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Patient Intravenous Drip Scrutinization System

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Abstract:- Intravenous (IV) infusion therapy is a crucial aspect of modern healthcare, but ensuring its safety and accuracy poses a significant challenge. In this paper, an Arduino Nano and NRF24L01 transceiver-based system for real-time IV drip monitoring is presented as a practical and affordable alternative. This patient intravenous drip monitoring system, which makes use of an Arduino Nano and NRF24L01 transceivers, offers a scalable and reasonably priced way to meet the urgent requirement for real-time IV drip monitoring in the medical field. The advantages of implementing such a system economically are also examined in this study, including better resource allocation and lower medical expenses related to problems from IV therapy. Patient outcomes could be improved by a patient intravenous drip scrutinization system, which could also greatly improve patient safety and healthcare provider decision-making.

***Keywords*:** Intravenous (IV) infusion therapy, Drip Monitoring System, NRF24L01 transceiver

1 Introduction

Like schools and colleges, hospitals are essential. In our current situation, many of us suffer from various health issues. During the peak of the COVID-19 pandemic, there were a massive number of patients suffering in such times, and it is not possible for frontline workers to monitor each and every patient personally. The pace of technological advancement is really rapid nowadays. It is imperative that everything be automated today. The task pertaining to health should be completed correctly, and the outcome should be really exact. There are various methods involved in the process of curing a person. IV treatment is one of the many techniques used by doctors to give patients medicine and fluids straight into their veins. It is essential for promoting a quick recovery and is frequently used for rehydration and nutrient provision. IV drips must be replaced and observed on a frequent basis, though. Moreover, the fluid flow must be metered based on the patient. This system detects the drip level and alerts the attending physicians. This delves into a novel solution that harnesses the power of readily accessible technologies—Arduino Nano and NRF24L01 transceivers—to develop a Patient Intravenous Drip Scrutinization System (PIDSS). The application of Arduino Nano microcontrollers and NRF24L01 transceivers in PIDSS demonstrates a versatile and accessible approach to healthcare technology the demand for innovative solutions in healthcare intensifies, the convergence of Arduino Nano and NRF24L01 transceivers in the form of PIDSS represents a groundbreaking approach to addressing the intricate challenges surrounding IV infusion therapy. This will lessen the strain of ongoing medical or nursing supervision at a reasonable price.

2 Objective

Implement a patient intravenous drip scrutinization system using Arduino Nano and NRF24L01 transceiver module to enable remote monitoring and control of IV fluid infusion, ensuring precise delivery and enhancing patient safety in healthcare settings and to to ensure accurate and real-time monitoring of IV fluid infusion, providing healthcare professionals with vital data for enhanced patient care and safety.

3 Survey of Literature

For monitoring the Patient intravenous drip , lot of study has been conducted. Various kind of paper are found as indicated in the reference list [1] to [5]. In [1] which uses an app based monitoring system based on IOT . In [2]

this work, an Arduino-based microcontroller was utilised to monitor drip emptying, manage a drop counter, and identify tube blockages. In [3] A new approach based on deep learning computer vision techniques is proposed for monitoring the IV infusion flow rate is done. In [4] the suggested system records the IV drip infusion kit with a camera, then classifies the captured frames using an algorithm based on deep learning. In [5] to ascertain the sensors' response parameters—such as precision, drift, and drop rate—when the droplet travels through the inner electric field of the sensors, experiments are carried out using four IV fluids that are often used in hospitals.

4 Methodology

4.1 CURRENT SYSTEM

The present method necessitates that a carer or nurse constantly monitor the drip's amount in order to keep the patient's blood from returning to the saline container. When a carer or nurse forgets to empty the saline bottle, it might result in the extremely dangerous reverse flow of blood from the patient to the bottle.

1)Manual monitoring

2)Expensive system

4.2 PROPOSED SYSTEM

Possible solution to this issue is the creation of an effective health monitoring system that alerts the doctor or nurse when the fluid level in the saline bottle surpasses the threshold limit. So to monitor the drip saline level, we have used Arduino nano, NRF24L01 transceiver, OLED 6 pin display , buzzer . In transmitter side the saline level is observed and in receiver side the output is detected and displayed in the OLED 6 pin display and buzzer sound is made according to the saline level.

