results of the created IOT system is very efficient and valuable for the respective nurse or the care taker on theduty.

Review of Literature

Summary of the investigation in the published papers

This is the review of literature

Name of the paper - Intravenous Drip Monitoring System

Abstract of IEEE paper

In Medical field, many devices to introduce a drastic change for monitoring the body measures like blood pressure, heart beat rate, diagnosis of heart attack symptoms and much more automatically with interdisciplinary nature. Health care system is becoming more valuable for these days. In this proposed system the IV fluid monitoring system automatically sends a message to the nurse through GSM technology. Our project is aimed to automatically turn off the flow of a liquid from the IV bag by using the solenoid valve. The pulse rate and the blood pressure of the patient is continuously monitored and displayed on the liquid crystal display (LCD). This technology reduces the work of the nurse instead of keep on watching of an IV Fluid system. One of the greatest advantages of our project is the ease interface with users which functionally can be managed by means of mobileapplication.

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 dripsystem.

- To monitoring the fluid level by thesensor.
- To provide Ease of accessibility for observer/Nurse.
- To ensure safety and health conditions by IV drip monitoringsystem.
- Temperature sensor helps to detect the patient conditionsexactly.
- Heartbeat sensor helps to detect the pulse rate ofpatient.

Name of the paper- A Novel System Design for Intravenous Infusion System Monitoring for Betterment of Health Monitoring System using ML-AI

Abstract of IEEE paper

In the upswing of contemporary sciencewe can monitor and regulate the saline flow rate. Scrupulous flow has to be retained so that risks of fore shortening the threshold level of patient's heart rate, blood pressure and oxygen level in blood level. Intravenous infusion used intermittently in hospital has to be checked for is purity. For the change in threshold level of patient's body condition, saline flow has to be adjusted. The assessments obtained from the patients is proceed to the centralizer controller which is connected to the cloud is updated periodically to avoid loss of reports. The updated data sets shared to the chemist and CPU so that flow rate of saline is controlled automatically in accordance to the data received. The machine learning based algorithm (SVM) is used to predict the more accurate changes on data which is obtained from patients so that the controller can act agilie. This work gives better results based on the accuracy level calculation and efficiency improvement in terms of more fastresponse.
The main objectives of this paper are:

- The intravenous Infusion system (IVs) with automated control on saline level and AI based machine level calculation supports for the flow control that will help the medico to monitor the saline level with high accuracy in terms of low rate, purity and observing points of patients.

- The sensory unit designed here will be interfaced with the centralized server so that the data can be uploaded directly to the clouds so that it can be easily accessed by the end user such as medico, patient'srelative.
- Thedifferentdatasetswillbeobtainedfromthepatientswillbetabulated and the results will be plotted to check the efficiency with traditional methods.
- Sothe upcoming field of AI based health care unit will help to analyze and diagnosis the different disease associated withpatients

Review of Literature: Summary of the Existing System

In the current healthcare measures, 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 thinner and allow saline fluid to flow through at a slower rate. If it is rolled in other direction, it loosens or releases the saline tubing which makes the tube less thin and allows the saline fluid to flow through at a faster rate. In the present world, there is no such monitoring system which will reduce the dependency of the patients on the nurses, doctors and would also reduce the need for the nurses to go to patient's bed every time to check saline level status of each patient. Therefore, there is need for development of IOT based saline level monitoringsystem.

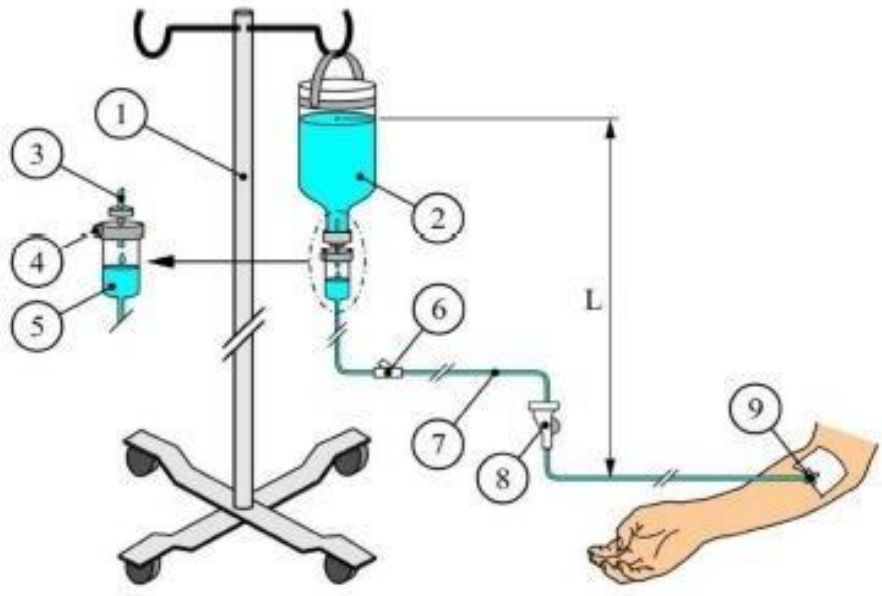

Figure 2.1: Traditional intravenous (IV) infusion therapy set

In the above Figure 2.1 i.e. Traditional intravenous (IV) infusion therapy set consist of:

1. pole/stand,
2. IV bottle/bag,
3. spike,
4. air valve,
5. drip chamber,
6. piggy back port,
7. IV tubing,
8. roller clamp
9. Cannula.

Comparison between the tools / methods /algorithms

- In current health care measures, nursing professionals are responsible for managing, monitoring and providing care to the patient receivingsaline.
- In today's world, there is no monitoring system that reduces patient dependence on nurses, doctors and every time the nurses will have to go to the patient's bed to check each patient's saline status. Therefore, the development of an IoT-based saline level monitoring system isrequired.
- Currently the process is donemanually.
- Our project will automatically stop when the saline drip is empty.

Analysis and Design

Methodology / Procedure adopted

Block Diagram

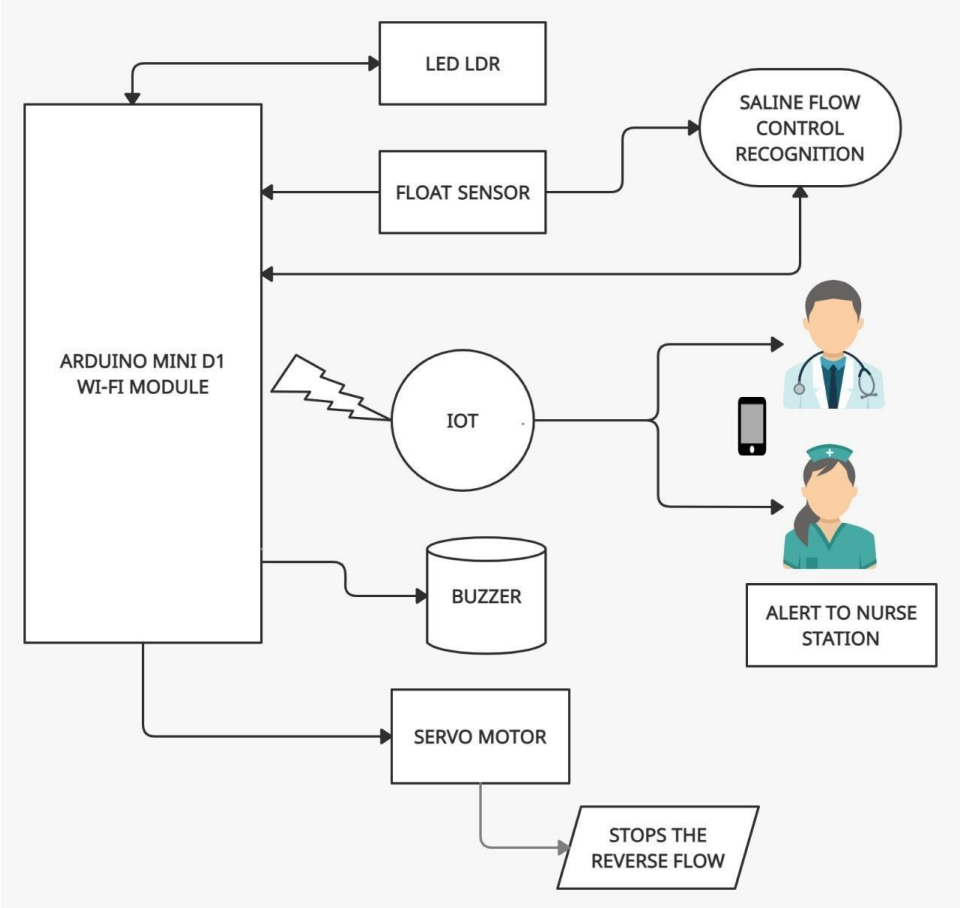

Figure 3.1: Block diagram of Saline Drip Monitoring System

This proposed system will function for two different scenarios which are explained below as follows:

1) Saline reaches at criticallevel.
2) Nurse fails to attend the patient to replace the salinebottle.

