Smart Saline Management System

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Abstract: In medical clinics, Saline is encouraged to patients to treat lack of hydration and accordingly improve their health. In current social insurance measures, at whatever point a saline is encouraged to any patient, the patient should be constantly controlled by an attendant or any overseer. Nearly in the entirety of the medical clinic, an attendant or a guardian is answerable for checking the saline level ceaselessly with no interferences. Because of the carelessness and absentmindedness towards saline culmination by specialists, attendants or overseer of the patients and absence of attendants with adequate aptitudes in emergency clinics and their over the top outstanding task at hand, countless patients are biting the dust and are being hurt in the emergency clinics. Thus to keep the patient from getting hurt and ensure their lives during saline sustaining period, the saline level observing framework have been created. The proposed framework is constructed utilizing Web of Things (IoT) stage. The proposed framework includes sensors which will go about as a level sensor for observing the basic degree of the saline in the saline container. At whatever point the degree of the saline scopes to the pre-characterized basic level, at that point the medical attendants, overseer, and specialists will be alarmed through the signal and an alarm message will be sent using web to the concerned medical caretakers and specialists that there is a requirement for substitution of the saline jug. This proposed framework can be used effectively in homes just as emergency clinics.

INTRODUCTION

Internet of Things (IoT) is the network of physical objects comprising of all the devices, vehicles, buildings and the other items embedded with electronics, software and sensors which enables these objects to collect and exchange data among teach other. Using this technology, objects are sensed and controlled remotely across existing network infrastructure. This creates opportunities for direct integration of the physical world into computer-based systems. IoT is advantageous in many ways as it leads to automation of daily tasks leading to better quality of life and saves money as well as time. Applications of IoT include avast number of systems, amongst them, a few are Smart homes, automated car, automated doors, Automated Escalators, Automated Hand Dryer.

LITERATURE SURVEY

- Charitha Amarasakera ; Ruvini Manage ; Charana Abeywickrama ; Ravindu Perera ; R.A.S.R. Achchige [1]Proposed that, Supplying the correct amount of vital nutrition at the correct time is the most fundamental and important requirement for the hospitalized patients. Among those treatments, saline therapy is the most important treatment many patients receive from the hospitals. It is a fact that, in almost all hospitals of Sri Lanka, an assistant or a nurse, among other assigned health care duties, are responsible for monitoring the saline supplied for each patient. Unfortunately, there are some critical situations, i.e., patient’s blood refluxing back into the saline tubing system, patients had to experience because of the observers’ mistake due to their busy schedules. Nonetheless, the traditional method of supplying saline is also proven not accurate because the saline drop rate for a patient has been adjusted by looking at the drops falling speed in the drip chamber. The proposed system facilitates a sophisticated method of controlling saline drop rate by monitoring the saline system remotely by using IoT.

- Xu Chengjie ; Wang Guojun ; Wang Honghua ; Jia Yinjie ; [2] Proposed that, This paper describes the necessity of construction of cloud computing platform of saline alkali industry. Through the demand analysis of saline alkali industry on public technology service, Cloud Safety Emergency Rescue Command Management System of saline alkali industry are designed as the core application, saline alkali industry services, science and technology industrial park management are designed as auxiliary application, all kinds of enterprises’ production systems needed to work on the cloud architecture, thus forming the public technology service cloud platform based on the safety regulation.

- Humayun Rashid ; Sarjahan Shekha ; S M Taslim Reza ; Iftekhar Uddin Ahmed Proposed that, The design and implementation of an automated liquid observation and controlling method utilizing an affordable liquid flow sensor and the microcontroller are presented here which has the ability to assist the health care provider to control the saline circulation rate using Matrix keypad or Android phone. The Arduino Mega (2560) platform has been used as controlling unit for providing necessary control along with a 34 matrix keypad and Bluetooth module to control the drop per minute manually and by using an android phone. The designed flow sensor will be hooked up to the drip chamber of the saline container to determine the saline flow rate as well as an accurate number of a drop of the saline. The obtained outputs from the sensor are continuously checked with the given command and if any mismatch is found, the microcontroller moves the servo motor to modify the circulation rate to balance with assigned command. The device has been tested after completion of necessary hardware development. The outcome is satisfactory which indicates a possible application in taking care of patient more appropriately.