The proposed block diagram consists of

- Arduino nano
- NRF24L01
- OLED 6 PIN Display
- Buzzer
- Two Arduino nano and NRF24L01 for transmitter side and receiver side.
- In transmitter side the output is observed

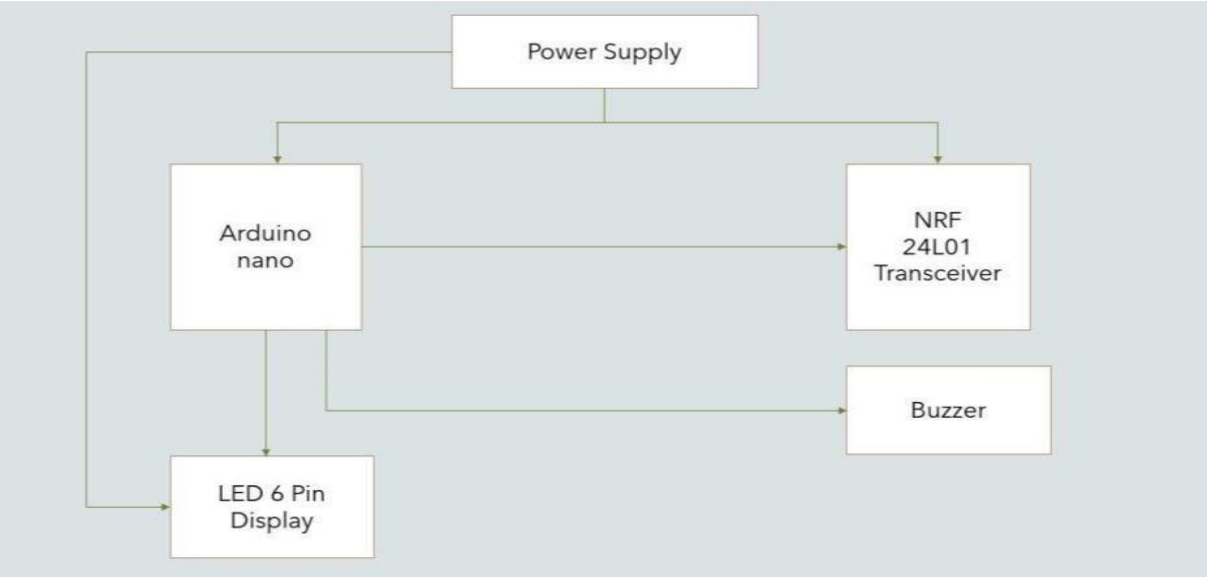

Fig 1 : BLOCK DIAGRAM OF TRANSCEIVER SIDE

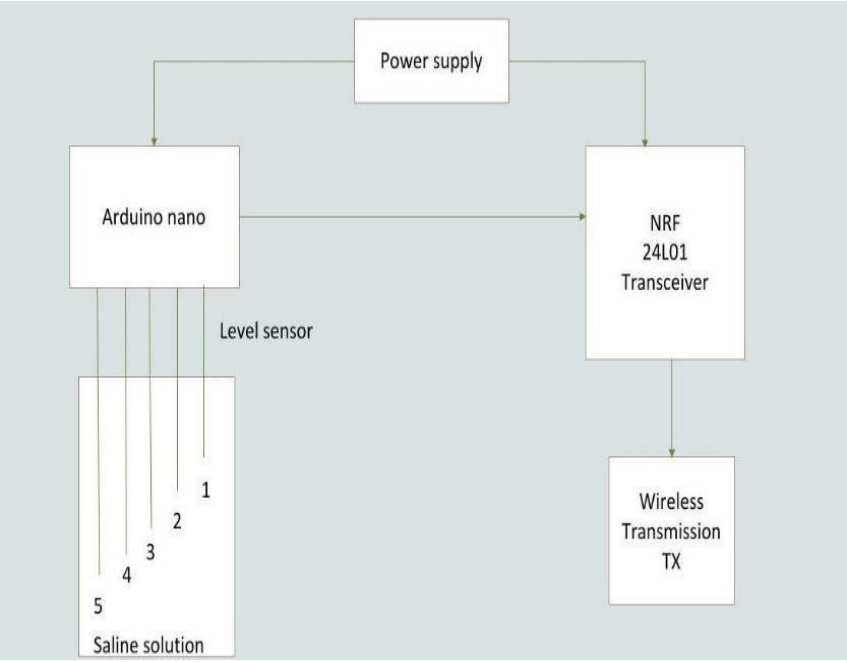

Fig 2 : BLOCK DIAGRAM OF RECEIVER SIDE

- In receiver side the output is displayed on the OLED 6 pin display and buzzer sound is made.

