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INTELLIGENT INFUSION ANESTHETIC DISPENSER USING SMART IoT

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ABSTRACT

This project introduces a smart anesthesia delivery system that automates how anesthetic drugs are infused during surgeries. Traditional manual methods can be risky if the dosage is too high or too low. To solve this, our system uses a microcontroller and a syringe pump that delivers anesthesia based on the dosage set by the anesthetist (in ml/hr). The system continuously reads patient vital signs—such as heart rate, oxygen level, and blood pressure—through sensors and adjusts the drug delivery as needed. It also triggers alerts in case of issues like pump failure, blockage, or abnormal readings. All actions and vitals are recorded, providing helpful data for doctors. This solution improves patient safety, reduces the chances of human error, and enhances the overall surgical process.

Keywords: IoT in healthcare, smart infusion pump, real-time monitoring, automated anesthesia system, patient safety

1. Introduction

Administering anesthesia during surgery requires continuous attention to avoid risks. Manual control can lead to overdose or patients waking up too soon. Our project addresses this by creating an automated system that carefully delivers anesthesia while watching the patient's vitals in real time. By using sensors and smart technology, the system adjusts the drug flow based on current patient conditions, improving the safety and efficiency of surgeries.

2. Problem Statement

Manual infusion of anesthetic drugs is prone to human error and lacks continuous monitoring. Without real-time feedback, patients may be at risk of receiving improper doses. This project aims to develop a smart IoT-based system that controls drug delivery automatically and monitors patient health in real time, reducing the need for constant human oversight.

3. Objectives

- Automate anesthesia infusion using a smart microcontroller system
- Monitor patient vitals using sensors
- Adjust drug delivery based on live data
- Alert the medical team during abnormal conditions
- Store and log all data for later review
- Improve safety and reduce human errors in surgeries



4. System Overview

Our system combines medical sensors, an infusion pump, a microcontroller (like Arduino), and a cloud-based monitoring platform. The sensors collect vitals and send them to the controller. The controller adjusts the flow rate accordingly. The data is also sent to a web dashboard for real-time viewing by doctors or nurses. Alerts are generated if anything goes wrong—like low oxygen levels or pump blockage.

5. Development Approach

Hardware Used:

- Microcontroller (Arduino/Raspberry Pi)
- Heart rate, SpO2, blood pressure sensors
- DC motor with syringe mechanism
- Buzzer and LCD display
- Wi-Fi module for IoT connectivity

Software Tools:

Arduino IDE

- Firebase / Blynk for IoT cloud storage
- HTML/CSS for web dashboard
- Python (optional) for data visualization

System Features:

- Real-time vitals monitoring
- Adjustable flow rate of anesthesia
- Automatic dosage control
- Alarm system for faults
- IoT dashboard for live data tracking

6. Working Principle

- 1. Anesthetist sets initial dosage (e.g., 3 ml/hr) using the system interface.
- 2. Vitals are monitored using connected sensors.
- 3. The microcontroller compares sensor data with safe thresholds.
- 4. If patient vitals change, the flow rate is adjusted.
- 5. Any abnormal readings trigger a buzzer or alert via the dashboard.
- 6. All data is logged to the cloud for future review.

Sample Input



Sample output



7. Implementation Results

Testing showed that the system responded well to changes in patient conditions. Flow rate adjustments were quick, and alerts were successfully triggered when problems occurred. The IoT dashboard gave real-time updates, helping healthcare staff monitor multiple patients efficiently. This improves both the safety of the patient and the effectiveness of the surgery.

8. Conclusion

The smart anesthesia infusion system helps in providing safe and automated drug delivery during surgeries. It lowers the chances of human error and keeps patient health constantly monitored. By using IoT and sensor technology, the system offers better control and can be a great asset in modern healthcare. In the future, we can enhance it with machine learning to predict drug needs and extend it for remote surgeries.

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