- Smart Saline Level Monitoring System Using ESP32 And MQTT [4] Proposed that, Saline, one of the most popular intravenous (IV) therapy plays a major role in the management of patients who are critically ill. Surveillance of saline bottle level
is very important because when the bottle is emptied and the needle is not removed from the vein then the blood flows outward into the bottle. In hospitals, the nurses or caretakers are responsible for monitoring the saline bottle level. Mostly, due to negligence and any unusual condition, the exact timing of removing the needle from the patient’s vein is ignored which causes a serious casualty and may lead to death as well. Furthermore, remote monitoring is a need to provide telehealth services. To prevent the accident due to the ignorance of caretakers and to provide remote surveillance in telehealth services, we have proposed the cost-effective smart saline level monitoring device which includes the combination of sensor and Internet of Things (IoT) technologies. We have built this system by using load sensor and ultra-low power low cost ESP32 WiFi System on Chip (SoC) microcontroller. The load sensor converts the weight of the bottle to a specific voltage. The ESP32 microcontroller generates and publishes a specific message based on the voltage received from the sensor. To publish and present the messages to the devices(e.g. smartphone, tablet, laptop etc.) of subscribers like doctors, nurses or caretakers, we have used MQTT-S publish/subscribe protocol which runs over TCP. This proposed monitoring system fulfills the reliable delivery of messages to the subscribers which is very important for healthcare.

**PROJECT IDEA**

Similarly IoT plays a major role in health monitoring system. Whenever a saline is fed to any patient, he/she needs to be constantly monitored by a nurse or any relatives. Most often due to negligence, inattentiveness, busy schedule and more number of patients, the nurse may forget to change the saline bottle as soon as it is totally consumed. Just after the saline finishes, blood rushes back to the saline bottle due to difference in blood pressure and pressure inside the empty saline bottle. This may cause backflow of blood to saline bottle from their vein. This results in the reduction of haemoglobin level of patients and may also lead to shortage of red blood cells(RBCs) in the patient’s blood causing tiredness. Therefore, there is a need of developing a saline level monitoring system which will reduce the patient’s dependency on the nurses or caretakers to some extent.

**MOTIVATION OF THE PROJECT**

- In the current healthcare measures, professional nurses are responsible for managing, monitoring and providing care to patient receiving saline. Roller clamp is used for manually controlling the saline infusion rate at the hospitals. If roller clamp rolls in one way, it compresses the intravenous tube more tightly which make tube more thin and allow saline fluid to flow through at a slower rate. If it is rolled in other direction, it loosens or releases the saline tubing which makes the tube less thin and allows the saline fluid to flow through at a faster rate [3]. In the present world, there is no such monitoring system which will reduce the dependency of the patients on the nurses, doctors and would also reduce the need for the nurses to go to patient’s bed every time to check saline level status of each patient.

1. **SOFTWARE REQUIREMENT:**
   - Language: Python 3.3
   - Database: MySQL 5.1 or Firebase
   - IDE: Arduino IDE
   - Operating system: Windows XP/Vista/7/8/8.1

2. **HARDWARE REQUIREMENT:**
   - Processor: Pentium 4, 2 GHz and above
   - RAM: 4 GB
   - Disk: 500 GB
   - NODE MCU or Arduino Uno
   - And many more

**GOALS AND OBJECTIVES**

- Reduce operational and service expense
- Get a new age platform to wow your customers

**METHODOLOGY:**

\[ S = (I, O, F) \]

Where,

- \( S \): System.
- \( I \): set of Input
  - \( \{ UL, AP, FT \} \) where
    - UL – User Login.
    - AP – Authentication Pass.
    - SC – Saline Control.
- \( F \): set of function
  - \( \{ F1, F2, F3, F4 \} \) where
    - F1 – Monitoring the Saline.
    - F2 – Sending notification.
• F3 – Getting ACK.
• F4 – Storing Data into database.

\[ O = \{ o_1, o_2 \} \] are set of Output
Where,
• o1 : Notifications.
• o2 : Saline Control.

**Success Condition:** Sensor embedding, proper database.
**Failure Condition:** No Database, No Internet Connection.

**CONCLUSION:** Hence, we have identified the functions and their dependencies.

**ARCHITECTURE DIAGRAM**

![Architecture Diagram](image)

**Fig. Architecture Diagram**

A. **Project Scope**
The problem we address in this work is how to choose values for filling form fields in a way to maximize the number of distinct database rows retrieved while minimizing the number of form submissions. Our solution is divided into a series of steps organized in an architecture. Similar to the work by Madhavan, we rely on the concept of templates.

