# IOT Based IV Bag Monitoring and Alert System

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**ABSTRACT: Intravenous (IV) therapy is a critical component of patient care in hospitals and healthcare facilities, ensuring that patients receive the necessary fluids, medications, and nutrients directly into their bloodstream. However, monitoring the IV bag's status, including fluid levels and flow rates, is traditionally a manual process, which can lead to human error, delayed responses, and potential risks to patient safety.**

**The IV Bag Monitoring and Alert System aims to address these challenges by introducing an automated solution that continuously tracks the status of IV bags. Utilizing sensors to measure fluid levels and flow rates, the system provides real-time data to healthcare professionals through a centralized monitoring platform. The system is designed to trigger alerts and notifications if anomalies are detected, such as a low fluid level or an occlusion in the line, allowing for timely intervention.**

## 1 INTRODUCTION

An IV bag monitoring and alert system represents a significant advancement in healthcare technology, aimed at improving the administration of intravenous therapy. This system integrates sensors that accurately measure the fluid levels in IV bags, continuously transmitting data to a central monitoring system. When the fluid level drops below a certain threshold, or if there is an abnormal flow rate indicating potential issues such as blockages, air bubbles, or leaks, the system generates immediate alerts.

These alerts can be sent to nurses' stations, mobile devices, or integrated into the hospital's electronic health records (EHR) system. The core benefits of this system include enhanced patient safety, as it ensures timely intervention and reduces the likelihood of complications arising from empty IV bags or malfunctioning equipment.

## 2 LITERATURESURVEY

The integration of IoT technology into healthcare has led to significant advancements, including the development of IoT-based IV bag monitoring and alert systems. These systems aim to automate the process of monitoring intravenous (IV) fluid levels and alert healthcare providers when intervention is needed, thereby improving patient care and reducing the workload on medical staff. This literature survey reviews recent studies and developments in this field. Recent studies have focused on utilizing various sensors to measure the IV bag's weight or fluid level. Load cells and weight sensors are commonly used to determine the amount of fluid remaining in the bag. Additionally, optical and capacitive sensors have been explored for detecting the presence or absence of fluid. These sensors are typically connected to microcontrollers like Arduino or microprocessors such as ESP8266 and Raspberry Pi, which process the sensor data and facilitate communication with healthcare providers.

## 3 PROPOSED SYSTEM

An IoT-based IV bag monitoring and alert system automates the monitoring of IV fluid levels. It uses weight sensors to track the fluid, a microcontroller to process the data, and a WiFi module to transmit this information to a central server or mobile app. The system displays real-time fluid levels on an LCD screen and sends alerts when the fluid level is low, ensuring timely intervention. This technology enhances efficiency, reduces manual checks, and improves patient safety by preventing complications from incorrect IV fluid administration.

### ADVANTAGES OF PROPOSED SYSTEM

a. Remote Monitoring and Control
b. Improved Efficiency
c. Enhanced Patient Safety
d. Data Logging
e. Automatic Monitoring
f. Resource Management

## 4    METHODOLOGY

To develop an IoT-based IV bag monitoring and alert system, a structured methodology is essential. Initially, the project begins with a detailed requirement analysis to understand the specific needs of healthcare providers. Following this, the selection of suitable components, such as weight sensors, microcontrollers, WiFi modules, and alert systems, is crucial.

The hardware development phase involves assembling and calibrating these components to ensure accurate fluid measurement. Integration of sensors with microcontrollers and communication modules is then performed, allowing the system to process and transmit data effectively. In the software development phase, firmware is programmed to handle sensor data and control the system's functions. Data transmission protocols are implemented to send information to a central server or mobile app. A user-friendly interface is designed for real-time data display and alerts. Comprehensive testing is conducted at both unit and system levels to ensure functionality and reliability.
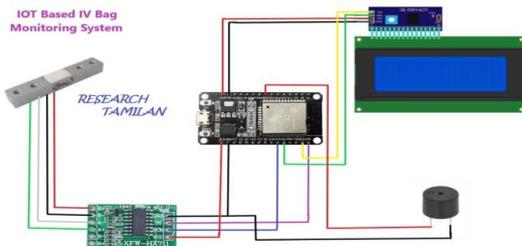
### A.  DESIGN



Fig.1. DESIGN

### B.  HARDWARE IMPLEMENTATION

POWER SUPPLY: All digital circuits require regulated power supply.