In the 1st scenario, after getting consumed by the patient, saline reaches the critical level which is sensed by the Float sensor and the IR sensor. This sensed output is sent to the micro-controller which scans the database for retrieving the contented information and buzzer starts ringing for alerting the nurses and doctors in the hospitals. A time limit will be set for ringing of the buzzer. An alert message is sent to the concerned nurses and doctors associated with the patient through the use of internet. If the nurse attends the patient, then she should stop the buzzer and reset the whole system. If she fails to do so, then 2nd scenario takesplace.

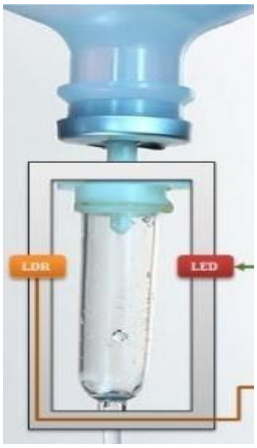

Figure 3.2: Position of IR Led and LDR sensor

In the 2ndscenario, if the nurse fails to attend the patient within the set time limit, the reverse flow of the blood into the saline bottle is stopped. For this a servo motor arrangement will be made. The clamp will be attached to servo motor, along with the compression and stretching ofspring, the clamp will also move in forward and backward directions. Again the IR sensor, at the neck of the saline bottle will sense that the saline is totally consumed and buzzer will again start ringing louder to notify the nurse that the saline is totally consumed and there is a requirement for replacement of saline bottle. The instructions for Arduino will be sent to Servo motor and as per functioning of DC motor the servo will move in forward direction and pinch the intravenous tube and stop the reverse flow of the blood in the saline bottle.

Analysis

The developed system has shown excellent results by performing applications properly. The reason for selecting this project i.e. saline drip monitoring system was something very new to us. Building a system which will help the medical staff i.e. the nurse or the care taker by sending an alert that it is time to change the saline bottle of the patient in hospital and will ease their work. The system was developed by the project team and evaluated by the project guide. Reviews were gathered and necessary corrections were implemented.

Software / System Requirement Specification – IEEE format . . *Attach as Appendix*

Software / System Requirement Specification – IEEE format

- ArduinoIDE
- TunIOT
- Website

Hardware / System Requirement Specification – IEEE format

- Arduino D1WiFi
- LDR
- LED.
- Float LevelSensor.
- Battery (6V1.2amp/hr)
- ServoMotor
- Buzzer

‘

System Architecture / Design

Proposed System

This system is aimed in automating the saline level monitoring system using D1 wifi kit and saline level can be precisely controlled. Also human can contact the system. If Float level monitoring system is failed to disconnect the drip system to patient, IR led and Ldr sensor will be activated. All most in all hospitals, assist / nurse is responsible for monitoring the saline 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.

This proposed system also provides a saline flow control/ stopping mechanism due to which whenever a saline is consumed completely and whether there may be any nurse or care taker present or not, it will automatically control or stop the flow of saline. This may lead to patients improvement in health. Hence, this project fulfills all the above stated requirements which are not present in the existingsystem.

Advantage of the proposed system over the existing system

- Provide cost effective and automatic saline level monitoring and controlling system which can also be effortlessly implemented in any hospital.
- Avoid harms cause to patient health due to negligence towards saline completion.
- Overcome the drawbacks and provide greater accuracy in manually controlled saline flow ratesystem.
- Inform the doctor/nurse spontaneously for patientsafety.
- Automatically stop the flow after emptying of saline bottle.