The goal of this project is to detect the saline level and display it on an OLED display. We have used Arduino nano, NRF24L01 transceiver, OLED 6 pin display , Buzzer as our main Components . The first step is NRF24L01 module was connected to the Arduino Nano using SPI communication (MOSI, MISO, SCK, CE, and CSN pins), and power (VCC and GND) was supplied correctly. For using Arduino, the nRF24L01 module is very popular choice for wireless communication. The NRF24L01 module and the Arduino board must be connected. The hardware connection is done between Arduino nano board and NRF24L01 transceiver using jumper wires for both transmitter side and receiver side . The code for the transmitter and receiver sides are able to be developed after the NRF24L01 modules are connected to the Arduino boards. The NRF24L01 library for Arduino was used to initialize and configure the module. The transmitter side Arduino Nano sent data packets using the NRF24L01 library functions like write (). The transmitter Arduino Nano successfully transmitted data packets to the receiver over the air using the NRF24L01 module. The NRF24L01 module on the receiver side was connected similarly to the transmitter side, using the same SPI pins and power supply. The NRF24L01 library was used to initialize and configure the module on the receiver side. The receiver Arduino Nano used the available () function to check for incoming data and the read () function to receive and process the data. The receiver Arduino Nano successfully received data packets from the transmitter Arduino Nano.Next the connection is made according to our project. Here in Arduino nano, we have connected a wire in a pin indicating that wire as Common Ground and 4 more wires are connected in the Arduino pin indicating 4 different saline levels in the drip. The 4 different levels are connected and code is altered. 23 The 4 different levels are 100uP%%. When the common ground wire is not connected to any one of these wires then that range is indicated as empty (no saline level in the drip). OLED display is connected only in the receiver side. This detected output is displayed in the 6 pin OLED in the receiver side and the buzzer sound is made when the output is low that is when the range is empty. Finally, the device can be marketed to potential users, and for hospitals who are frequently in need of patient intravenous drip scrutinization system.

5 Results

Arduino Nano with NRF24L01 transceivers on both the transmitter (sender) and receiver sides, we have implemented a basic wireless communication system. NRF24L01 is a popular 2.4 GHz RF transceiver module commonly used for low-power and short-range wireless communication between microcontrollers.

Transmitter Side Results:

Hardware Assembly and Configuration:

1.Successfully assembled the transmitter hardware, including the Arduino Nano, NRF24L01 transceiver module

2.Ensured proper voltage regulation and power supply for stable operation.

Wireless Communication Setup:

1.Configured the NRF24L01 transceiver module for wireless communication on the transmitter side.

2.Established a reliable communication link between the transmitter and receiver units using NRF24L01 modules.

Flow Rate Monitoring:

1.Implemented a flow rate monitoring system connected to the IV drip setup. Accurately measured and collected real- time flow percentage data from the IV drip.

System Integration:

1.Coordinated with the receiver unit to ensure seamless communication and data exchange.

2.Ensured compatibility between the transmitter and receiver in terms of data formats and protocols.

Future Enhancements:

1.Identified potential improvements or features to enhance the system's functionality based on testing and real-world usage.

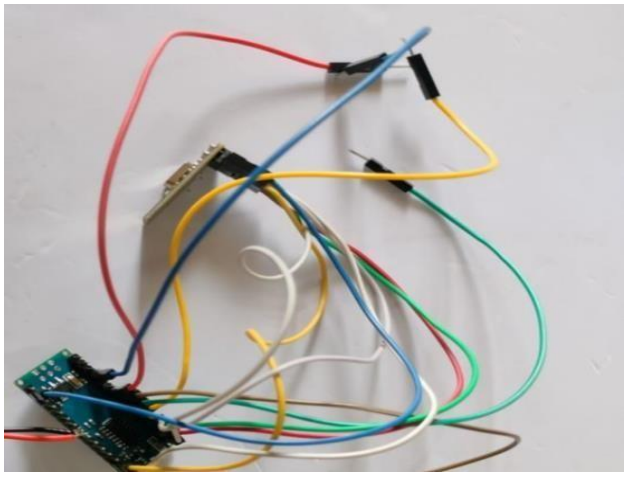

Fig 3: Transmitter Side

Receiver Side Results:

Hardware Assembly and Configuration:

1.Successfully assembled the receiver hardware, including the Arduino Nano, NRF24L01 transceiver module, OLED 6-pin display, and buzzer.