COMPONENT SELECTION: Choose appropriate hardware components such as weight sensors, microcontrollers, WiFi modules, and LCD displays.

PROTOTYPE: Assemble the hardware components on a prototype board for initial testing.

SENSOR COLLABORATION: Calibrate weight sensors to ensure accurate measurement of IV fluid levels.

MICROCONTROLLER PROGRAMMING: Upload firmware to the microcontroller to handle data processing and communication.

INTEGRATION: Connect the sensors, microcontroller, WiFi module, and display to form an integrated system.
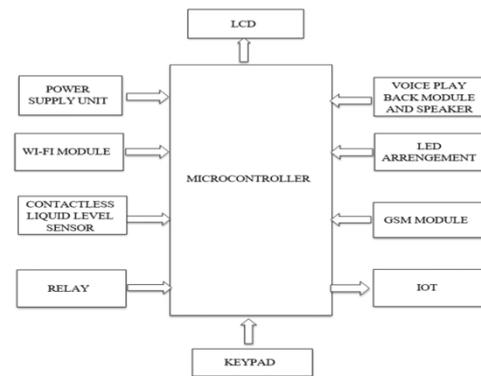
### C.  FLOW CHART WORKING



Fig.2. Block Diagram

### D.  SOFTWARE IMPLEMENTATION

Requirement Analysis: Identify and document software needs.

Firmware Development: Write and upload firmware for microcontroller.

Sensor Integration: Implement code to interface with weight sensors.

Data Processing: Develop algorithms for processing sensor data.

WiFi Module Configuration: Code to handle wireless data transmission.

User Interface Design: Create mobile app or web dashboard for monitoring.

Alert System Programming: Set up notifications for low fluid levels.