Modules and their description

Design Details – Use case diagram

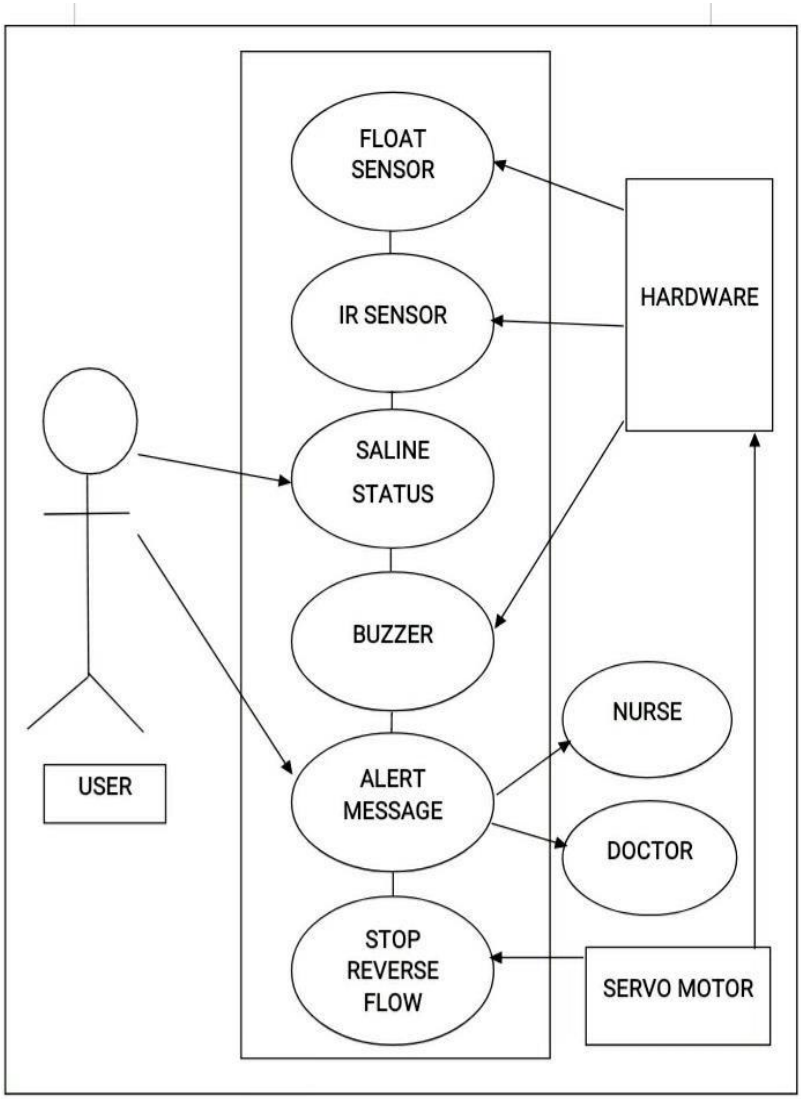

Figure 3.3: Use case diagram

Design Details – Flowchart diagram

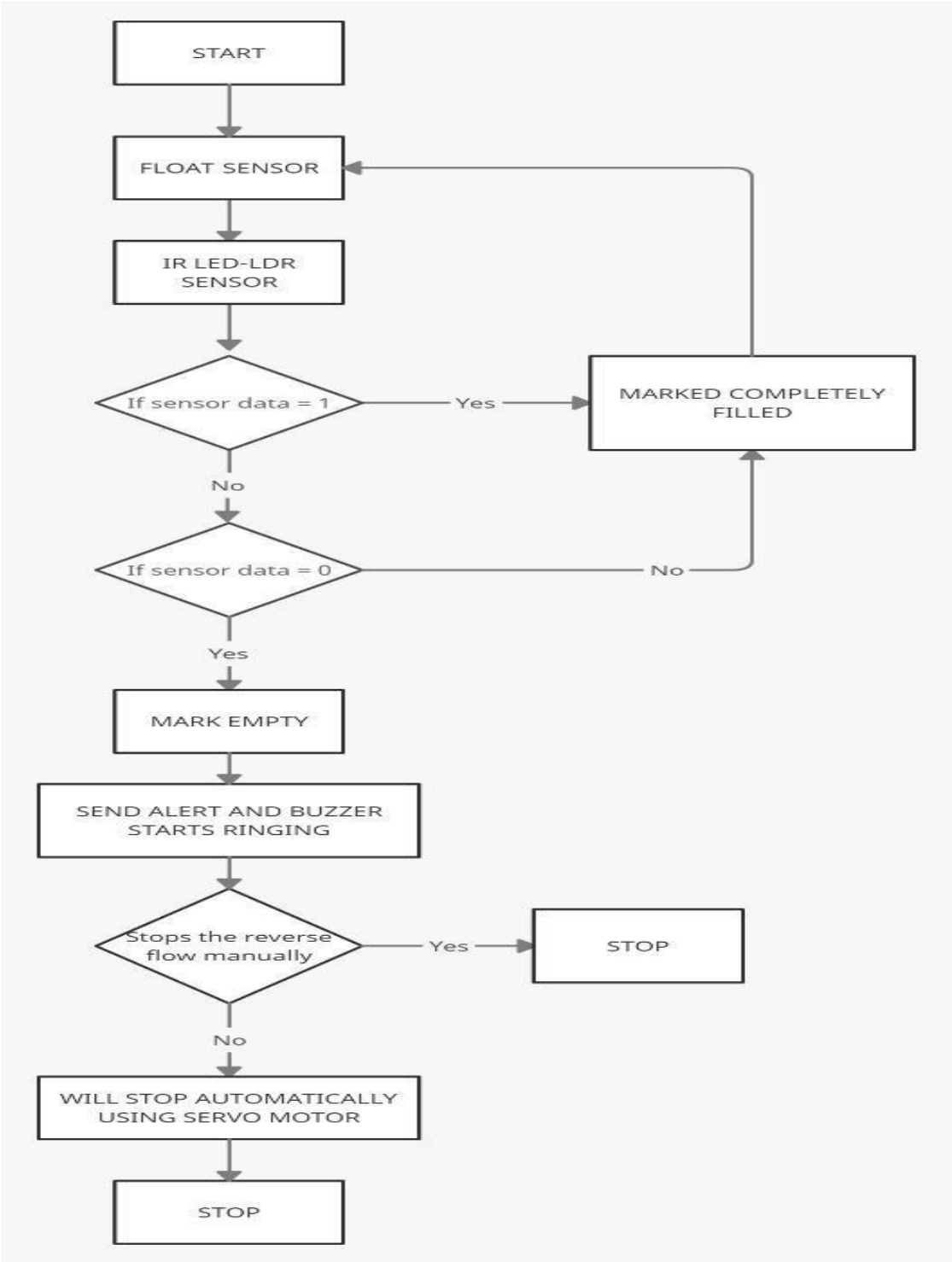

Figure 3.3: Flowchart Diagram

Specific Requirements and Description

• Arduino D1 Wi-Fi**:-**
WEMOS D1 is a WIFI development board based on ESP8266 12E. The functioning is similar to that of NODEMCU, except that the hardware is built resembling ArduinoUNO.
The D1 board can be configured to work on Arduino environment using BOARDS MANAGER. So, it's not necessary to use a separate Arduino board, the D1 itself can be programmed on Arduino IDE. This is handy in using with IOT projects. Further many Arduino SHIELDs are compatible with the D1 board.

• LDR**:-**
Can be used to sense Light. Easy to use on Breadboard or Perf Board Easy to use with Microcontrollers or even with normal Digital/Analog ICSmall, cheap and easily available. Available in PG5, PG5-MP, PG12, PG12-MP, PG20 and PG20-MP series

• IR LED**:-**
The IR LED or Infrared LED has polarity i.e.it has a positive and negative pin. The pin which is long is the positive pin (anode) and the pin which is short is the negative pin (cathode) as shown in the above IR LED pinout.

• Float Level Sensor**:-**
Float Level Sensor are continuous levelsensorthat rises and falls as liquid levelschange.

• Battery (6V 1.2amp/hr)**:-**
6 Volt 1.2 Amp 20 Hour Sealed Lead Acid Battery with F1 Terminals. Backup battery delivers a 24 charge.

• Servo Motor **:-**
Servo motor is a type of motors whose output shaft can be moved to a specific angular position by sending it a coded signal. The servo motor will maintain the position of the shaft as long as you keep applying the coded signal. When you change the coded signal, the angular position of the shaft will change. A common type of servo provides position control. Servos are commonly electrical or partially electronic in nature, using an electric motor as the primary means of creating mechanical force.

• Buzzer**:-**

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

Implementation

Implementation Plan *for Sem –8*

Implementation Plan shows the overall process of planning and executing the project by achieving the milestone and executing each stage at particulartime span.

- Task – list of projecttasks
- Percentage Completed – lists the percentage of each taskcompleted
- Status – task status such as: completed, on schedule, behindschedule, cancelled
- Day Started – date taskbegun
- Day To Be Complete – estimated date of taskcompletion
- Actual Completion Date – date task wascompleted
- Task Assignment – Name of task owner
- Priority – task priority such as High, Medium orlow
- Milestone – Yes or No to indicate if this is a milestonetask

