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Blood Bank Management and Inventory Control Database Management System

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Abstract

This paper presents a detailed approach for an efficient blood bank database management system. The database is the single most useful setting for caching data, and it is also an ideal tool for contriving, managing, updating, and modifying data from different angles. The benefits of a well-structured blood bank database are limitless and yield the benefits of improving efficiency and saving time. Here, our motive is centred on this area. India faces a shortage when it comes to the amount of blood donated. The gap in demand and supply in widened due to mismanagement and inefficient databases. We have modelled a well-organized database to try and reduce this gap. Alongside, we have developed an application that reminds donors when they become eligible again, gives locations of nearby blood donation camps, makes requesting blood easier for blood recipients etc. as well as promoting a healthy community. IOT is used for interlinking the application to the server as well as for inter-application communication. With the help of IOT this collection and exchange of data becomes more efficient.

Keywords: Database; MySQL; Blood-bank; Management Information System; IOT; mobile application

1. Introduction

In recent times, India has seen a tremendous improvement in collection of blood. Despite such growth, we face a shortage of nearly 1.95 million units. We aim to create an efficient database system to curb the existing gaps in the Blood banking systems and ensure minimal wastage of blood units. We have created a blood bank management

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database using Microsoft SQL server. Blunders at the hour of organization of blood or blood parts have resulted in severe casualties. We have created a system that mitigates such disparities[1]. Rajya Sabha was informed by the Union government of India that 63 districts did not have blood banks. Arunachal Pradesh, Assam, Manipur, Bihar, Meghalaya and Nagaland are the states that face such issues.

2. Literature Survey

Recently, various approaches for blood bank database systems have been proposed in the literature. Few of the relevant methods are described here:

2.1. The Optimization of Blood Donor Information and Management System by Technopedia

Priya et al. [3] introduced an android mobile application with GIS that establishes a productive, organized, and secure Information Management System. The proposed solution detects fake donors and the misuse of information by users of the application. Also, quality checking of blood at various levels is introduced. It is required for the safety of the patients.

2.2 A Study on Blood Bank Management System

Teena et al. [4] designed an efficient information management system that maintains records of donors and patients. It has a security layer that allows only authorized employees of the Blood bank to access and update the records through a login using a secret password.

2.3. Effective Blood Bank Management Based On RFID in Real Time Systems

Pramodini et al. [7] have created a database system which minimizes human error. Most of these errors occur during a blood transfusion. They have ensued a Blood bank DBMS based on RFID that strives at mitigating these errors..

3. Proposed Approach

The proposed system endeavours to help blood bank supervisors to service inquiries and various blood recipients, whether they are individual patrons or hospitals, with higher efficacy and attenuate wastage. This approach tries to effectively bridge the gap between blood banks, donors and recipients by creating effective databases and applications for all the three and further breaking down the databases to reduce the chances of the inconsistency of the data and hence increasing the efficiency of the system.

The relational diagram of the proposed method is illustrated in the following:

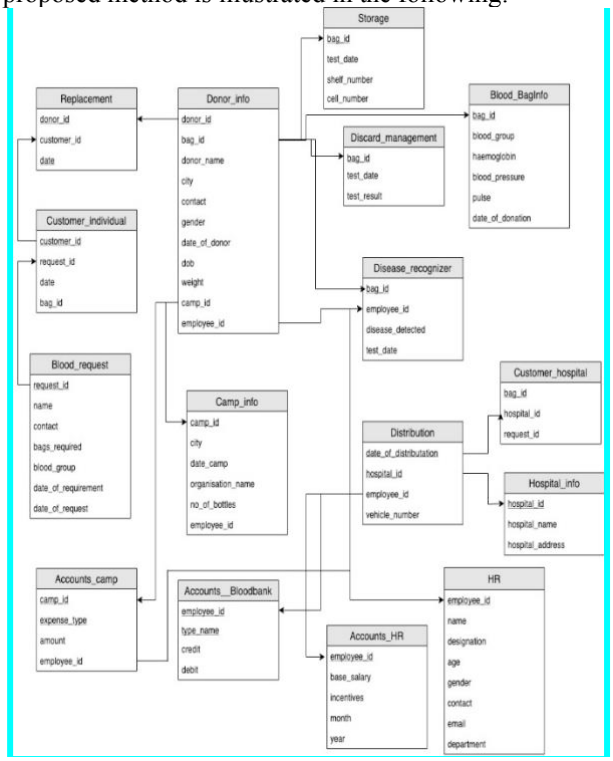

Fig.1. Relational Diagram of the Project

Information about various relations is listed below:

- *Donor_info* contains detailed information about the donor.
- *Storage* contains information about where various bottles of blood are stored.
- *Replacement* contains information about donor, customer who wish to replace requested blood bottles.
- *Customer_*individual contains information about individual customers who have requested blood.
- *Blood_BagInfo* contains information about all the contents in the blood bag.
- *Discard_managment* deals with blood bags that need to be discarded.
- *Disease_recogniser* deals with infected blood bags.
- *Camp_info* contains information about various camps that happen.
- *Customer_hospital* contains information about hospitals that requested blood from blood banks.
- *Hospital_info* contains information about various hospitals.
- *Blood_request* contains information about individuals that requested blood from blood banks.
- *Disribution* deals with transportation between blood banks and hospitals as well as various employee.
- *HR* contains detailed information about various employees that work at various blood banks.
- *Accounts_HR* deals with the accounts of various employees that work at various blood banks (salary and insentives).
- *Accounts_Bloodbank* deals with operational costs of various blood banks.
- *Accounts_camps* deals with operational costs of various camps.

