

Real Time Drip Monitoring System Using XKC-Y26-NPN

Nazida Ansari¹, Mohammad Shahid Husaini², Vadthya Bheemdu³
Under Graduate Students, Department of Electronics and Communication^{1,2}
Assistant Professor, Department of Electronics and Communication³
G. B. Pant Government Engineering College, New Delhi, India

Abstract: *The Project aims to Present a real time Monitoring System which will be used to monitor the Intravenous Fluid remaining in the IV fluid bottle and to provide with an indication such that a timely alarm or an indication can be generated which will then be attended by the hospital staff. The need of the project arises from the fact that often times due to negligence or the absence of required staff, the needs of the patient is overlooked which not only result in discomfort but also can cause infection and even blood backflow. The project utilizes XKC Y-26 N-P-N sensor to detect the overall level of the fluid left in the bottle and if it is found that the level has gone below certain stipulated level an alarm system gives indication to the nursing station. The project also combines the temperature and heart sensors as it is vital to monitor the two important parameters, then with assistance from Excel data streamer Module the data is sent to excel sheet so that it can be displayed in an interactive model. The project has the potential to be used in hospitals which will be beneficial given the adverse Covid related scenario and the entire setup can be used to detect not only the IV fluid level but also any other fluid and sensor that is given to the patient.*

Keywords: Intravenous Fluid, Sensor, XKC-Y26-NPN, Data Streamer

I. INTRODUCTION

A robust patient monitoring system includes continued monitoring of the important health parameters so as to get better insight of the patient's health. One such parameters is administering Intravenous Fluid(IV Fluid) as it has been found to be very effective in order to provide the body with essentials in quick time and act as a life saver in many cases. The gradual rise in population has also leads to the increase in the total number of patients, and pandemic has made the scenario worse, it has given the need of the effective patient monitoring system without the constant human intervention so as to improve the overall efficiency of the Monitoring System without actually increasing the staff while at the same time maintaining a very high Efficiency Standard. The rise in overall number of the patients cannot be met with increasing the number of personnel as the medical industry is already running short on budget and technological improvements with the potential of cutting the overall cost will not only serve the purpose but as the chances of error in a machine-driven environment is certainly less than human maintained system. The Project aims to provide a reliable and efficient system which can be used on multiple bed at the same time and which aims to provide a real time monitoring system.

The Need of the Project arise from the fact that often times due to Negligence the hospital staff forget to change the IV fluid in time which not only causes severe discomfort to the patient but can also be very troublesome especially when it comes to critical patients given the fact that blood backflow can result in blood loss and also in infections, and patients who are in Intensive Care Unit (ICU) or who are sub conscious cannot report physically to the staff if IV fluid bottle is empty so a Sensor along with concepts of real time data transfer will be of great significance to the patient.

The project uses the information coming from the level sensor attached to the IV Fluid along with temperature and heart sensors to give an overall insight into the patient's health, and since the data collection is done without the need of human intervention the collected data is not only reliable but also error free and in cases of emergency will act as an important information providing system which will have the potential to save lives in times of crisis.

II. LITERATURE REVIEW

AruliousJora, DivyaLaveena, Earlina and Nirmala of Loyola - Icam College of Engineering and Technology, Chennai, Tamil Nadu, India, proposed a paper, "Automatic Intravenous Fluid Level Indication System for Hospitals".

Description: To indicate the level of IV fluid light dependent resistor (LDR) is used. It senses the light produced by the LED and produces the output. The LDR and the LED are fixed opposite to each other on either side of the IV fluid bottle at the near bottom of the bottle. Until there is a solution in the bottle up to the level set, the light received by the LDR will be low which increases its resistance. When the level of fluid in the bottle goes below the set level, the conductivity of the sensor increases. The Arduino controller is used which is set so as to compare the intensity of light that falls on the LDR with a predetermined value and if it increases, the circuit is programmed in such a way that the buzzer buzzes in the nurses' room indicating that the IV fluid is about to be over and the nurse/ medical assistant is needed to change the fluid.

III. PROPOSED REAL TIME IV FLUID MONITORING

In proposed real time IV fluid monitoring, Xkc-y26-npn sensor is placed on IV fluid bottle to indicate the fluid level. Other sensors like heart rate sensor, temperature sensors are also placed at the patient side to measure continuously heart rate and temperature. All monitoring parameter values will be sended in real to the Nursing station to take the necessary action in emergency condition of patient.