Implementation Plan

Gantt Chart

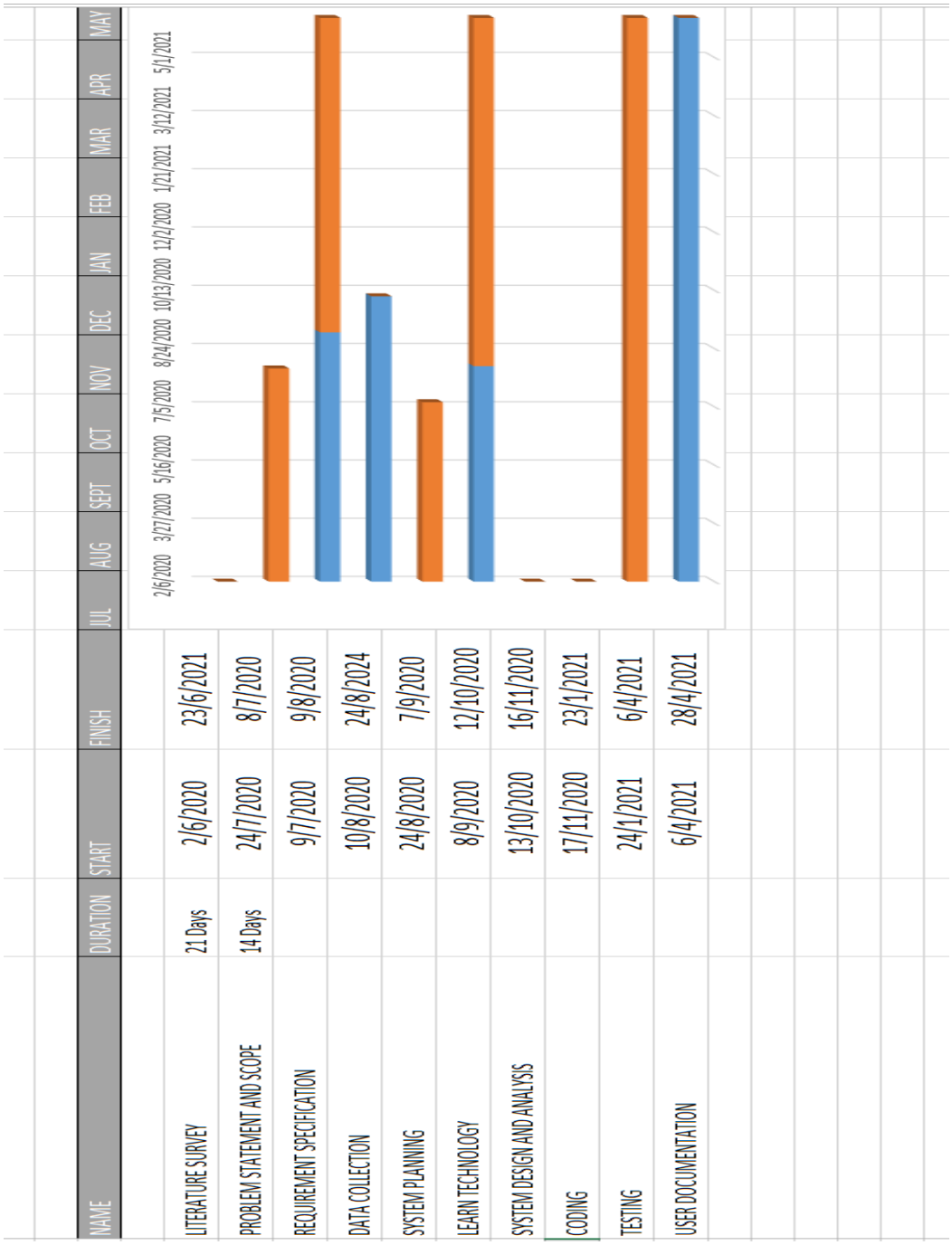

Figure 4.1: Implementation Plan

Work Break down structure

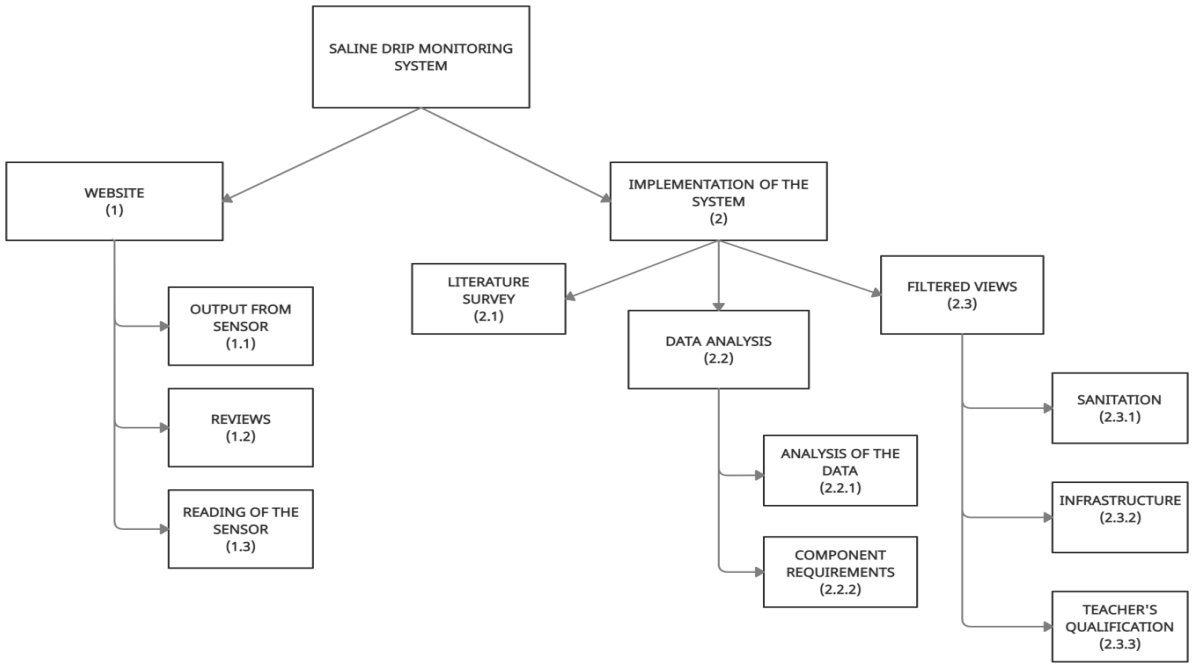

Figure 4.2: Work break down structure

CodingStandard

ALGORITHM

[1] Access theLibraries

[2] Enter SSID andPassword

[3] Define Http port80 & Create servo object to control aservo

[4] Initialize pin for floatsensor

[5] Select the input pin for thepotentiometer

[6] Store the value coming from thesensor

[7] Set baud rate for serial communication and Setdelay

[8] Enable WEP if hotspot is WEP type. Comment this line if hotspot is WPA type.

[9] Print Connecting to SSID name, Print SSID on Serialmonitor

[10] Set the float sensor pin in the input mode Set the ldr Pin in the inputmode

[11] Set the pin in output mode for buzzer

[12] Initially set buzzer low, connect to the Wifi using ssid and password

[13] Print IP address on serial monitor when a server receives an HTTP request on the root (/) path, it will trigger this function

[14] start the server

[15] goes from 0 degrees to 90 degrees, tell servo to go to position invariable 'pos', waits 15ms for the servo to reach theposition

[16] goes from 90 degrees to 0 degrees, tell servo to go to position invariable 'pos', waits 15ms for the servo to reach theposition.

