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ADVANCING BLOOD BANK EFFICIENCY AND SAFETY THROUGH IOT AUTOMATION

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ABSTRACT-

Ensuring the safety and availability of blood for patient use is crucial in a blood bank setting. This can be achieved through constant monitoring of temperature levels to prevent spoilage and maintain optimal conditions. Utilizing Radio Frequency Identification (RFID) technology allows for automatic wireless identification using electronic tags, which can be integrated with fingerprint biometric technology to enhance security measures. By matching RFID tags and fingerprints with a database, authorized personnel can be easily identified and granted access to blood bank resources. This study presents a novel system that combines RFID technology with fingerprint biometrics to monitor temperature and humidity levels in a blood bank setting. The system consists of sensors installed in blood bank racks, an IoT module interfaced with a PIC board, and a Wi-Fi module for data transfer to a server. Real-time data on blood stock levels are displayed on a web page, enabling blood seekers to locate the nearestblood bank with available supplies. By automating environmental monitoring and inventory tracking, this system ensures the safety and availability of blood products. The integration of RFID technology and fingerprint biometrics enhances security measures and streamlines blood bank operations. This system offers a customizable and user-friendly solution for blood bank management, with the potential to improve efficiency and patient care.

Keywords: Blood bank, RFID technology, fingerprint biometrics, temperature monitoring, humiditylevels, IoT module, inventorytracking, securitymeasures, blood stock levels, real-time data, web page display, blood seekers, environmental monitoring, blood products, blood bank operations, efficiency, patient care.

I. INTRODUCTION :

Automated Blood Bank is a project that aims to connect voluntary blood donors with those in need of blood through a user-friendly android application. The goal is to ensure that every blood request in the country is fulfilled in a timely manner. By utilizing a low-cost and low-power PIC microcontroller kit, this project will bridge the communication gap between donors and recipients. Every year, the demand for blood in the countryis high, with onlya small fraction of the required units available. With someone needing blood every two seconds, there is a constant need for blood donations. The Automated Blood Bank project seeks to address this needbyprovidingaplatformforindividualstoeasilyfindwillingdonors.ByleveragingIoT technology, the project will streamline the process of connecting donors with those in need of blood. This will help ensure that patients, including those undergoing cancer treatments or involved in accidents, have access to the blood theyrequire. Automated Blood Bank is dedicated to making a positive impact on the lives of those in need of blood.

METHODOLOGY EXISTINGSYSTEM

This existing used the cross-match ratio, it determines core demand of each patient, as well as reserve demand. The double cross-match policy in which two patients, considering the compatibility criteria, can have a common (shared) reserve. This existing idea is borrowed from inventory management techniques, with the aim of reducing the in hand inventory, which cause aging the blood units. They have developed, hybrid issuance policy based on a combination of FIFO and LIFO approaches. Age of the product, as well as two different demand types based on the age of the product is also modeled.Once the decisions are completed on the assignment of shared hold back at the end of each period, blood units are assigned to the patients and the inventory status is updated (as it deals with aging products, in a multi period setting), using the new hybrid issuance policy. An illustrative numerical example is developed to describe the mechanism ofthemodel. Using younger blood units is preferred for qualityofcarepurposes, the proposed issuance policy also helps improving the quality of care. Disadvantages: They have developed only numerical model.

