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Design and Implementation of Blood Bank Stocks Tracking and Donation System

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ABSTRACT: In the time of crisis, procuring an adequate quantity of blood can prove crucial in saving someone's life in many scenarios. The current solutions do not provide immediate connection between blood banks, donors and the patients that results in a long, expensive and tedious process of obtaining blood. Manual systems also prove time consuming and prone to many human errors. Moreover, the lack of control on blood banks, parallel markets and unavailability of rare blood groups is another concern in the current system. A centralized blood bank management system is needed that can connect all the entities of the system to provide quick insights, information and help when needed to the stakeholders. In this paper, we give the details about the blood bank management system and propose our system that aims to provide a common platform for blood donation and for blood banks to update their blood stocks and provide vital information in real-time.

KEYWORDS:Blood bank, Donor, Centralized, Blood bank management system

I. INTRODUCTION

The primary function of a blood bank is to procure blood from donors with various blood groups, maintain a database of blood groups and storage of blood, and provide adequate amounts to hospitals or beneficiaries when needed. To take a case when blood procurement becomes an emergency, for example, the numbers of crashes and of people left injured were also the highest levels since the recording of such data started in India—at 4.5 lakhs and 4.8 lakhs respectively in the years of 2014 and 2015, most of the injured people will require the blood during the surgery [1]. Usually, when patients or their families look for a specific blood group at any blood bank, they cannot get it due to a shortage of blood bags. Blood transfusions are commonly needed for trauma victims - accidents or burn victims, organ transplants, for women with complications during childbirth, new-born babies and patients with leukemia, cancer or thalassemia [2]. The rising demand for blood and the sheer number of manual steps required in the current system makes it difficult for blood banks to maintain the accuracy of their respective stocks, and therefore, the need of a management system that can help tackle such a situation with ease.

In 2020, Indian blood banks faced a nationwide shortage of blood stocks in blood banks due to COVID-19, resulting in decreased blood donation [3]. In such a scenario, communication between donors, blood banks, hospitals, and beneficiaries become more challenging. It can happen that a donor is available but the other entities are not aware of it. In this paper, we take a look at the supporting literature, their implementations and work done to gain insights into how they approach and try solving this problem. Then, we propose our system alongwith the design, system components and images of the final implementation. The paper is organized as follows. Section II presents the literature survey studying the approach used in previous papers. Section III presents the proposed system followed by implementation in Section IV and finally, with the conclusion and acknowledgements.

II. LITERATURE SURVEY

The purpose of this survey is to find a way to provide a solution to not only the blood banks but also to the numerous patients and willing donors. To do that, we have put effort in studying research in this field and gather enough information to achieve that goal.

[2] Describe an android application developed that allows blood receivers and donors to register to the system. All blood banks, receivers and donor information are stored in a central database. They implement three kinds of users in their application: receivers, donors, and blood banks. The application enables receivers to check the availability of blood and make requests of blood. System can provide the receivers with the nearest blood banks and donor locations. The system notifies donors to donate blood in donation camps at the time of emergency. The system uses the location of the user and Google API to find the nearest blood banks and donors. However, using the location of the user can threaten the privacy of the user and in case the user denies location access, can hamper the usability of the application. Rather, the application should have a user-chosen city/area preference to donate according to preference.

[4] Proposed a blood bank system using an android application. In this system, users can register so that they can search blood banks and nearby hospitals using Google Maps API. The user can also request blood, which needs to be accepted by the administrator. The system sends notifications to the user when their blood group matches the required blood in their region. This system also allows the user to conduct a blood donation camp by providing venue and date. The system then sends notifications to other users in that area. The disadvantage in this implementation is that any user can organize a blood donation camp without validation. Also, it allows receivers to directly receive blood, which makes it possible to misuse the service.

[5] Discussed how the requirement for the blood is essential for treatments in hospitals and other medical centres, especially during emergencies. They proposed an android application for blood donors and receivers to connect with blood banks. Receivers can request blood but if there is no availability of required blood groups in the blood bank or stock level is low then blood banks send notifications to donors using web services. Registered blood donors receive notifications and they can donate blood. To connect web and mobile services, the system uses a cloud-based database that stores all information about users and blood banks.

[6] Proposed a similar system for Nigeria that considered both online and offline functionality by proposing a central online database interface through web application and USSD/SMS code for easy access and free Toll line for voice communication. This system attempts to protect the interest of every party while building a sustainable system involving hospital, donors, and patients. The paper also recommends barcode-based blood bags for more control over the stocks and local language support in the future so the application can cater to a larger audience in rural areas.