Test Cases

Test cases for Modules / component

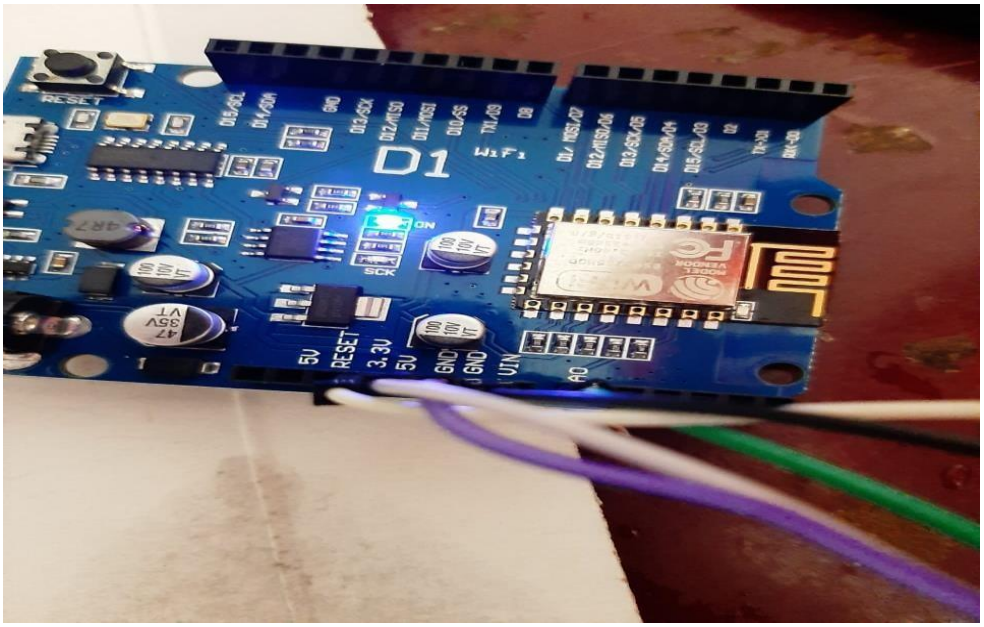

Figure 4.3: Working of D1 Wifi

Figure 4.4: Intravenous Tube

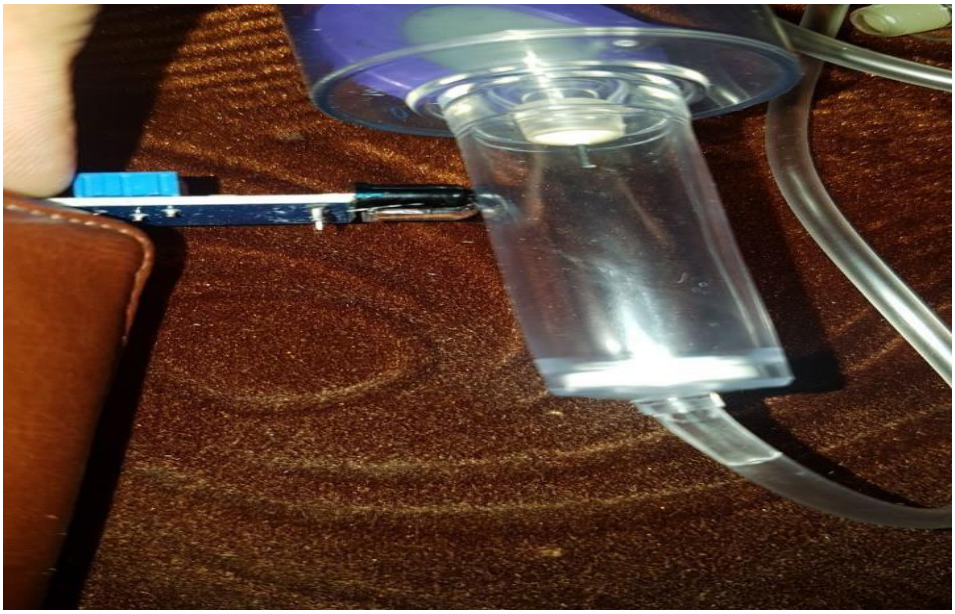

Figure 4.5: Position of IR Led and Intravenous Tube

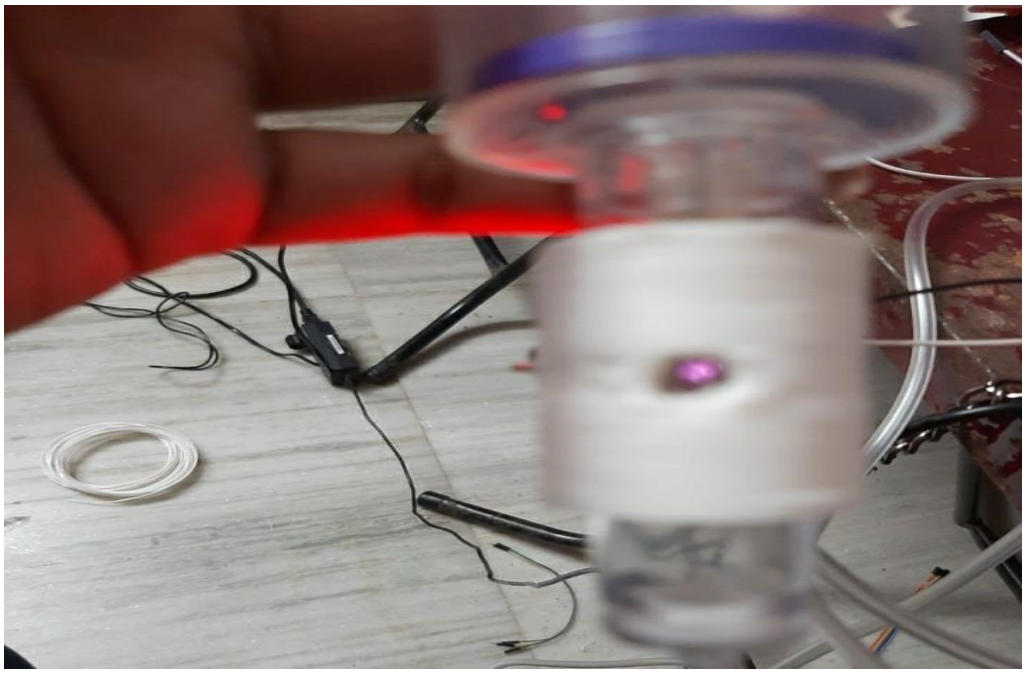

Figure 4.6: Testing IR Led

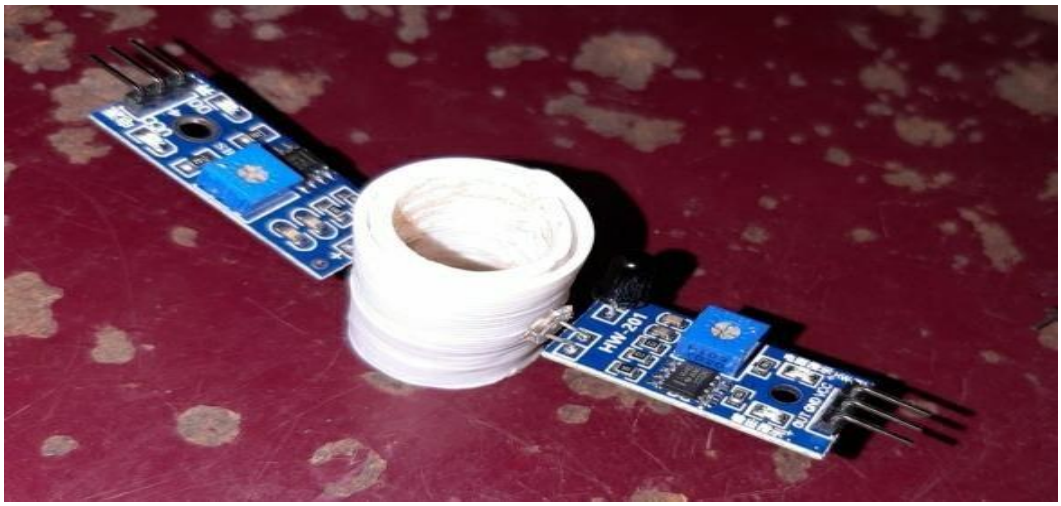

Figure 4.7: Casing for IR led and Ldr

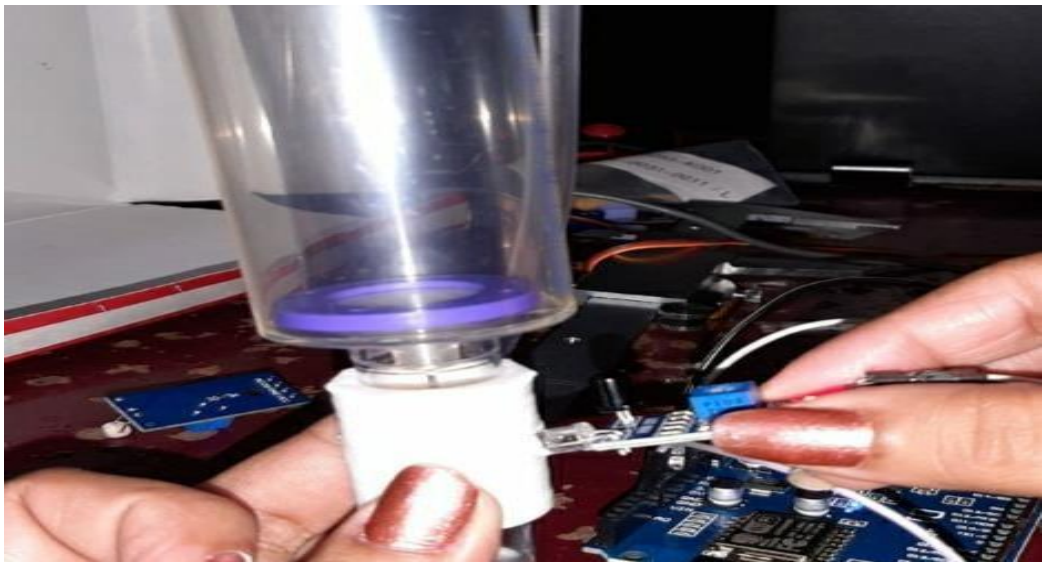

Figure 4.8: Position of the IR led and Ldr on IV tube

Figure 4.10: Position of Float sensor

Figure 4.11: Casing for Sevo Motor

Results of Testing and System Performance

Results of Testing and Integration Testing

1. Results of Testing of FloatSensor

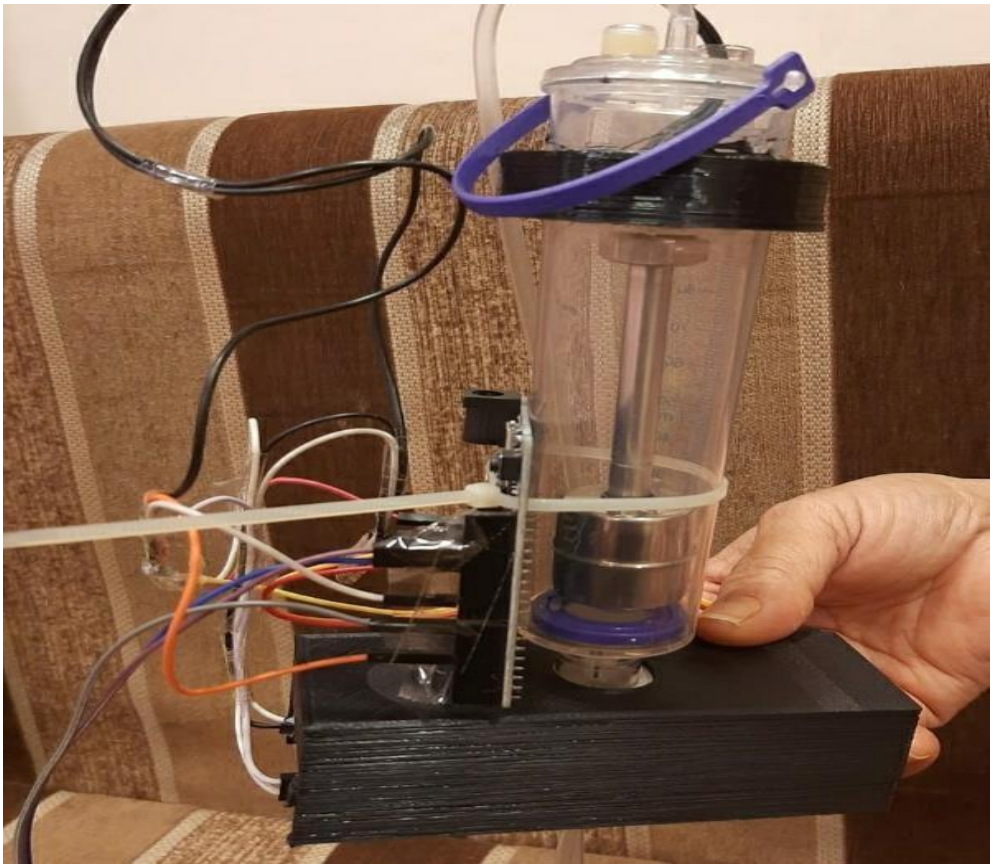

Figure 4.12: Implementation and working of Float sensor

Float level sensors are continuous level sensors featuring a magnetic float that rises and falls as liquid levels change. The movement of the float creates a magnetic field that actuates a hermetically sealed reed switch located in the stem of the level sensor, triggering the switch to open or close. In Saline monitoring system Float sensor plays a vital role.

