IOT BASED DRIPS MONITORING SYSTEM IN HOSPITAL

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ABSTRACT

The development of a saline drip detection and control system for injecting saline or intravenous fluids into a patient's veins is the primary objective of this project. The solution presented in this study uses the Internet of Things to handle problems like blood loss and fluid leakage. solution for issues including blood loss and fluid leakage, among others. We created the Automated Intravenous Drip Monitoring System as a result. In this project, we manage the drop rate, detect tube obstruction, and alert the user when the drips are emptied using an Arduino-based microcontroller. Here, we'll use an ultrasonic sensor to keep track of the drip rate and determine if it's low or excessive. The MEMS motion sensor allows us to track the patient's mobility as will.

1. INTRODUCTION

The integration of the physical world into a computer-based system is made easier by IoT systems. The Internet of Things (IoT) simplifies tasks by automating routine tasks, improving living quality and generating cost and time savings. Generally, the significance of health care increases with population density. Therefore, it is essential that everyone in the globe takes good care of their health. The health monitoring system greatly benefits from the Internet of Things (IoT). By incorporating this technology into hospital management systems, we can enhance patient care, reduce the capital and lab our intensity of the medical personnel, and reduce operating costs for the hospitals. In the recent years, a variety of automated health monitoring devices have been created to assure patient safety while also lowering medical staff stress. In the proposed work, a monitoring system for automatic control of liquid level with the assistance of the Internet of things is used to manually control flow rate via a mobile app, monitor IV fluid level in the bag and alert medical staff to change the bag, and also a monitoring system for automatic control of liquid level with the assistance of the Internet of things is used to manually control flow via a mobile app. A remote drip infusion device's infusion rate and empty infusion were detected using a Bluetooth module. In our suggested method, the drip flow will be manually controlled, and low drip and overdose warnings will be given. Here, we'll use ultrasonic sensors, eye on the drip rate and determine whether it's low or excessive. We'll also use MEMS sensors to record the patient's motion while they take drips after surgery or when they're in a life-threatening situation, and we'll use IOT to wirelessly communicate the data over Bluetooth. For our alert system, we use a messaging system and a buzzer system. An alarm will be issued to the doctor's or nurse's station if the patient is uneasy or if any dramaticchanges take place.

2. SOFTWARE AND THE ARDUINO UNO BOARD

The ATmega328p microcontroller serves as the processing engine in the embedded board known as the Arduino Uno. The digital and analogue pins of the Arduino Uno board are connected to MEMS, Ultrasonic sensors, and other actuators. Using an Uno board, the sensor's data is processed and shown in a 162 LCD with seven segments. The Arduino Uno Board comes with built-in features including GPIO (General Purpose Input and Output) for connecting sensors and actuators, PWM (Pulse Width Modulation) for controlling actuators, and ADC (Analogue to Digital Converter) for analogue sensor input. A personal computer was used for the Arduino Uno's power supply and programming. To programme, debug, and upload to the ROM of the Arduino, the Arduino Integrated Developer Environment (IDE) was installed on a computer.

3. MEMS SENSOR

Capacitive plate IC technology is used in Micro Electromechanical System Sensors to sense movement, pressure, and other things. Due to variations in capacitance between the plates caused by mechanical movement, a potential difference is created. In our suggested study, patient hand motion was detected utilising MEMS sensors.

4. BLOCK DIAGRAM OF PROPOSED SYSTEM

Figure 1 depicts the block diagram of the saline monitoring system. The diagram above 25,26 illustrates the basic logic of the system design. IoT gadgets can wirelessly transmit all of the patient's bodily data to computer- or mobile-based apps via sensors [27] [28]. The real-time system can monitor and evaluate all of the data through the apps using a mobile app. An ultrasonic sensor may be used to gauge the fluid level. If the fluid level becomes empty, the medical station will be contacted 29,30. The MEMS sensor may be used to track the patient's motion. By evaluating the fluid status , a doctor or a nurse mamanagethe flow rate and the patient's mobility.

Consumer data may be gathered by IoT devices using Bluetooth, WiFi, or any other internet platform. To assist the patient in preventing a heart attack or stroke at an early stage, data such as fluid levels and patient movement can be monitored. The patient's data can be shown via mobile apps by utilising a mobile app. We created the system as a real-time monitor as a consequence. A free, open-source software programme called the Arduino IDE enables users to create and upload code in a real-time setting. People that want an additional degree of redundancy typically use this code since it will be preserved on the cloud. With the system, every Arduino software board is fully compatible Dot MCU.

