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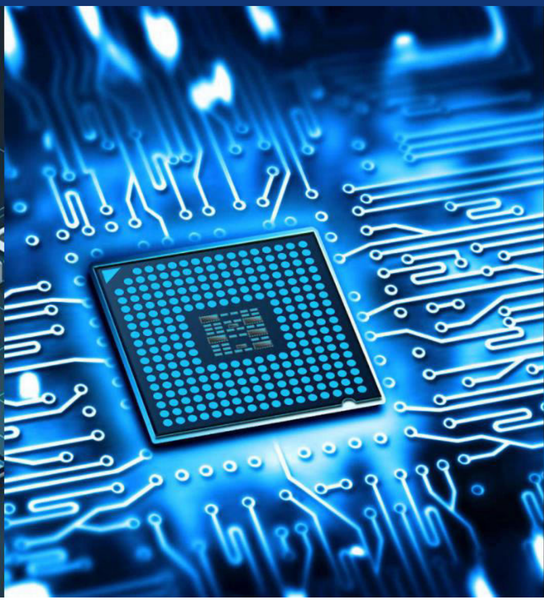


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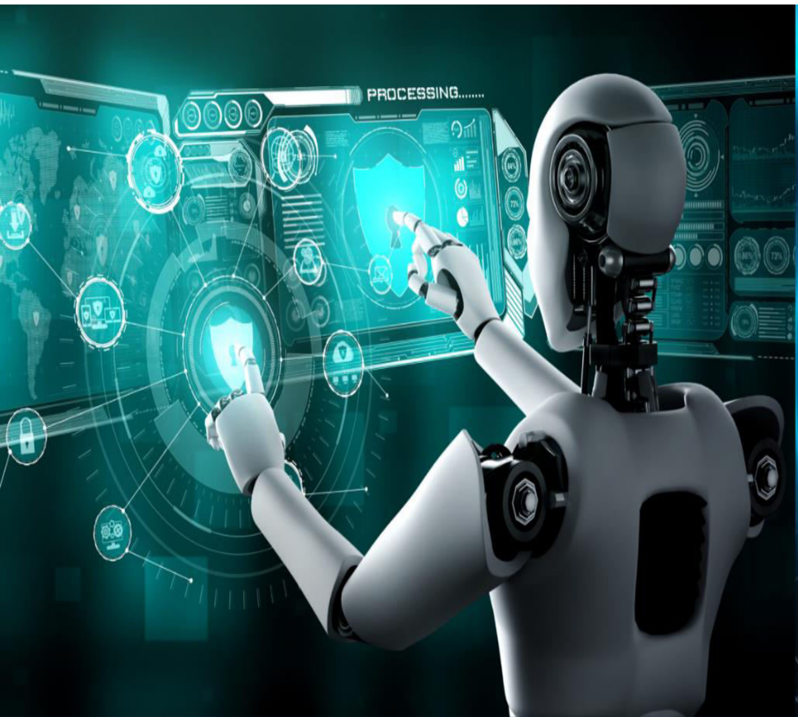

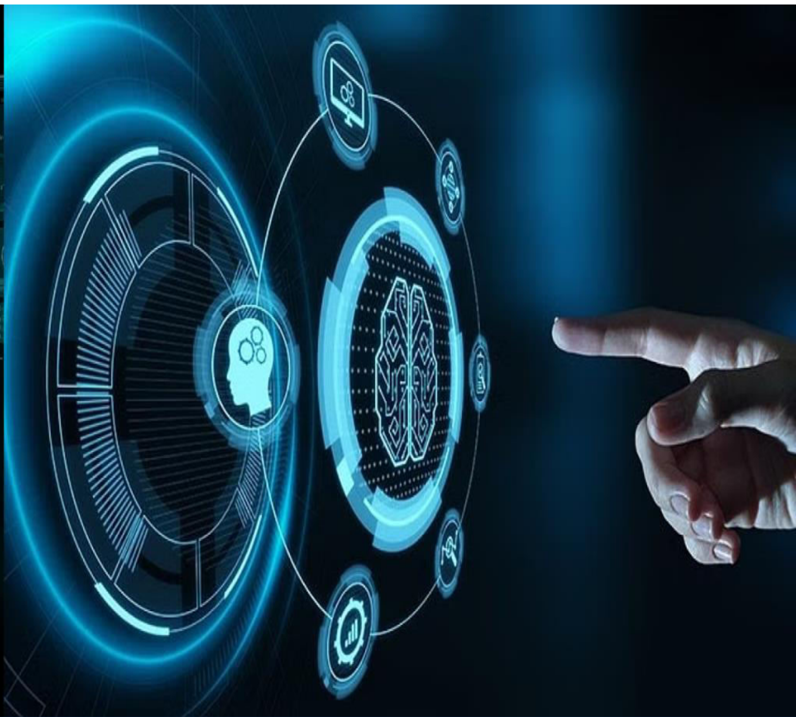

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A Review on Smart IV Pole Monitoring and Comparison of Drips