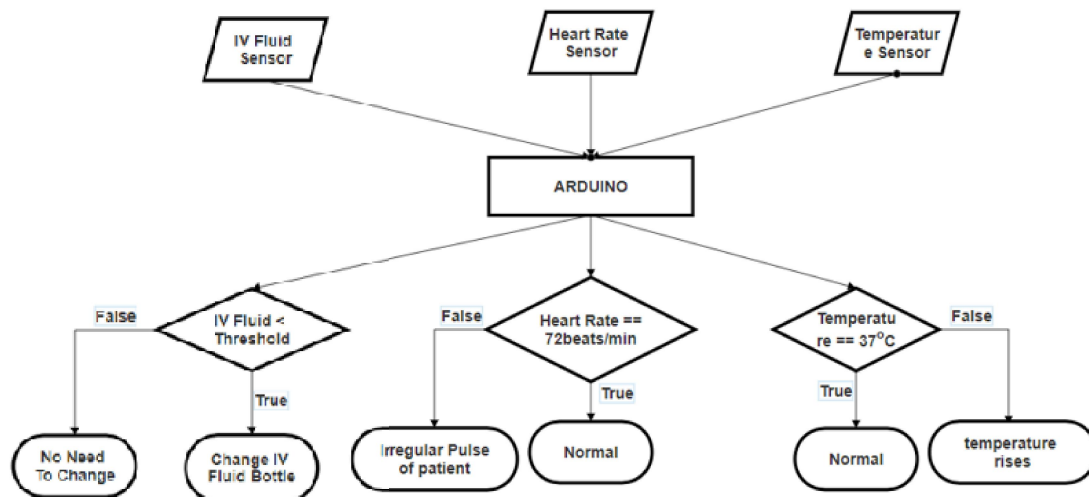


Figure 1: The flowchart indicating the workflow

IV. TECHNOLOGY USED

4.1 XKC-Y26-NPN Sensor

XKC-Y26 is a non-invasive liquid level detection sensor which detects the liquid present in the bottle or the container without being dipped in the liquid. The sensor is Accurate and stable detection with strong compatibility to penetrate into tube like plastic, glass, ceramic etc. Its sensing tube wall thickness can be up to 20mm. It is applicable to different shapes of container or tube level's liquid level detection.

When there is liquid, sensor will generate certain static capacitance with liquid Parasitic capacitor. When the liquid goes down slowly the liquid parasitic capacitor willvanishes to this static capacitor so that the terminal capacitance of sensor will decrease. The changing capacitance signal will be input to the Arduino (microcontroller) and achieve signal switch, then transform the changing capacitance value into variation of certain electric signal.

The sensor in the project is used such that the level of the IV Fluid is constantly monitored and as the IV fluid decreases below a certain threshold the automatic alarm system goes off as to indicate that the IV bottle needs to be replaced.

4.2 Heart Rate Sensor

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heart-beat. The heartbeat sensor is based on the principle of photoplethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (avascular region). In the case of applications where the heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by the blood, the signal pulses are equivalent to the heartbeat pulses. Heart rate sensor is used to measure pulse per minute of the patient

4.3 Temperature Sensor

The Thermostat is a contact type electro-mechanical temperature sensor or switch, that basically consists of two different metals such as nickel, copper, tungsten or aluminium etc., that are bonded together to form a Bi-metallic strip. The different linear expansion rates of the two dissimilar metals produces a mechanical bending movement when the strip is subjected to heat. LM35 is used to measure the patient temperature.

4.4. Arduino IDE

Arduino Integrated Development Environment is an open-source Arduino Software which makes it easier to write code and upload it to board. It helps in compiling the code so as to achieve the desired result and whenever an error occurs it gives indication so that necessary corrections can be made.

4.5. Excel Data Streamer

Excel data streamer is a novel way of sending data to and fro from Microcontroller to the Excel workbook and vice-versa. In this project the live data received from the Arduino was sent to Excel Data streamer. Since Microsoft office is one of the widely used software, using this software enables a greater reach for the project.