SOURCE CODE:

```
#define            BLYNK_TEMPLATE_ID
"TMPL3OZyGqOML"
```

```
#define BLYNK_TEMPLATE_NAME "IOT based
IV Bag Monitoring"

#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);
#include <HX711.h>
#define DOUT  23
#define CLK  19
#define BUZZER 25
HX711 scale;
#define BLYNK_PRINT Serial

char                  auth[]                  =
"6ujmZWLkuxAvkDAQou5p2nOYHcKZEkfY";
char ssid[] = "vivo V29e";
char pass[] = "shree12345";

int liter;
int val;
float weight;
float calibration_factor = 102500; // change this
value for your Load cell sensor

void setup() {
 // Set up serial monitor
 Serial.begin(115200);
 lcd.init();
 lcd.backlight();
 pinMode(BUZZER ,OUTPUT);
 Serial.println("Remove all weight from scale");
 scale.set_scale();
 scale.tare(); //Reset the scale to 0
  long zero_factor = scale.read_average(); //Get a
baseline reading
  Serial.print("Zero factor: "); //This can be used to
remove the need to tare the scale. Useful in
permanent scale projects.
 Serial.println(zero_factor);
 Blynk.begin(auth, ssid, pass);
}
 void loop() {
Blynk.run();
 measureWeight();
}
 void measureweight(){
 scale.set_scale(calibration_factor); //Adjust to this
calibration factor
 weight = scale.get_units(5);
   if(weight<0)
```

```
  {
   weight=0.00;
   }
  liter = weight*1000;
  val = liter;
  val = map(val, 0, 505, 0, 100);
  lcd.clear();
  lcd.setCursor(1, 0);
  lcd.print("IOT Based IV Bag");
  lcd.setCursor(2, 1);
  lcd.print("Monitering System");
  Serial.print("Kilogram: ");
  Serial.print(weight);
  Serial.println(" Kg");
  lcd.setCursor(1, 2);
  lcd.print("IV Bottle = ");
  lcd.print(liter);
  lcd.print(" mL");
  Serial.print("IV BOTTLE: ");
  Serial.print(liter);
  Serial.println("mL");
  lcd.setCursor(1, 3);
  lcd.print("IV Bag Percent=");
  lcd.print(val);
  lcd.print("%");
  Serial.print("IV Bag Percent: ");
  Serial.print(val);
  Serial.println("%");
  Serial.println();
  delay(500);
  if (val <= 50 && val >= 40){
   Blynk.logEvent("iv_alert","IV Bottle is 50%");
   digitalWrite(BUZZER, HIGH);
   delay(50);
   digitalWrite(BUZZER, LOW);
   delay(50);
  }
  else if (val <= 20){
     Blynk.logEvent("iv_alert","IV Bottle is too
LOW");
   digitalWrite(BUZZER, HIGH);
  }
  else{
   digitalWrite(BUZZER, LOW);
  }
  Blynk.virtualWrite(V0,liter);
  Blynk.virtualWrite(V1,val);
}
```
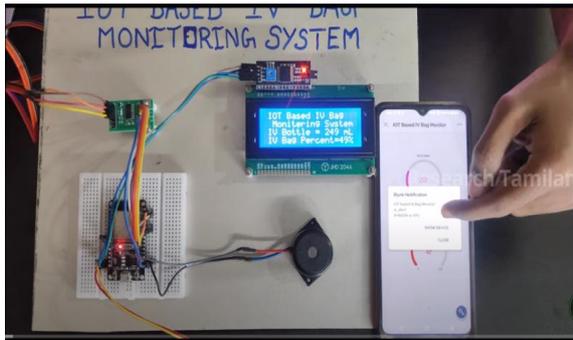
## 5    EXPERIMENTAL RESULT

Fig.3.Result

## 6 FUTURE SCOPE

The future scope for an IoT-based IV bag monitoring and alert system is promising, with several advancements on the horizon. Enhanced data analytics could leverage machine learning algorithms to predict patient needs and optimize IV fluid usage, while integration with Electronic Health Records (EHR) can streamline documentation and improve patient care.

Additionally, advanced alert systems utilizing wearable devices or augmented reality glasses could provide real-time notifications to healthcare providers. Implementing AI for predictive maintenance ensures continuous operation by anticipating hardware failures and scheduling proactive maintenance.

Moreover, the system's scalability and customization can be developed to cater to different hospital settings and patient needs. Integration with telehealth platforms could expand its usage to remote patient monitoring, enhancing home care services.

Energy-efficient designs and robust cybersecurity measures will make the system more portable and secure, ensuring data protection and system integrity. These advancements are poised to significantly enhance the efficiency, reliability, and scope of IoT-based IV bag monitoring systems, leading to better patient outcomes and improved healthcare operations overall.

## 7 CONCLUSION

The integration of IoT-based IV bag monitoring and alert systems represents a significant advancement in healthcare technology. By leveraging real-time data collection and analysis, these systems enhance patient safety and improve the efficiency of intravenous therapy. The automation of monitoring processes reduces the likelihood of human error, ensuring that healthcare providers are promptly alerted to potential issues such as low fluid levels or flow rate irregularities, thereby enabling timely interventions.

However, the adoption of IoT-based IV monitoring systems comes with certain challenges. The initial costs for implementation and the need for ongoing maintenance and technical support can be substantial. Additionally, the complexity of these systems may require specialized training for healthcare staff, and there is always the risk of technical issues such as sensor malfunctions or connectivity problems. Data privacy and security are also critical concerns, necessitating stringent measures to protect sensitive patient information.

## 8 REFERENCES

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