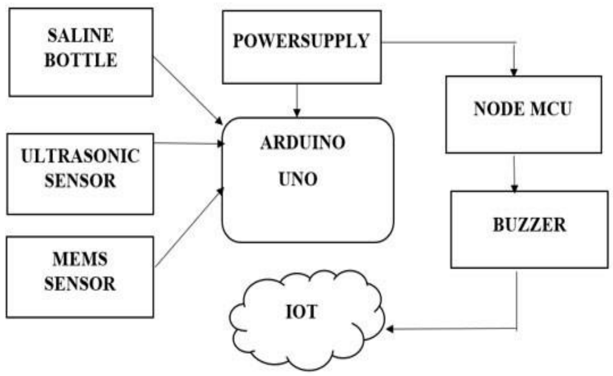

Fig 1: Block diagram of proposed system

5.RESULTS OF SIMULATION

We use ISIS Proteus Design Suite, a software programme designed specifically for automating electronic design, in our work. First, we construct the circuit for the LCD that is linked to the Arduino Uno on the transmitter side. Then, we install sensors like ultrasonic, flow, and MEMS sensors with battery sources attached to the Arduino pins, and we write and compile the programme codes using the Arduino IDE. When we increase the sensor readings, the output will show the values on an LCD or serial monitor, and an LED will illuminate. If the values drop, the LED will turn off. Figures 2 and 3 illustrate the control circuit's simulation output.

6.SENSOR MEMS

The first blue LED will illuminate and show S1 with the number 1023 in the LCD if we increase the ultrasonic sensor's value.

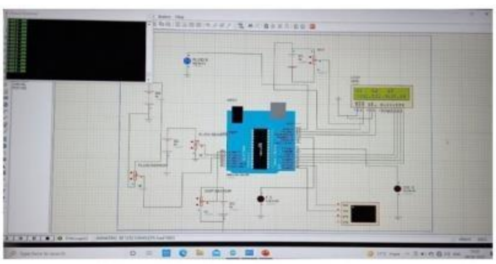

Fig 2 Simulation of Ultrasonic Sensor

MEMS SENSOR

The second blue LED will illuminate and be designated as S2 on the LCD if the ultrasonic sensor's value is increased, and it will display the value 1023.

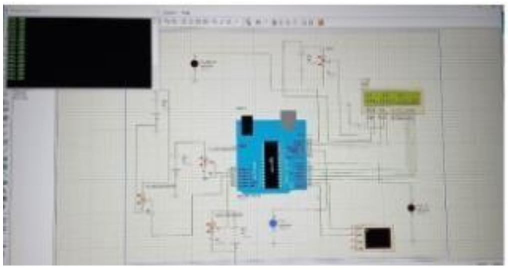

Fig 3 Simulation of MEMS Sensor

Figures 4 (a and b) and 5 show the system's final output after connecting sensors like an ultrasonic water level sensor and a MEMS sensor to an Arduino UNO. These sensors are used to monitor the saline level as well as patients' erratic movements as drips are injected into their veins. To launch the real-time apps, the Arduino code will be assembled using the Arduino IDE programme. In order to capture patient data and communicate it to the nurse or doctor's station in the hospital, the obtained data will be transmitted using a mobile app like Ubidots.

Fig 4 A.Hardware setup and B.Motion detection

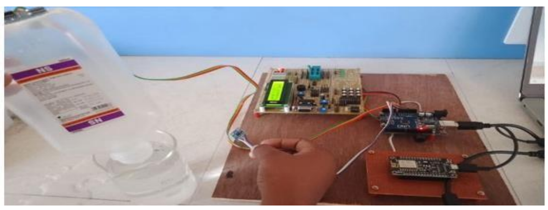

Fig 5 Saline Level Detection

Figure 6(a and b) displays the saline level graph. The graph may be seen in the Ubidots app and varies depending on the saline level. The buzzer will sound an alert and send a notice to the hospital's medical station if the saline level reaches 17. Figure 10 displays a graph of patient movement detection. The graph may be seen in the Ubidots app and varies based on the patient's erratically moving. The buzzer will sound an alert and send a notice to the hospital's medical station if the angle rises to 400 degrees.hose data to the hospital's nurse or doctor station.

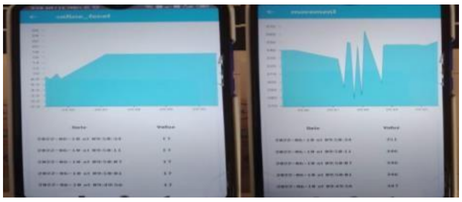

Fig 6 Saline Level graph and detection graph

Fig 7 Gauge widget of Saline lavel

Figure 7 demonstrates how the Saline Level Gauge Widget may be used to display the current condition of the complete drips monitoring system.