2. Results of Testing of IR Led and LDR sensor

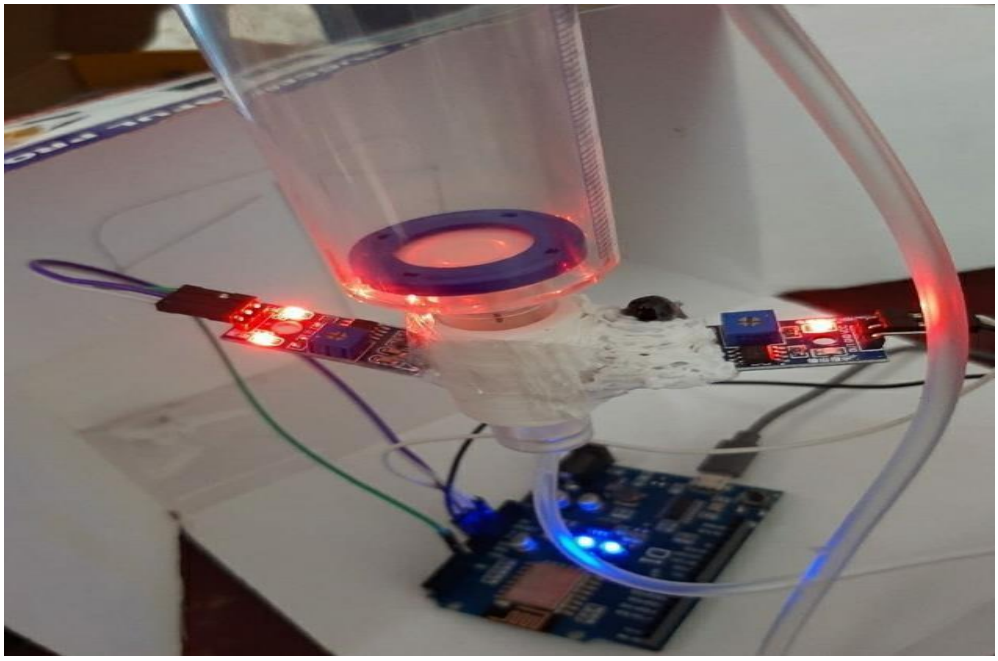

Figure 4.9: Implementation and Working of IR Led and Ldr

An LDR or "Light Dependent Resistor" is a resistor which works on the intensity of light, where the resistance decreases with the strength of the light. Light Dependent Resistors (LDR) also called as Photo Light. It is a type of sensor which actually senses the light as our eyes does. When the sunlight comes, visible to eyes it automatically switches OFF the lights. The LDR would turn on the light as soon as it senses darkness and will turn off in the morning. Remote Controlled home automation is a small step towards reducing human effort and to use technologies smartly and efficiently to human benefit.
IR stands for "Infrared rays" it simply sends a continues beam of IR light which is not visible through human eyes but still we can see IR light with the help of cell phone camera and the light gets reflected when falls on the objects the reflected light is received by a infrared receiver. The Position of IR led and Ldr was the most important and crucial part of the project as they are placed at the critical level of the Intravenous Tube i.e. IV tube and are supposed to be positioned and aligned exactly on the same line.

Results and Discussion

The Saline Drip Monitoring System provides a platform to help the hospital community to gain fruitful help about saline completion of ‘n’ no patients at time. The system performs excellently and alerts the respective nurse station. Even if he or she is busy with another some important work and don’t reach on time it won’t harm the patient. So far the coding and testing is done and the system works properly and also there is no problem with the website.

1. Results from the Floatsensor:

This system consists of two sensors that is used for monitoring the critical level of the saline liquid in the saline bottle and also there is a mechanism that will stop the reverse flow after the completion of the saline and it is empty, and that mechanism is known as servo motor and also the alarm would be generated to the respective nurse station.

Figure 5.1: Float Sensor

Float level sensor is the continuous level sensor that rises and falls as liquid level changes.

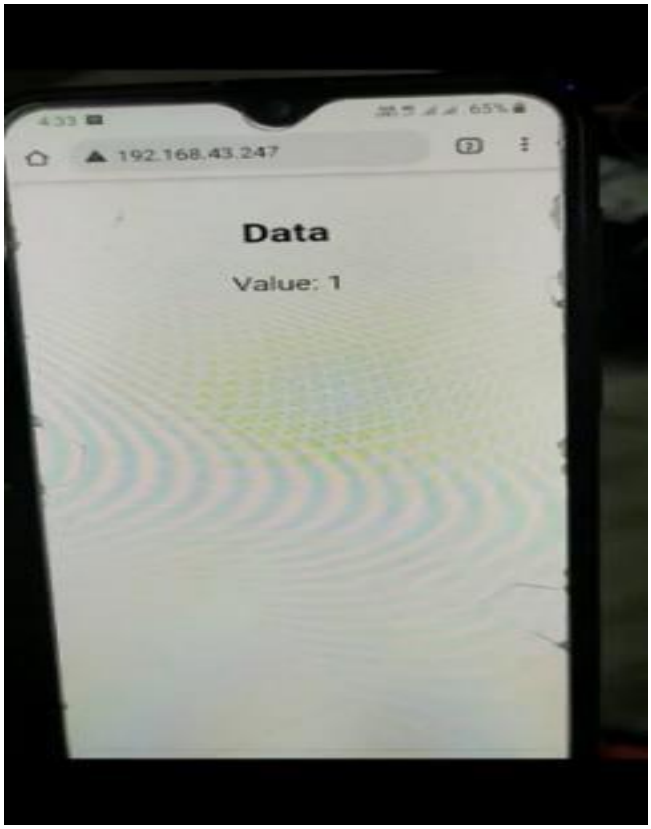

Figure 5.1: Data value 1

Data value:1, When the liquid from the saline bottle flows drop by drop into the Intravenous tube i.e IV tube is full of saline, at that time the float sensor is on the TOP. Hence, 1 here indicates binary 1 for saline is not yet over.

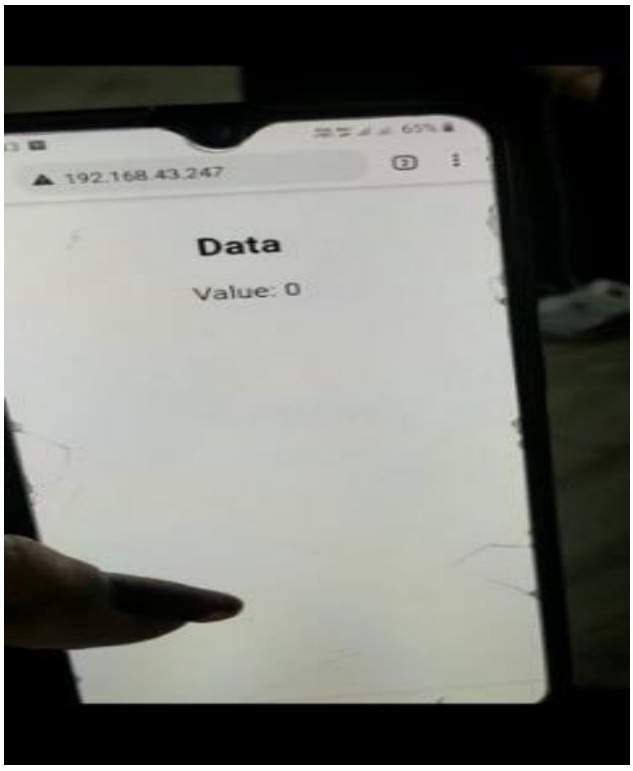

Figure 5.2: Data value 0

Data value : 0, When the saline from the Intravenous tube i.e. IV Tube moves down it will indicate that the saline is almost over and the saline bottle needs to be changed or the flow should be stopped manually. Also this system would alert them with a buzzer i.e. the buzzer will start ringing. And also it will generate the sms on the website that the saline is over. So, 0 here indicates binary 0 for saline is empty.

2. Result from the IR Led and Ldrsensor

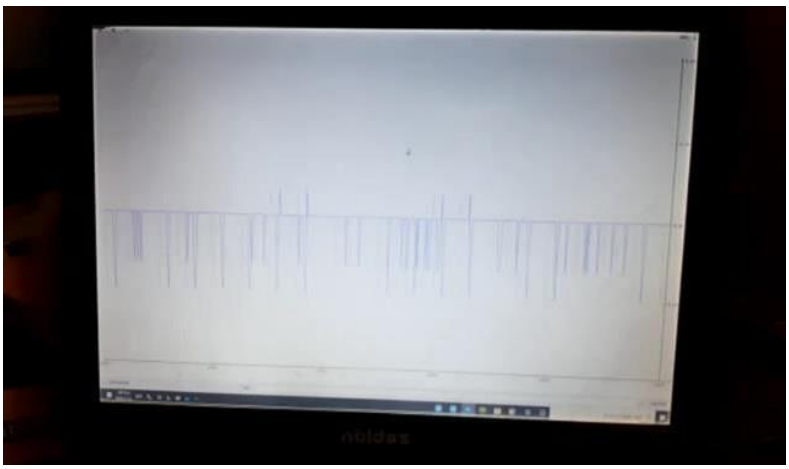

Figure 5.3: Output from IR Led and Ldr

The IR Led and LDR sensor will work similarly as the Float sensor. Only difference is that Float sensor is placed inside the Intravenous Tube and IR led and LDR is placed at the critical level.