B. **User Classes and Characteristics**
Most of the existing work on form filling overlooks the problem of finding good values for these fields. Existing solutions for dealing with text fields usually rely on a list of values previously built by a specialist, on a sample of known values, or they entail the extraction and understanding of the fields (which depends on the language and on the domain of the forms). Our proposed solution is automatic, requires no training, and relies on feedback from previous submissions. Furthermore, it can work with forms from any domain (i.e., books, jobs, hotels, airfares, etc.). Domain often influences value selection for the fields. Although our method does not use domain knowledge explicitly.

C. **Operating Environment**
Web application will work on Windows 7 or above, unfortunately it won’t run on a Linux-based system or Mac.

D. **Design and Implementation Constraints**

- **Android**
  Android is the mobile operating system (OS) based on the Linux kernel and currently developed by the Google. With a user interface based on direct manipulation. Android is designed primarily for the touch-screen mobile devices such as smart phones and tablet computers, with specialized user interfaces for television (Android TV), cars (Android Auto) and wrist watches (Android Wear).

- **Java**
  Java is a general-purpose computer programming language that is concurrent, class based, object oriented and specially designed to have as few implementation dependencies as possible. It is intended to let application developers "write once run anywhere (WORA), meaning that compiled java code run on any virtual machine (JVM). Regardless of computer architecture. As of 2017, Java is the one of most popular programming language in use, particularly for the client server web applications.

- **Android SDK Tool**
The Android Software Development Kit (SDK) includes a comprehensive set of development tools These include a debugger, libraries,a handset emulator based on QEMU, documents, sample code, and tutorials. Currently supported development platform includes computer running Linux (any modern desktop Linux distribution), Mac OS X10.5.8 or later, and window XP or later. As of March 2015 the SDK is not available on Android itself, but the software development is possible by using specialized Android application.
I. JDK Tool
The Java Development Kit (JDK) is implementation of Java Platform, Standard Edition; Java Platform, Enterprise Edition or Micro Edition Platforms which is released by Oracle Corporation. The JDK includes a private JVM (Java Virtual Machine) as well as a few other resources to finish the development of Java Application.

II. External Interface Requirements

A. User Interfaces

In information technology, the user interface (UI) is everything designed into an information device with which a person may interact. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website.

B. Hardware Interfaces

An architecture used to interconnect two devices together. It includes the design of the plug and socket, the type, number and purpose of the wires and the electrical signals that are passed across them. Software Interfaces

C. Software Interfaces

We are using open-source xampp for development purpose.

D. Communication Interfaces

In communication studies, the notion of an interface in the work environment is used for a point of interaction between a number of systems or work groups. In the manufacturing environment, the coordination and interaction between several work groups is used to communicate plans and control production activity.

II. NONFUNCTIONAL REQUIREMENTS

A. Performance Requirements

The user will easily get the schedule of diet plan through Web application. The system will make an announcement as per schedule entered simultaneously.

B. Security Requirements

Only the authorized user with credentials can able to insert a schedule and see the information on web page.

C. Software Quality Attributes

• Reliability
• Availability
• Maintainability
• Portability

ADVANTAGES

• Easily to use.
• Reduce the Time
• Reliable
• Scalable
• High Performance

APPLICATION

• Home.
• Hospitals.
• Personal.
• Organization.
CONCLUSION

The proposed saline framework won’t just screen the saline status yet in addition control the drop pace of the saline, which can be expanded and diminished according to the prerequisite. The framework can be additionally improved for different patients with a solitary web application through which we can screen the saline status of various patients and control their drop rates remotely.

FUTURE SCOPE

In future With IoT based saline level checking framework, the manual exertion with respect to the medical attendants is spared. As the whole proposed framework is mechanized, it requires exceptionally less human intercession. It will be worthwhile around evening time as there will be no such necessity for the medical attendants to visit patient’s bed every time to check the degree of saline in the jug since a ready notice will be sent to the attendants, specialists, guardians when saline reaches the basic level. It will spare the life of the patients. This will diminish the worry in nonstop checking by the specialist or attendant at a moderate expense.

REFERENCES