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ABSTRACT: In modern healthcare, the accurate and timely monitoring of Intravenous (IV) Fluid levels is crucial to prevent complications such as blood back show into the bottle dive to delayed replacement. However, nurse's busy schedules often lead to oversight in IV Fluid management. This project proposes a novel "Designing a smart saline Monitoring and Implementation of Automatic container swapping system" by using embedded system to ensure the optimal administration of saline bottle is paramount for patient well-being. The proposed system addresses the critical need for precise saline level monitoring through the integration of advanced technology. The system converts the mechanical force of the saline bottle's weight into an electrical pulse with the help of load cells. This system is designed to automatically monitor the saline level in a bottle and change the container when it is near empty, ensuring continuous fluid administration without the need for manual intervention.

KEY WORDS : Embedded system, IV monitoring, load sells reverse blood flow prevention, Healthcare.

I. INTRODUCTION

Healthcare Facilities are becoming more and more integrated into our daily lives. Nurses are responsible for monitoring intravenous (IV) Fluids level in almost all hospitals most often due to their busy schedules, people neglect to replace the bottle when it should, which might cause blood to flow backward towards the bottle. This novel to ensure uninterrupted administrated of saline fluids while safeguarding patient well-being. The system Leverages a Load cell to continuously monitor the saline bottles weight, converting the mechanical force of the bottle into an electrical signal. Once the saline level approaches a predefined threshold, the system activates a servo motor-based switching mechanism to automatically replace the bottle with a new one. Simultaneously, notifications and alerts are sent to healthcare staff via a connected, GSM platform, providing live updates on saline levels and patient vitals. This automated solution minimizes human interventions, reduces the risk of human error, and ensures continuous fluid administration particularly in critical care scenario designed to be cost effective, scalable and user friendly, this system represents a significant step forward in integrating advanced technology into routine healthcare practices to enhance patient care and efficiency.

Overall, this pioneering approach not only addresses the existing challenges in saline administration but also sets a new standard for patient care by leveraging cutting-edge technology to enhance monitoring and intervention capabilities.

II. LITERATURE PREVIEW

The Vivek Kumar's "IoT based smart Intravenous Fluids (IV) drip monitoring and reverse blood flow prevention system" proposed a solution that the total number of drops from the trickle bottle is calculating with accuracy. It automatically monitors the entire process with intimation through alerts and notifications at times through messages to nurses and caretakers based on the electrolyte levels in the IV bag with a unique key. If they failed to notice the message and replace the bottle, the smart tuning system mechanism will block the fluid path and eliminates reverse flow of blood and stops the process automatically.

The Sidharth Bhorge's "IoT based IV pole Monitoring System" is concentrating on monitoring the health status of patient with efficient monitoring of Saline bottle fluid level and also, they have provided an ESP32, cam module which will give they us live image streaming of patient also we can adjust the height of the particular IV pole accordingly with the help of advanced technology.

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This model is aiming to bring the technology closer to hospital and common medical working staff and it eliminates efforts of monitoring the health status of patient by nursing staff physically.

Tyler Hack's "Mitigating medication lampering and diversion via Real-time intravenous opioid Quantification" aims to mitigate tampering and diversion through analytical verification of the administered drug before it enters the patient. The proposed system is connected to an IV drips system during surgery or post- operation recovery. Finally, we demonstrate real-time Fluidic measurements connected to a flow cell to simulate IV administration and a blind study classified using a machine-learning algorithm.

III. HARDWARE REQUIREMENT

REFERENCE-1

COMPONENTS	SPECIFICATIONS
Node MCU ESP 8266	Microcontroller with Wi-Fi
IR sensor	2-10cm sensing range
LCD display	I2C 20*4 display
Control mechanism	Stepper motor with gears and block bar
Connecting wires	Male to female
Buzzer	5V

REFERENCE-2

COMPONENTS	SPECIFICATIONS
Node MCU ESP32 cam	Microcontroller
Load cells	Weight between 40-100ml will send notification
MA*30100 sensor ML*90614 sensor	Heart rate monitor sensor & temperature sensor
Control mechanism	Stepper motor and motor driver L293D
Buzzer	5V

REFERENCE-3

COMPONENTS	SPECIFICATIONS
Flow cell	80ul
Device assembly	Area of 2.73 in^2,SPE connector
Analog device - AD5940	Potentiostat signal path
Nordic nRF52840	Microcontroller with Bluetooth low energy system
Power supply (LP503035)	500mAh rechargeable Lithium-Ion polymer battery

IV. RESULT

The figure represents the final set up of the proposed system. The hardware uses Node MCU microcontroller for processing and communication with the cloud platform.