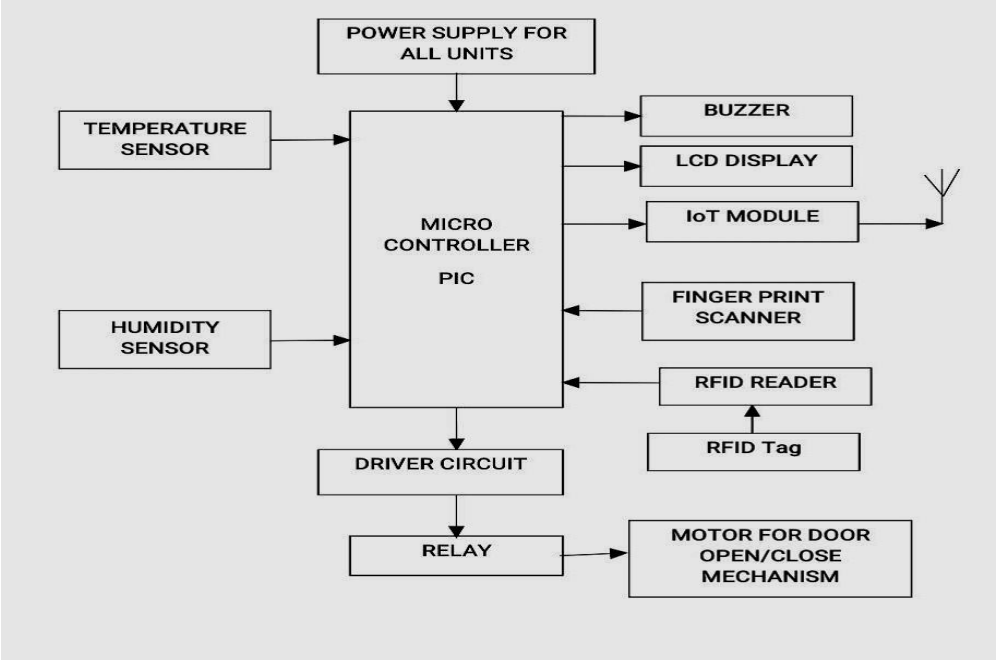
PROPOSEDSYSTEM

Blood is a saver of all accessible lives in case of crisis needs. In our proposed"Automated Blood Bank" is to collect the information from the donors, to monitor the Blood groupdatabaseand to send therequired Blood duringtheneed ofrecipient in caseofemergency. We aim to establish a network of individuals who can assist each other during emergencies. By monitoring blood banks, we not only reduce waste but also rigorously manage inventory levelsto ensure patients receive the blood they need when they need it. This includes continuous monitoring and automatic updates of temperature and other critical factors. Inbuilt time monitoring to ensure the expiring date of the stored blood packs and automatic alert system. Detection of nearby blood banks and blood donors in case of emergency will be easy.

This can help morepeople in manyways even can saveliveat a critical time. Blood bank monitoring not only reduces waste but also rigorously supports inventory levels, ensuring patients receive the blood they need when they need it. Manual recording of temperatures in blood banks has the potential for suffering human error as well. The proposed system is an IoT systemwhichwillcloselymonitortheavailablestatusofthebloodandtemperatureandhumidity of the refrigerator which is present inside the. Blood bank has sensing unit installed to it which has humidity, temperature sensor, PIC controller as a gateway with Wi-Fi module using wireless protocol for wireless communication between blood bank and cloud.

Customizable and with low learning curves, an automated environmental monitoring system not onlydocuments temperaturebut also humidityto ensurethesafetyofblood. Constant monitoringandroutineupdateoftemperatureandotherfactors. Inbuilttimemonitoringtoensure the expiring date of the stored blood packs and updated to the cloud RFID Reader is used toreads the RFID based smart blood pack and update the available blood pack to the cloud using cayenne server. The user/consumer can view the blood group with stored date & time without any human intervention. Identification of nearby blood banks and blood quality with date and time in case of emergency using IoT module This can help more people in many ways even can save live at a critical time.

BLOCK DIAGRAM



WORKINGMODEL EXPLANATION

1. Data Collection:

Sensors continuously collect data on temperature, humidity, and weight from the storage units. RFID/NFC tags provide real-time information on the location and details of each blood bag, including type, expiry date, and donor information.

2. Data Transmission:

The collected data is sent to the IoT device (microcontroller).The IoT device processes this data and transmits it to the cloud server via Wi-Fi or GSM modules.

3. DataStorageandProcessing:

The cloud server stores the data in a database. Data processing algorithms analyze the data to detect any deviations from the optimal storage conditions.

4. MonitoringandAlerts:

If any parameter (temperature, humidity) goes out of the safe range, the system triggers an alert. Alerts are sent to the relevant personnel via SMS, email, or push notifications through the mobile/web application.

5. UserInterface:

Healthcare professionals can log into the web or mobile application to view real-time data, historical trends, and reports. The application provides insights on blood stock levels, upcoming expiries, and any maintenance needed for storage units.

6. AutomatedActions:

The system can automaticallyadjust coolingmechanisms if connected to a smart HVAC system. It can also reorder supplies or flag blood bags nearing expiration for priority use.

RESULTANDDISCUSSION

There are three keyareas within the Internet of Things (IoT) concept that hold significant potential for future improvement and research: efficiency, scalability, and qualityof service. We have developed a prototype system that provides real-time information about available blood stock. Additionally, an alert system using RFID tags combined with smart temperature sensors can be integrated to indicate expired blood packets and monitor their temperature.

In the future, this work can be expanded to encompass all blood banks within a country. Big Data analysis can be performed on the collected data from various regions, allowing for the allocation of specific domain names to the blood bank app. The blood bank's website can also offer login IDs and passwords to blood seekers, enablingthem to make online requests for blood units.

The hospital blood bank is responsible for managing blood bags from the moment they are received from donors until they are transfused to recipients. Blood is highly sensitive to temperature and must be stored in a stable, refrigerated environment to prevent deterioration during storage and transport. To prevent indirect deterioration, we utilize a sensor network with IoT capabilities and temperature sensors installed in the blood bank refrigerator. These sensors measure the internal temperature and transmit data to a sink node and laptop, which is connected to a global cloud server. If the refrigerator's temperature becomes unsuitable for blood storage, the IoT module sends alert information to the blood bank.

Before a blood transfusion, medical staff performs various tests to determine if the blood is suitable and to confirm the blood bag's temperature. However, the blood bank's storage facilities and equipment are still vulnerable to power failures and human error, as temperature reporting is currently manual and occurs every second. The blood bank sensor network system, along with RFID tags for use during blood transport, has been developed to enhance efficiency beyond manual efforts alone, enablingdata sharingand ensuringthe accurate provision of blood.

CONCLUSION

The implementation of an IoT-based blood bank monitoring and identification system significantly enhances the efficiency and reliability of blood storage and management. By integrating real-time data monitoring and automated identification processes, such systems ensure optimal storage conditions, reduce the risk of human error, and facilitate timely interventions when necessary. This technology not only streamlines the operational workflow within blood banks but also improves the traceability and safety of blood products, ultimately contributing to better patient outcomes and more efficient healthcare delivery. As IoT continues to evolve, its application in blood bank management promises to drive further innovations and improvements in the healthcare sector.

OUTPUT

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