2.Ensured proper voltage regulation and power supply for all components to operate reliably.

Wireless Communication Setup:

1.Configured the NRF24L01 transceiver module on the receiver side for wireless communication with the transmitter.

2.Successfully established a reliable communication link with the transmitter unit using NRF24L01 modules.

Real-time Data Display:

1.Implemented code to display real-time flow rate and liquid level data on the OLED 6-pin display.

2.Designed a user-friendly and informative interface for healthcare providers to monitor IV drip parameters easily.

Alarm System:

Successfully implemented an alarm system that triggered a buzzer when predefined conditions

Future Enhancements:

Identified potential enhancements or additional features to further improve the receiver unit's functionality based on real-world usage and user feedback.

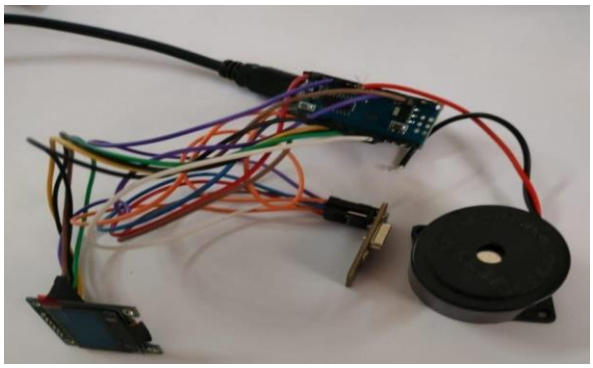

Fig 4: Receiver Side

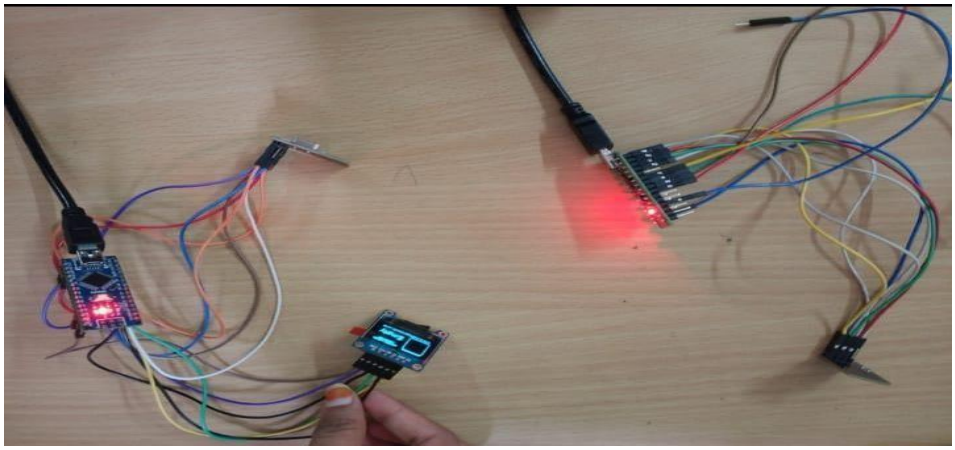

Fig 5:Both Transmitter and Receiver Side

Output – Saline Ranges:

Fig 6 : 100%

Fig 7 : 75%

Fig 8 : 50%

Fig 9 : 25%

6 Discussion

An important development in healthcare technology, the use of patient intravenous (IV) drip monitoring systems has many advantages for both patients and healthcare providers. This system has proven to be a valuable tool in ensuring the safety and effectiveness of IV therapy. Firstly, it enhances patient safety by continuously monitoring the flow rate and alerting healthcare professionals. Secondly, the IV drip monitoring system improves efficiency in healthcare settings. Nurses and other healthcare staff can allocate their time more effectively, as they receive real-time notifications and alarms when interventions are required. This reduces the need for frequent manual checks, allowing for better allocation of resources and improved patient care. In conclusion, the patient intravenous drip monitoring system is a crucial technological advancement that promotes patient safety . As technology continues to evolve, we can expect further enhancements in this field, ultimately leading to even better patient care and outcome.

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