In Fig.1, we have underlined a few attributes to represent primary/composite key. The data in all the databases are in sync with each other and extremely easy to retrieve with the help of strong computational powers of My SQL. All the tables of the database would be normalized, reducing the chances of data redundancy. This would be done by having different tables to store the information of donors, individual customers, hospitals, HR of the blood banks, accounts

of blood banks, and the various blood camps. Moreover, all the databases would be hosted on a cloud server, making them more scalable and more reliable.

4. Experimental Analysis

In this subdivision, we will introduce the features and results of the design to illustrate the execution of the submitted database system. We also interpreted the significance of different parameters and correlated them with existing methods.

4.1. Blood bank systems and governing institutions of other countries

- United Kingdom

The UK has four predominant national blood service organizations. In 1999, the UK blood services forum was founded and was concomitant to the decentralization of government in the UK. It includes executive directors and medical directors for the four consortiums[8]. For safe blood storage and blood transfusion, JPAC has established many guidelines like specifications for uniform labeling of blood and human tissue products and various standard protocols for electronic data interchange within UK blood transfusion services [9-11].

- United States of America

In the USA, the FDA started cloud-based blood bank database management system in 1988 [12]. in 1989 FDA published comprehensive guild lines for all blood banks[13]. Further amendments were made in 1994, 1997 and 2005 [14 -16].In the interim, other first-world nations, which includes the France and the UK, have created extensive guidelines [17–21]. The country's blood and plasma are gathered by two particular frameworks that depend on various donors and produce various items. The blood collected is fundamentally not for benefit. However, the plasma collection is monetized. Blood banking is managed by the federal government [22]. It screens the security and adequacy of blood items, and advances examine blood illnesses. The two frameworks are managed by the FDA likewise, in spite of the fact that the particular necessities vary on account of contrasts among blood and plasma items[23].

4.2. Relational Algebra and sample queries

The database contains over 4000 data entries which are created in a randomized manner. It is created using well interlinked relations. As a result we can reduce the search time as well as eliminating data redundancy. This makes the database more efficient and reduces lag. We have created the system using SQL. Using SQL based system is very easy. Therefore in real time, the Pathology technicians and phlebotomist can easily obtain any information from the database and can design the queries if some new questions arise from end users.

- Select donor who did not donate in any camp (Donated directly at a hospital).
  - Relational algebra
    $\prod_{donor\_name} (\sigma_{camp\_id} (donar\_info) - \sigma_{camp\_id} (Camp\_info))$
  - Sql query:

```
Select donor_name
From donar_info
Except
Select donor_name
From Camp_info;
```

- Name of all organizers who have organized in Ahmedabad
  - Relational algebra
    $\prod_{organization\_name}(\sigma_{city=Ahmedabad"}(camp\_info)$
  - Sql query:

```
Select organization_name
From camp_info
```

Where city=”Ahmedabad”;

donor_name
Ajay
Ajay
Anvesha
Anvesha
Anish
Anurag
Heem
Amin
Raj

donor_name
Anish
Anvesha
Heem
Joey
Pete
Phoebe
Raj
Raju
Rama

organisation_name
Red Cross
Red Cross
Red Cross
Red Cross
Red Cross
Red Cross

Fig. 2. (a) Output of first SQL query; (b) Output of second SQL query; (c) Output of third SQL query

5. Comparative Analysis

The proposed method is compared with methods [1-5] described in Section 2.1-2.5. Table 1 shows the comparison in terms of different features. It can be inferred from Table 1 that compared to the previously existing methods proposed in [1-5], the performance of this method is better, which confirms the efficacy of the existing method.

Table 1. Comparison of our approach with other papers

Features	Paper1[3]	Paper2[4]	Paper3[5]	Paper4[6]	Paper5[7]	Our Approach
Notification to donor when they are eligible	Yes	Yes	Yes	Yes	No	Yes
Hospitals can contact donors in case of emergency	Yes	No	Yes	Yes	No	Yes
Notification to donor when a camp is held where they have previously donated	No	No	Yes	Yes	No	Yes
Requesting blood directly from blood bank (via application)	Yes	No	Yes	Yes	No	Yes
Application shows nearest blood bank	No	Yes	Yes	No	No	Yes
Secure and anonymous chat to the donors	No	No	No	No	No	Yes
Different authorization rights to hospitals, blood banks, doctors and donors	No	Yes	No	Yes	Yes	Yes

Table 1 compares our approach with previously published works. It compares the various features of our research paper such as creating an applicant that sends necessary notification to hospital and donors as well as making the system more efficient and transparent. It also preservers the atomicity of the system as well as making it secure.

6. Future Scope and Conclusion

Currently we have designed an efficiently interlinked Database Management System. In future a GUI based application can be created that connects the users with the Various blood banks in the city and get information about availability of types of blood available as well as information about donors in case of emergency. This application can be installed in ambulances in order to save time. Ambulances can take patients directly to hospitals with their blood type. With the help of this application hospitals will get notifications before the expiry date of blood units as well as notifications of test dates and results to the blood bank workers. An application for donors can be built where they will get SMS alert when they become eligible to donate blood along with information regarding various blood donation camps as well as building an aware community.

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