V. CIRCUIT DIAGRAM AND WORKING

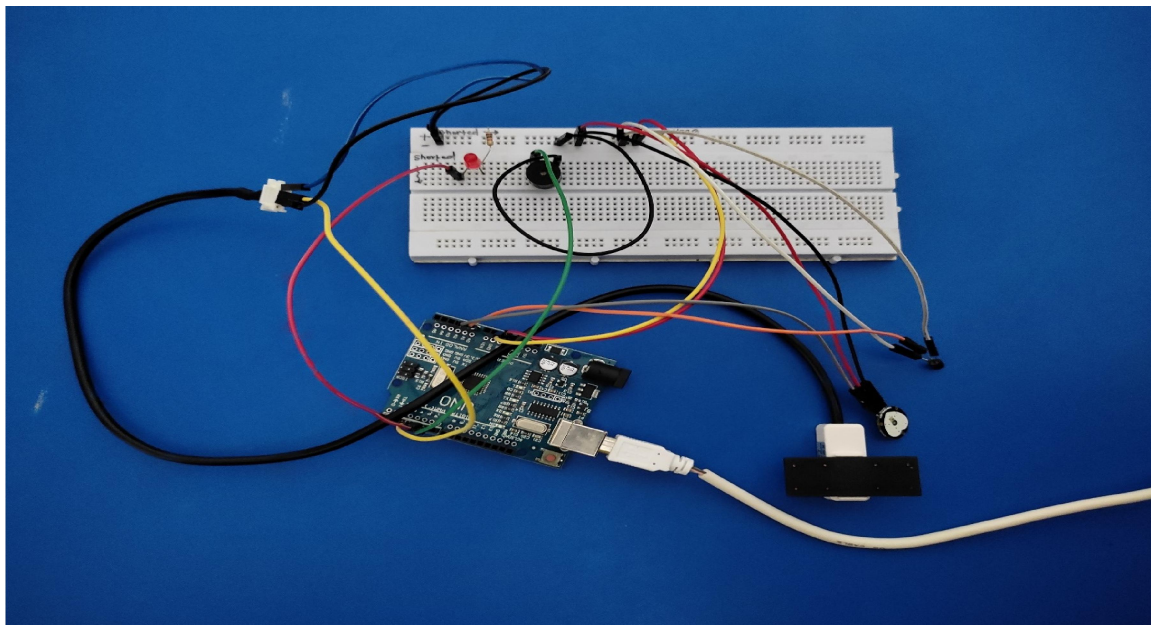


Figure 2: Circuit of working model

The sensor used in the Project works on the principle that whenever the total volume of the fluid left in the bottle goes down a certain stipulated level it sends an indication to the Nursing Station as well as to the relatives of the patients so that timely action can be taken. When the IV fluid reaches to threshold level set by medical staff, xkc-y26-npn indicator sensor sends signal to the Arduino board which turns on the LED, Buzzer at patient side along with sending the alert to the nursing station in real time. Temperature sensor and heart rate sensor continuously collect data from patient body and sends to the nursing station through Arduino.

At nursing station, IV fluid level along with other monitoring parameters heart rate and temperature of patient are collected on real time basis. If fluid level goes down from threshold value alert will generate to change the IV fluid with patient information. Heart rate and temperature of patient are very important parameters to monitor, irregular values of heart rate (other than 72/min) and temperature (other than 37 Degree Celsius) by the respective sensors emergency alert will be generated showing patient information to attain the patient at nursing station.

The LED and buzzer along with level sensor XCK-Y26-NPN at patient side are used to highlight the IV fluid status so that a prompt action can be taken in emergency. The two sensors additionally used are Heart Rate and Temperature Sensor, as it is apparent from the fact that in case of emergencies it becomes very important to monitor both these parameters regularly so to be able to access the situation with more insight. Heart Rate Sensor monitors the heart Rate and the Temperature monitors the overall temperature of the body. The Entire set-up is interfaced with the Arduino Uno (ATmega328) and works in the way such that The XKC-Y26-NPN sensors senses the level of IV Fluid remaining in the Bottle and when the level goes down the certain stipulated limit the Arduino gives indication to the buzzer and turns on the LED at patient side at the very same time the Arduino board also collects the data coming from the temperature and heart sensors and together these data is sent to the nursing station through excel data streamer.

VI. OBSERVATIONS

We successfully demonstrated the working of the project and successful implementation of the technology so as to calculate the total volume of Intravenous fluid left in the bottle and to monitor the overall health of the patient by monitoring Heart rate and Temperature. The data obtained from the sensors was successfully transmitted to a nursing station in real time and whenever any measured value goes below the stipulated limit an On-Screen alarm system showed an indication so that a timely action can be performed.

NURSING STATION

PATIENT MONITORING

Patient Monitoring parameters are IV fluid level, pulse and temperature

Time	REAL TIME MONITORING PARAMETERS	MONITORING STATUS	REAL TIME MONITORING VALUES
07:25.7	PATIENT INFORMATION	ROOM NO 2	BED 3
07:25.7	IV FLUID	CHANGE IV FLUID	LESS THAN 20% LEFT
07:25.7	PATIENT PULSE	NORMAL	72
07:25.8	PATIENT TEMPRATURE in C	NORMAL	37.09°C
07:25.8	PATIENT TEMPRATURE in F	NORMAL	98.76F

Figure 3: The display of the information on Nursing Station

VII. CONCLUSION

The Aim of the project to detect the total intravenous fluid remaining in the bottle and to be able to generate an indicator along with the detection of Heart Rate and Temperature of the patient so that timely action can be performed by the hospital staff was achieved successfully. The project end goal was to create a system which will help to minimize the human monitoring so that the efficiency can be improved and probability of error due to negligence can be suitably reduced. The sensor is able to detect the total fluid remaining in the Intravenous Fluid Bottle and to generate

the alarm which will help the hospital staff in undertaking timely action which will be very beneficial to the patient. The project will help solve the problem of Blood Reflux or any other complication arising with the patients. The project will act as huge boon for the patients who are in Intensive Care Unit or are in vegetative state therefore unable to inform the nursing staff on their own, as it has the potential of proving with indication SMS.

With the rise of Covid 19 and increasing number of patients requiring the need of Intensive Care Unit it has become imperative that new technological progress eliminates the need of physical monitoring and used a system in which maximum assistance can be provided with minimal staff. As the Sensor, XKC Y-26-NPN, has a potential to detect other fluid, this designed system will find broad use the medical industry as this automatic system capable of sending alert will be very helpful in improving the overall efficiency of the medical system.

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