Saline Suffusing Level Ascertainment Using IOT

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Abstract- *As in the hospitals the each patients should be treated properly. In that manner saline is one of the important for patients. As saline is used for the treatment of dehydration, metabolic alkalosis in the presence of fluid loss, and mild sodium depletion. When saline is given to the patients ,then it is necessary for the nurses and doctors to have an continuous monitoring on the level of saline as well as they have to note the droplet rate of the saline .There are many cases where patients are harmed due to inattentiveness of the nurses, as this absence can lead to patients death, as once the saline bottle is empty there is an problem of backflow of blood and if the droplet rate is fast then it may cause many changes in patient as far the headache, high blood pressure and it may cause trouble in breathing as well as the body temperature should be noted. Hence to protect the patient of getting harmed the Saline level observation technique based on IoT has been developed. In this the sensor will observe the saline drops and the buzzer will let the nurse about the saline's emptiness.*

Keywords- Saline, IR Sensor, Flow Sensor, Servo motor, buzzer, Arduino Microcontroller.

I. INTRODUCTION

Arduino microcontroller consists of both physical programmable circuit board and a piece of software or IDE (Integrated Development Environment) that runs on the computer, thus it plays a major role in developing the constantly monitoring system. Mostly it controls the all over device such as working of sensors [1] [2]. The busy schedule and huge number of patients may causes the inattentiveness of nurses towards the patient .Thus it results to the rushing back of blood through the intravenous tube because of the imbalance created between the blood pressure and the pressure within the empty saline bottle. This may cause the back flow of blood from the vein through cannula resulting in the reduction of patient hemoglobin levels and shortage of red blood cells (RBC's)[10][11][12].

Mostly these type of problem occurs while the absence of nurse in the hospital, it leads to loss of patient's life. Thus, to overcome the problem of droplet rate, saline bottle emptiness and the body temperature of patient all will be monitored by the saline level observation system [14].

In this system, once the saline level comes to an end, automatically the tube will be compressed and it will give an buzzer to the nurses, additionally if the saline bottle is not changed within 20 second then the buzzer will be snoozed again until it is being change.

II. LITERATURE REVIEW

Inside saline bottle there is a saline solution (intravenous fluid) which is a combination of sodium chloride and sterile water. The water helps to rehydrates the patient's body.

Sodium chloride provides electrolytes. Electrolytes improve your immune system, stabilize blood sugar, repair tissues, and balance blood pressure balance. Saline solution for medication, minerals, vitamins. As it directly enters to blood cells and stream. As it is known saline solution is an combination of sodium chloride and water at a concentration of 9 grams of salt per liter (0.9% solution).Saline has a pH of 5.5 making it acidic [5][6].Most of the doctors and nurses are responsible for the monitoring of saline. But, it is difficult for them to monitor them properly and there is no automated system. Thus, the saline level observation system will observe the completion of bottle as well as will stop the back flow of blood with noted droplet rate.

III. EXISTING APPROACH

In the present health care system doctors and nurses are responsible for taking care of a patient. They are the one who monitors the saline level and uses roller clamp for controlling the flow of saline manually. When the clamp is rolled in upward direction it compresses the tube and stops or slows the saline rate [3] [5].If it is rolled in downward direction it releases the tube and increases the fluid rate. In the present world there exists no system which will reduce the dependency of nurses in monitoring the saline levels. Thus there is a need for development of automatic saline suffusing level ascertainment using IoT, which will let the nurses/doctors to know about the completeness of saline bottle

using snoozing technique and it helps them to calculate the droplet rate that is measured by the flow meter [12].

IV. PROPOSED METHODOLOGY

4.1. System Requirements

4.1.1. IR Sensor

IR Sensor is an electronic device that emits the light in order to sense some object of the surroundings .An IR Sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum all the objects radiate some form of thermal radiation. It is set at the trickle office of the saline bottle to observe the saline fruition status [1] [5] [7].

4.1.2. Arduino Microcontroller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It is a physical programmable circuit board. It is based on Atmel Microcontroller. It is used as programming unit for sending guidelines to the servo engine, buzzer and flow meter [1] [4].

4.1.3. Servo Motor

A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It takes a shot at the PWM (Pulse Width Modulation) standard, which implies its point of turn is constrained by the term of heartbeat applied [1] [5].

4.1.4. Buzzer

A buzzer is an audio signal device, which may be mechanical, electro mechanical, or piezoelectric, alerts the nurses as soon as the bottle gets emptied [1].

4.1.5. Flow Meter

It is device used to measure the volume or mass of gas or liquid. It works based on Faraday's Law of Electromagnetic induction. It calculates the saline's flow level.