When the saline reaches the critical level, it will be sensed by the IR Sensor. The sensed output is send to the micro-controller. And then the buzzer will start ringing for alerting the respective nurse station in the hospital. If the nurse fails to attend the patient within the set time limit, the reverse flow of the blood into the saline bottle will stopped using the servomotor.

Conclusion & Future Work

This report consists of the goals, objectives and detailed information of the Saline Drip Monitoring System. With IoT based saline level monitoring system, the manual effort on the part of the nurses is saved. Our Project on saline monitoring has been completed with a successful result. As the entire proposed system is automated, it requires very less human intervention. It will be advantageous at night as there will be no such requirement for the nurses to visit patient's bed every time to check the level of saline in the bottle since an alert notification will be sent to the nurses, doctors, caretakers when saline reaches the critical level. It will save the life of the patients. This will reduce the stress in continual monitoring by the doctor or nurse at an affordable cost. This system will help nurse and staff to improve their work speed and performance all information will be digitalized. This proposed system will reduce the manual effort. It requires very less human intervention as the system is completely automated. This eventually helps reduce humanerrors.

By implementing such a system, patients will also be rest assured, which in turn will help them get well more quickly. This project can also be added to smart card attendance system so that the controller gets the detail of absentee of a faculty and also can send message to doctor about the absence of faculty and alert another faculty to take position of that absented faculty. The flow control mechanism proposed can be modified and used in other fields such as chemical mixing. The devices used in our project can be replaced by any alternative or better mechanism can be used for pressing and the proposed work can be interfaced with keypad for better results. In future, the system can be extended to a distributed wireless network system. The flow control mechanism proposed can be modified and used in other various fields.

Furthermore, with the development of embedded hardware, more complex embedded coding can be done. The sending and receiving speed of a security alert message is high, so this can be used to give more kinds of applications in the future. Similarly, this project can be implemented on a larger scale that is on a national level with more resources and support

References

[1] Priyadharshini .R ,Mithuna.S,VasanthKumar.U,Kalpana Devi.S, Anuradha Kumari Dr.Suthanthira Vanitha.N "Automatic IntravenousFluid Level Indication System for Hospitals" International Journal for Research in Applied Science &EngineeringTechnology (IJRASET) Volume 3 Issue VIII, August 2015 Pg.no :427-432.

[2] S. Tawade, M.S. Pendse, H.P. Chaudhari "Design and Development of Saline Flow Rate Monitoring System UsingFlow Sensor, Microcontroller and RF ZigBee Module" International Journal of Engineering Research and GeneralScience(IJERGS) Volume 3, Issue 3, MayJune, 2015 Pg.no:472-478.

[3] PattarakamonRangsee,PaweenaSuebsombut,PhakphoomBoonyanant"Low - Cost Saline Droplet Measurement System using for Common Patient Roomin Rural Public Hospital" Joint International Conference on Information and Communication Technology, Electronic and Electrical Engineering (JICTEE) Janurary 2014 IEEE2014.

[4] C.C. Gavimath, Krishnamurthy Bhat, C.L. Chayalakshmi, R.S. Hooli, B.E. Ravishankera"Design and developmentof versatile saline flow ratemeasuring device and GSM basedremote monitoring device" International Journal ofPharmaceutical Applications(IJPA) Volume 3, Issue 1, 2012, Pg.no: 277- 281.

[5]]. R.Aravind, Syed Mustak Ahmed "Design of family health monitoring system using wireless communication", International Journal ofAdvanced Research in Computer and Communication Engineering Vol. 2, Issue 9, September 2013.

[6] V.Ramya, B.Palaniappan, AnuradhaKumari "Embedded patient monitoring system" International Journal of Embedded Systems and Applications (IJESA) Vol.1, No.2, December2011.

[7] D.Janani, J.Prathibanandhi, P.MeenakshiVidya, K.S.Sujatha "Wireless Saline Bottle Level Indicator for Hospitals", Compo soft anInternational Journal of Advanced computer Technology.

[8] Lei Yu, Yang Lu, XiaoJuanZhu,‖ Smart Hospital based on Internet of Things|,JOURNALOFNETWORKS,VOL.7,NO.10,OCTOBER2012,PageNo.1-8.

[9] Manoj Kumar Swain, Santosh Kumar Mallick , Rati RanjanSabat‖ Smart SalineLevelIndicatorcumController|,InternationalJournalofApplicationor Innovation in Engineering & Management (IJAIEM), Volume 4, Issue 3,March 2015,Page No.1 and 3.

[10] Mansi G. Chidgopkar;Aruna P. Phatale "Automatic and low cost salinelevel monitoring system using wireless bluetooth module andCC2500
transreceiver" International Journal of Research in Engineering and Technology (IJRET) Volume: 04 Issue: 09 September-2015 Pg.no: 274-276

Acknowledgements

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Date: 30/04/2021

Saline Drip Monitoring System

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Abstract- In hospitals, Saline is fed to patients to treat dehydration and thus improve their health. In current healthcare measures, whenever a saline is fed to any patient, the patient needs to be continuously monitored by a nurse or any caretaker. Almost in all of the hospital, a nurse or caretaker is responsible for monitoring the saline level continuously without any interruptions. Due to the negligence and inattentiveness towards saline completion by doctors, nurses or caretaker of the patients and lack of nurses with sufficient skills in hospitals and their excessive workload, a huge number of patients are being harmed in the hospitals. Hence to prevent the patient from getting harmed and protect their lives during saline feeding period, the saline level monitoring and control system have been developed.

Keywords- Sensor, IoT, Saline Drip IV Tube, Arduino, Float Sensor, Nurse.

I. INTRODUCTION

During recent years, due to the technologies advancements many sophisticated techniques have evolved for assuring fast recovery of the patients in hospitals. Need for good patient care in hospitals, assessment and management of fluid and electrolyte is the most fundamental thing required. Almost in all hospitals, an assistant/nurse is responsible for monitoring the electrolyte's bottle level. But unfortunately, most of the time, the observer mayforget 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 isproposedwhere sensor is used as a level sensor or weight sensor. It is based on the principle that the sensor output changes when fluid level/weight is below certainlimit.

II. LITERATURESURVEY

Existing system:-In the current healthcare measures, 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 thinner and allow saline fluid to flow through at a slower rate. If it is rolled in other direction, it loosens or releases the saline tubing which makes the tube less thin and allows the saline fluid to flow through at a faster rate. In the present world, there is no such monitoring system which will reduce the dependency of the patients on the nurses, doctors and would also reduce the need for the nurses to go to patient's bed every time to check saline level status of each patient. Therefore, there is need for development of IOT based saline level monitoring system.

Comparison between the tools / methods/algorithms:

1. In current health care measures, nursing professionals are responsible for managing, monitoring and providing care to the patient receivingsaline.
2. In today's world, there is no monitoring system that reduces patient dependence on nurses, doctors and every time the nurses will have to go to the patient's bed to check each patient's saline status. Therefore, the development of an IoT-based saline level monitoring system isrequired.
3. Currently the process is donemanually.
4. Our project will automatically stop when the saline drip isempty.

III. SOFTWARE ANDTOOLS

Hardware: -

- Arduino D1 Wi-Fi:-
  WEMOS D1 is a WIFI development board based on ESP8266 12E. The functioning is similar to that of NODEMCU, except that the hardware is built resembling ArduinoUNO.
  The D1 board can be configured to work on Arduino environment using BOARDS MANAGER. So, it's not necessary to use a separate Arduino board, the D1 itself can be programmed on Arduino IDE. This is handy in using with IOT projects. Further many Arduino SHIELDs are compatible with the D1 board.

- LDR:-
  Can be used to sense Light. Easy to use on Breadboard or Perf Board Easy to use with Microcontrollers or even with normal Digital/Analog ICSmall, cheap and easily available. Available in PG5, PG5-MP, PG12, PG12-MP, PG20 and PG20-MP series

- IR LED:-
  The IR LED or Infrared LED has polarity i.e.it has a positive and negative pin. The pin which is long is the positive pin (anode) and the pin which is short is the negative pin (cathode) as shown in the above IR LEDpinout.

- Float Level Sensor:-
  Float Level Sensor are continuous level sensor that rises and falls as liquid levels change.