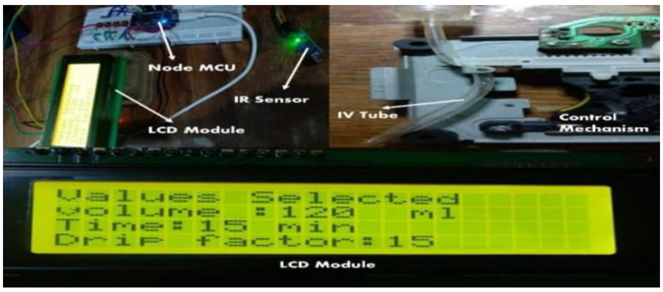

Fig: Working setup of proposed system

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Based on the Load cell transducer for the detection of empty saline bag. From the references existing system uses some similar approaches but our proposed model showcase added features like heartbeat sensing/monitoring, SPO2 sensing and low SPO2 alert, low temperature alert, saline bag empty alert, pole height adjustments, live patient monitoring. After successful testing of the prototype accurate results were noted. Fig. 3, 4, 5 shows heart rate, SPO2, temperature graphs. The system provides a very efficient alert system as shown in fig.6 showing the graph plot of saline bottle level which showing the reducing level of saline bottle as time goes on and fig 7 showing the alert we getting after the saline bottle gets empty also it giving notifications for low temperature and low SPO2.

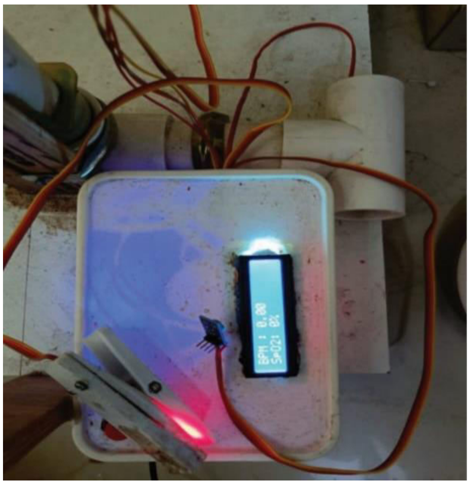

Fig: SPO2 and Heart Readings

Fig: IV Pole Monitoring Prototype

This outcome is obvious in hindsight since no samples in the training set had peaks near ketamine.The accuracy can likely be improved with additional data, but it is already quite good. It is worth pointing out that the classification pipeline was run on a computer but could be easily ported onto the microcontroller.

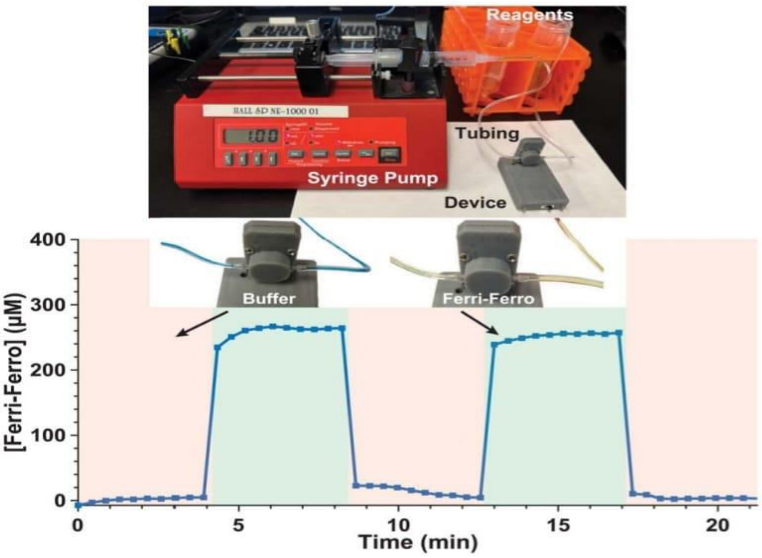

Fig: Real time consecutive DPV measurements

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V. FUTURE SCOPES

- The threshold value of electrolyte bottles can be set from anywhere using our smart phones.
- In future along with this setup ECG and temperature data of patient can be monitors using the proposed system.
- Minimal integrated setup with better user interface in design and experience.
- This system also has image processing or computer vision as its one of the future scopes on which work can be done to make the system more efficient.
- We can collect images of patient obtained from ESP32 cam module and from patient's facial expression we can predict the condition or abnormal behaviour of patient whether he/she is feeling well or not.
- The tampering application is targeting, if the opioid is detected solely, then there is nothing no prevent the patient from metabolising a potentially dangerous substance.
- As such, this work explicitly targets opioid sensing before administration.

VI. CONCLUSION

This paper has a review on smart IV pole monitoring and comparision of drip system. It will be lead to reports the smart Intravenous Fluids drips monitoring, reverse blood flow prevention system and mitigating medication tampering & diversion with real-time IV opioid quantification. The hardware synthesis of those systems are compared and clarified with equivalent specifications.

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