[7] Proposed an application "Blood Management System" where four modules were introduced, Android Application for donor, Web Application for hospital, web application for blood bank and the database. Donors can find nearest blood banks according to current location using the GPRS system and donate blood. These registered donors can be contacted if blood is required in blood banks near them. Through The hospital web application, Using the unique hospital id registered in the hospital's database recipient can request a required amount of blood. Recipients can check blood availability in all nearest blood banks. In module 3, Blood bank can serve blood request after validating request. It can request blood from neighbouring blood banks and registered donors too. Module 4 consists of databases; 3 separate databases were used for 3 modules and these were hosted on cloud for scalability and reliability. The paper describes a comprehensive implementation while maintaining necessary functionality for each stakeholder.

[8] is a web application designed and developed by the Government of India to ensure proper blood collection & donation, effective management and monitoring the quality and quantity of donated blood. It is a robust application integrating Aadhaar linkages, alert and notification system, blood grouping, registry of rare blood group donors and generation of regular repeat donors. It can keep track of numerous blood banks across the nation and is available on desktop and mobile platforms. However, the user interface and experience are not intuitive, resulting in critical response from the masses.

III. PROPOSED SYSTEM

Based on the previous research in the area, we propose a web application for managing stocks in blood banks and managing donors to provide good communication between all parties. The proposed system has three actors: Blood bank, users and administrator to regulate the blood banks. The system will provide real-time quantities of blood in any registered blood bank and anyone can look up the information on the application and be motivated to donate blood, resulting in better available stocks when needed. It also helps patients get insights on which blood bank has good chances of still possessing blood stocks when they need it.

The proposed application has been developed using the latest and popular technologies available for all parts of the system.

- The system was built using JavaScript for both frontend and backend development with npm package manager for implementing security features like SHA-512 and bcrypt hashing for passwords in the database.

- The system runs on all desktop and mobile operating systems since it is a web-based application hosted on the cloud.

- System requirements: Google Chrome v80.0 or later, Mozilla Firefox 48.0 or later.

IV. CONCLUSION

A. Design

The block diagram for the proposed system is shown in figure 1.
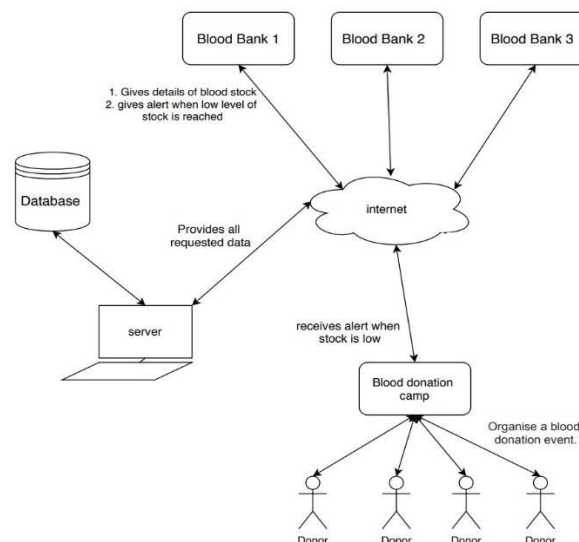
Fig. 1. Block Diagram of Proposed System

The application has three components:

1. Blood Bank: Bloodbanks have to register on the platform using their information and they cannot get access to their features unless the administrator approves their information. The blood banks can update their stocks, organize blood donation camps, and get access to plasma donors in their area.

2. User: Users can also register on the platform and get access to all the sections of the application like blood camps, individual and aggregated information of blood stocks in blood banks in the form of a table, they can view the plasma donors so they can contact if needed. A user can also register as a plasma donor and contribute to the cause and show interest in blood donation camps through email format already fed in the application.

3. Administrator: The sole purpose of the administrator is to approve blood banks in the application and this provides a sense of control over which blood banks can participate in the application.