TABLE 1. READINGS OF ULTRASONIC SENSOR

rasoundlevel	Saline level	Buzzer Alertness
5	100	–
6	150	–
8	200	–
9	250	–
11	300	–
12	350	–
14	400	–
Above 15	Above 450	yes

TABLE 2: READINGS OF MEMS SENSOR

Angle	MEMS value (Movement)	Buzzer Alertness
0 degree	340	No
30 degrees	343	Yes
60 degrees	345	Yes
90 degrees	400	Yes
120 degrees	345	Yes
150 degrees	393	Yes
180 degrees	397	Yes

DISCUSSION

The final output of the system is shown in tables 1 and 2. We created hardware, such as an Arduino embedded with a sensor, to collect data such as fluid level and patient movement in life-threatening situations like coma or the intensive care unit while injecting saline into the veins. With the drip system, the discovered data is displayed graphically on an Android app by computer-based programmers or mobile app developers. All of the gathered information is moved to a safe cloud and made available through an Android app from any location across the hospital. The main objective of this project is to develop a user-friendly Android application that shows drip level notifications for nurses and observers. Utilising a buzzer system.

CONCLUSION

The IV solution level of hospital patients may be monitored using this technique, and the data can be analysed at the hospital's doctor's or nurse's station. As a result, the flow rate and infusion interruption issues were effectively monitored, and the data was wirelessly provided via mobile and smart phone applications. Our suggested approach was used to replace the current open loop saline drip monitoring system, which did not provide feedback when the drip disconnected owing to a patient's unconscious hand movement. According to this technology, it also detects patient movement after saline injection. If any movement is detected, the alarm system instantly sounds, and an LED also begins to shine. Prior to and following the procedure, keep an eye on the patient's veins for drip flow.

REFERENCES

1. Ramisha Rani K, Shabana N, Tanmayee P, Loganathan S, Dr. Velmathi G. Smart Drip Infusion Monitoring System for Instant Alert Through nRF24L01. International Conference on Nextgen Electronic Technologies, 2017; pp.452-455.

2. Sincy Joseph, Ms Navya Francis, Ms. Anju John. Intravenous Drip monitoring system for smart hospital using IoT. International Conference on intelligent computing, 2019; pp.835-839.

3. Raghavendra B, Vijayalakshmi K, Manish Arora. Intravenous Drip Meter Controller Need Analysis and Conceptual Design. COMSNETS 2016; pp.1-5.

4. Hidekuni Ogawa, Hiromichi Maki, Sosuke Tsukamoto, Yoshiharu Yonezawa. A new drip infusion solution monitoring system with a free- flow detection function. 32nd Annual International Conference of the IEEE EMBS Buenos Aires. 2010; pp.1214-1217.

5. Prikshit Verma et al, "Conceptual design of intravenous fluids level monitoring system a review", IOP Conf. Ser.: Mater. Sci. Eng. 2017; 263; pp.1-6.

6. Wang, B. Li, and D. Qian, "Infusion Monitoring System Based on Wireless Transmission.", IEEE International Symposium on Microwave, Antenna, propagation, and

EMC Technologies for Wireless Communications. 2012; pp.656-659.

7. Arjun Udayan, Sharook.H, C. Jeyanthi. "A Survey on automatic flow control in drip" published in IJAREEIE. 2016; 5; pp.120-126.

8. Hikaru Amano, Sosuke Tsukamato, W.Mortan Caldwell. "A remote drip infusion system employing Bluetooth". IEEE in Medicine Biology and Society. 2012; pp.2029- 2032.

9. Satwik Tanwar, Deepa.K, Riddi Maniktalia. "An IoT based intravenous Drip Monitoring System". International Journal of Science and Research (IJSR). 2021; 1299; pp.6-38.

10. Catarinucci, D. Donno, L. Mainetti, L. Palano, L.Patrono, M.L.Stefanizzi, and L. Tarricone. "An IoTAware Architecture for Smart Healthcare Systems", IEEE Internet of Things Journal, 2(6): 515-526,2015.

11. Noor, M. Swaied, M. AlMesned and N. AlMuzini. "A Method to Detect Object's Width with Ultrasonic Sensor," International Conference on Computing, Electronics & Communications Engineering (ICCECE).2018;pp.266-271.

12. N. Ibrahim, M. S. L. Hakim, A. L. Asnawi and N. A. Malik. "Automated Water Tank Filtration System Using LDR Sensor," 2016 International Conference on Computer and Communication Engineering (ICCCE). 2016; pp.195- 199.