- Battery (6V 1.2amp/hr):-

6 Volt 1.2 Amp 20 Hour Sealed Lead AcidBattery with F1 Terminals. Backup battery delivers a 24charge.

- Servo Motor:-
  Servo motor is a type of motors whose output shaft can be moved to a specific angular position by sending it a coded signal. The servo motor will maintain the position of the shaft as long as you keep applying the coded signal. When you change the coded signal, the angular position of the shaft will change. A common type of servo provides position control. Servos are commonly electrical or partially electronic in nature, using an electric motor as the primary means of creating mechanical force.
- Buzzer:-
  Buzzer is an audio signalling device. Buzzer will alert the nurses, caretakers and doctors when saline reaches the critical level and for replacement of salinebottle.

Software: - ARDUINO IDE, TunIOT

IV. ARCHITECTURALDESIGN

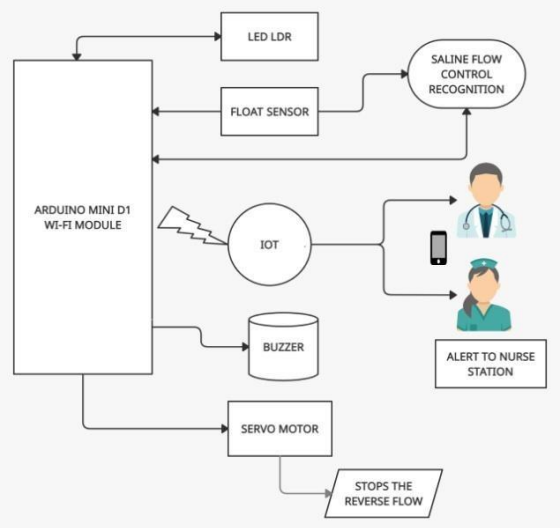

Figure 1: Block Diagram of Saline Drip Monitoring System

This proposed system will function for two different scenarios which are explained below as follows:
1) Saline reaches at criticallevel.
2) Nurse fails to attend the patient to replace the saline bottle.

In the 1st scenario, after getting consumed by the patient, saline reaches the critical level which is sensed by the Float sensor and the IR sensor. This sensed output is sent to the micro-controller which scans the database for retrieving the contented information and buzzer starts ringing for alerting the nurses and doctors in the hospitals. A timelimit will be set for ringing of the buzzer. An alert message is sent to the concerned nursesand

doctors associated with the patient through the use of internet. If the nurse attends the patient, then she should stop the buzzer and reset the whole system. If she fails to do so, then 2nd scenario takesplace.

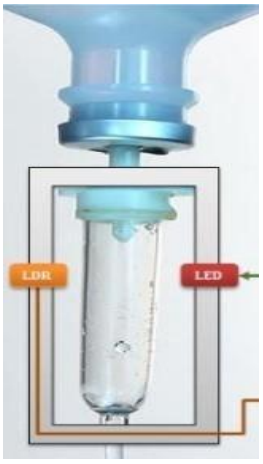

Figure 2: Position of IR Led and LDR sensor

In the 2ndscenario, if the nurse fails to attend the patient within the set time limit, the reverse flow of the blood into the saline bottle is stopped. For this a servo motor arrangement will be made. The clamp will be attached to servo motor, along with the compression and stretching ofspring, the clamp will also move in forward and backward directions. Again the IR sensor, at the neck ofthe saline bottle will sense that the saline is totally consumed and buzzer will again start ringing louder to notify the nurse that the saline is totally consumed and there is a requirement for replacement of saline bottle. The instructions for Arduino will be sent to Servo motor and as per functioning of DC motor the servo will move in forward direction and pinch the intravenous tube and stop the reverse flow of the blood in the salinebottle

V. RESULT

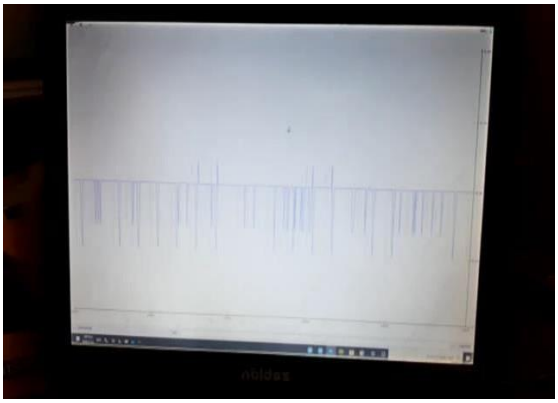

Figure 3: Output from IR LED and LDR

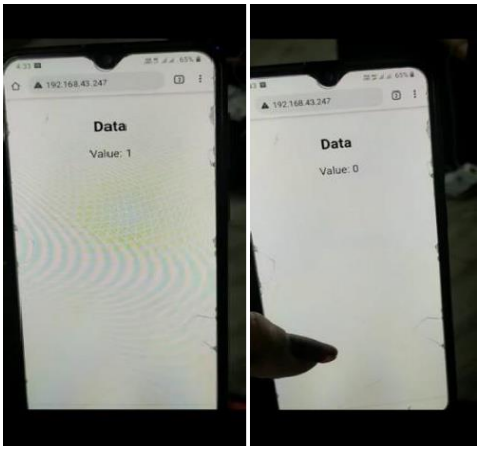

Figure 4: Output of float sensor on website

VI. CONCLUSION

With IoT based saline level monitoring system, the manual effort on the part of the nurses is saved. As the entire proposed system is automated, it requires very less human intervention. It will be advantageous at night as there will be no such requirement for the nurses to visit patient's bed every time to check the level of saline in the bottle since an alert notification will be sent to the nurses, doctors, caretakers when saline reaches the critical level. It will save the life of the patients. This will reduce the stress in continual monitoring by the doctor or nurse at an affordable cost. This system will help nurse and staff to improve their work speed and performance all information will be digitalized. This proposed system will reduce the manual effort. It requires very less human intervention as the system is completely automated. This eventually helps reduce human errors. By implementing such a system, patients will also be rest assured, which in turn will help them get well morequickly.

VII. ACKNOWLEDGMENT

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VIII. REFERENCE

1. Priya dharshini.R,Mithuna.S, Vasanth Kumar.U, alpanaDevi.S, Dr .SuthanthiraVanitha.N "Automatic Intravenous flidLevel Indication System for Hospitals" International journal for Research in Applied Science &EngineeringTechnology(IJRASET) Volume 3 Issue VIII, August 2015 Pg.no : 427-432.
2. S. Tawade, M.S. Pendse, H.P. Chaudhari "Design and Development of Saline Flow Rate Monitoring System UsingFlowSensor, Microcontroller and RF ZigBee Module" International Journal of Engineering Research and GeneralScience(IJERGS) Volume 3, Issue 3, MayJune, 2015 Pg.no:472-478.
3. PattarakamonRangsee,PaweenaSuebsombut,Phakphoo mBoonyanant"Low-Cost Saline Droplet Measurement System using for Common Patient Room in Rural Public Hospital" Joint International Conference on Information and Communication Technology, Electronic and Electrical Engineering (JICTEE) Janurary 2014 IEEE 2014.
4. C.C. Gavimath, Krishnamurthy Bhat, C.L. Chayalakshmi, R.S. Hooli, B.E. Ravishankera"Design and developmentof versatile saline flow rate measuring device and GSM basedremote monitoring device" International Journal of Pharmaceutical Applications (IJPA) Volume 3, Issue 1, 2012, Pg.no: 277-281.
5. R.Aravind, Syed Mustak Ahmed "Design of family health monitoring system using wireless communication", International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 9, September 2013.
6. V.Ramya, B.Palaniappan, Anuradha Kumari Embedded patient monitoring system" International Journal of Embedded Systems and Applications (IJESA) Vol.1, No.2, December2011.
7. D.Janani,J .Prathibanandhi, P.Meenakshi Vidya, S.Sujatha "Wireless Saline Bottle Level Indicator for

Hospitals", Compo soft an International Journal of Advanced computer Technology. Lei Yu, Yang Lu, XiaoJuanZhu,|SmartHospitalbasedonInternetof Things|,JOURNALOFNETWORKS,VOL.7,NO.10, OCTOBER 2012, PageNo.1-8.

8. Manoj Kumar Swain, Santosh Kumar Mallick ,Rati RanjanSabat| Smart Saline Level Indicator cum Controller|,InternationalJournalofApplicationor Innovation in Engineering & Management (IJAIEM), Volume 4, Issue 3,March 2015,Page No.1 and3.

9. Mansi G. Chidgopkar;ArunaP. Phatale "Automatic and low cost saline level monitoring system using wireless bluetooth module and CC2500 transreceiver" International Journal of Research in Engineering and Technology (IJRET) Volume: 04 Issue: 09 September-2015 Pg.no:274-276