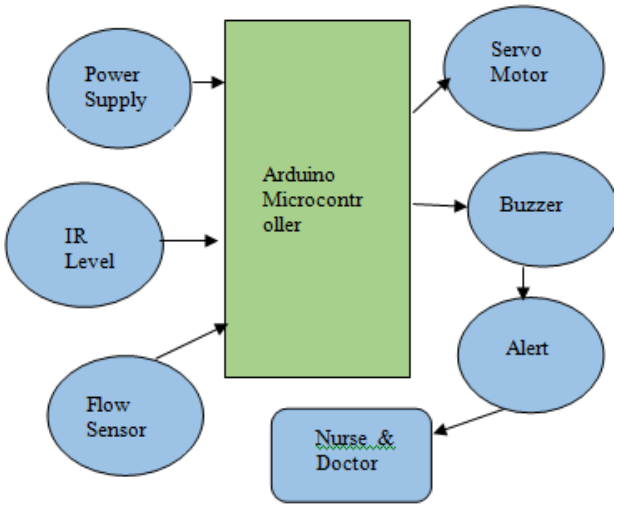


Fig.1.Architecture diagram.

In Fig.1, Arduino takes the power as the input through the USB cable and IR sensor is placed at the drip chamber of saline bottle. When the saline drop is not detected continuously for 30 sec then the IR sensor sends the signals to servo motor, buzzer and flow meter. The servo arm rotates the tube by 90 degree preventing the reverse flow of blood and buzzer gives the sound alerting doctors/nurses.

4.2. Working System

The proposed system functions in some different scenarios which are explained as follows above

1. Giving a buzzer
2. Twisting the intravenous tube
3. Snooze for every 20 sec if the saline bottle is being changed
4. Measure the body temperature to know the condition of patient

In the first scenario the IR sensor detects the each saline drop and if it does not detect the drop for a specified time period it gives a buzzer, alerting the nurse about saline completion and If doctors/nurses doesn't changed the saline bottle then the buzzer will be snooze for every 5 sec until it is being changed.IR sensor is used for both saline as well as body temperature to know the condition of patient. In the second scenario the arm of the servo motor rotates about 90 degree simultaneously with the buzzer by twisting the intravenous tube.

4.3 An algorithm of working of system

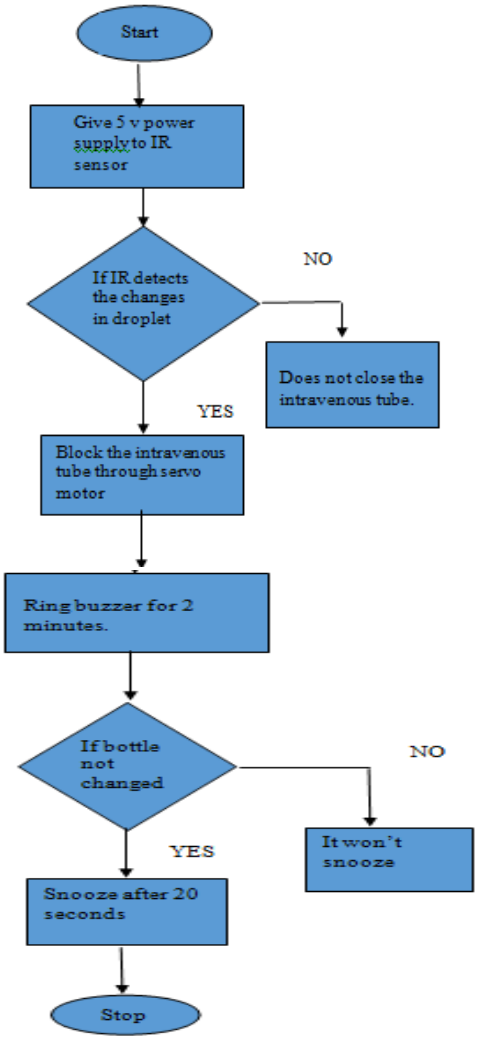
1. Acquire 5 voltage power supply from battery
2. Input 5 voltage to IR Sensor

3. If the detector does not detect the saline drops for or increased/decreased then
   3.1. Ring buzzer for 2 minutes
   3.2. Sending the signal to the servo motor
   3.3. Rotation of servo arm will help to stop the back flow of blood in intravenous tube.
   3.4. Twisting the Intravenous tube
   3.5. Blocks the reverse flow of blood
4. Snooze if nurses/doctors doesn't changed the bottle for every 20 sec until it is being changed.

4.4 Mathematical Expression

x=droplet rate(gtts/min)
y=servomotor (0◦)
sound→0=off&1=on
if x!=constant value of droplet rate
y=y+90◦ && sound=1

4.5 Flow Chart



V. CONCLUSION

As the whole proposed framework is automated it requires very less human intercession and endeavors in the center [16-18]. It will be more invaluable at nights as there will be no such prerequisite for the nurses to check level of saline in saline container every now and again which is an apprehensive undertaking. It also saves the patients getting them harmed from the backflow of blood into the saline container which sometimes can have a deadliest impact. This will lessen the worry in persistent observing by the medical care taker at a reasonable expense.

VI. FUTURE SCOPE

In future, it can be implemented with more features using IoT like. It can also include the smart health system, which gives the information about blood pressure, heart rate and also the pulse rate. This help in deciding whether the patient requires another saline bottle or not.

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