The below figures show the final working version of the application and all its modules. In addition to the modules described earlier, some additional but useful features like resetting password using OTP via email and updating profile have been developed.
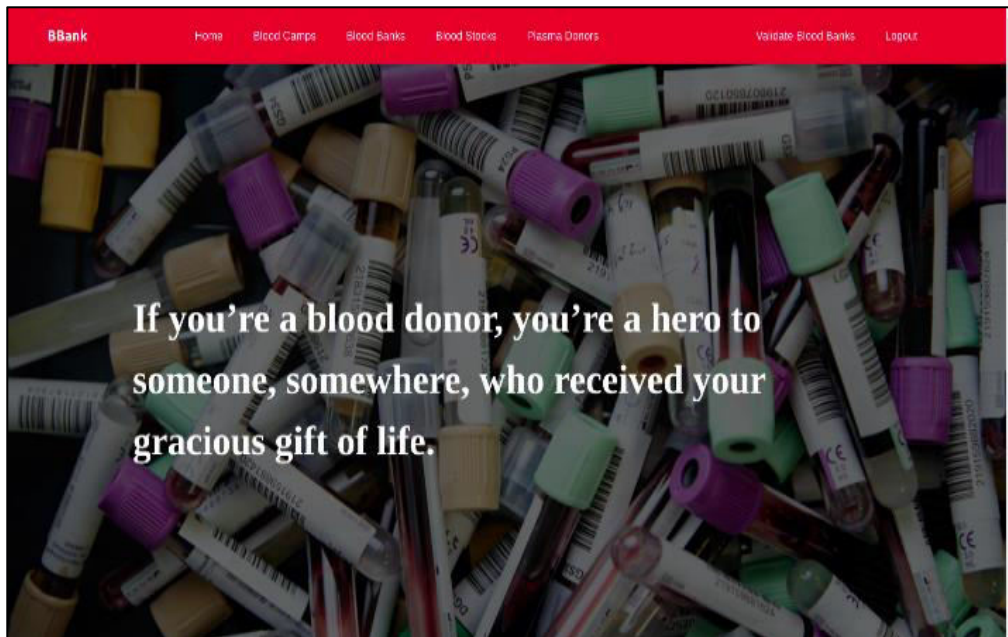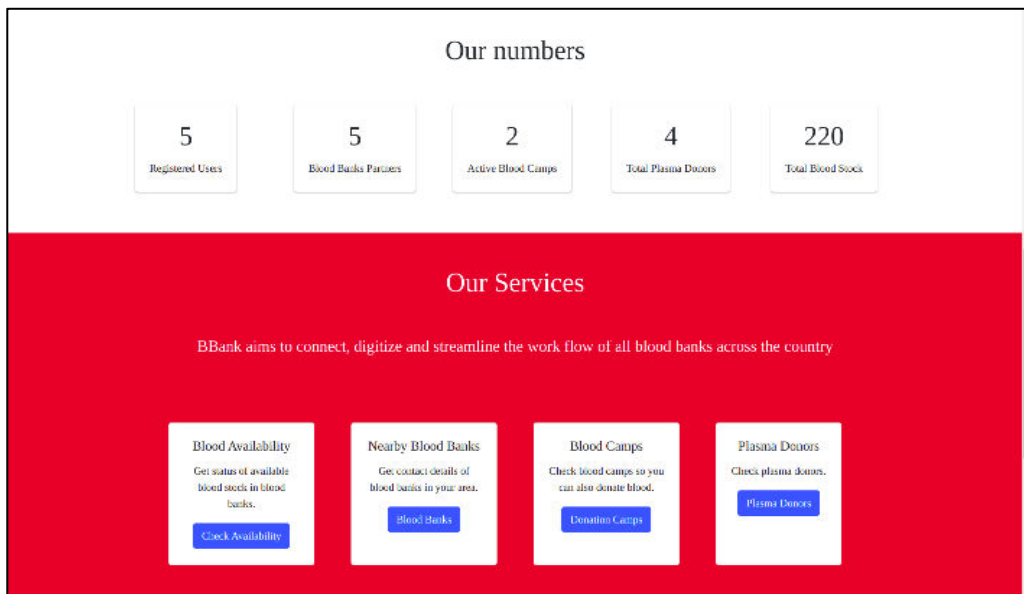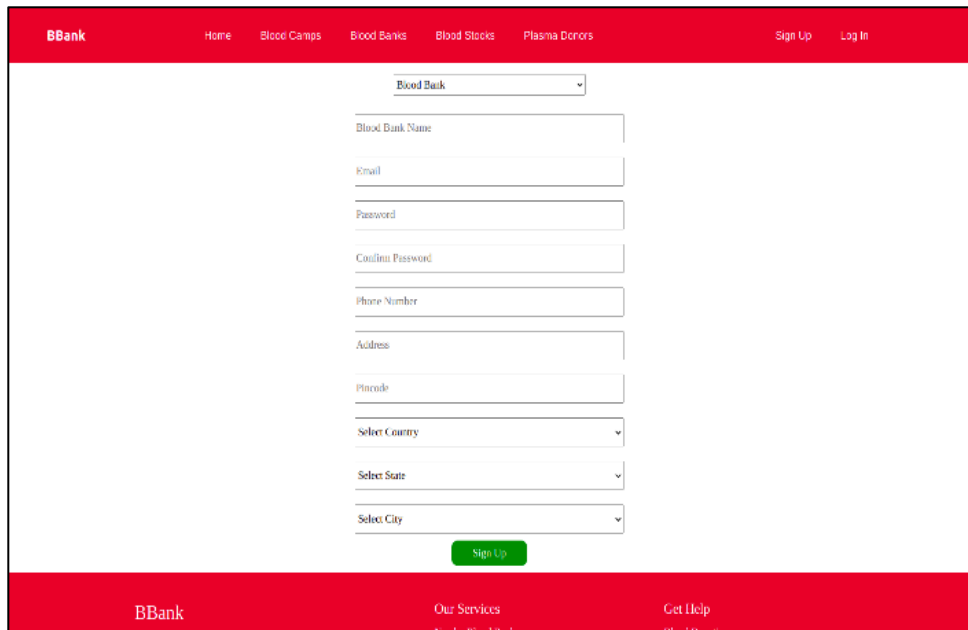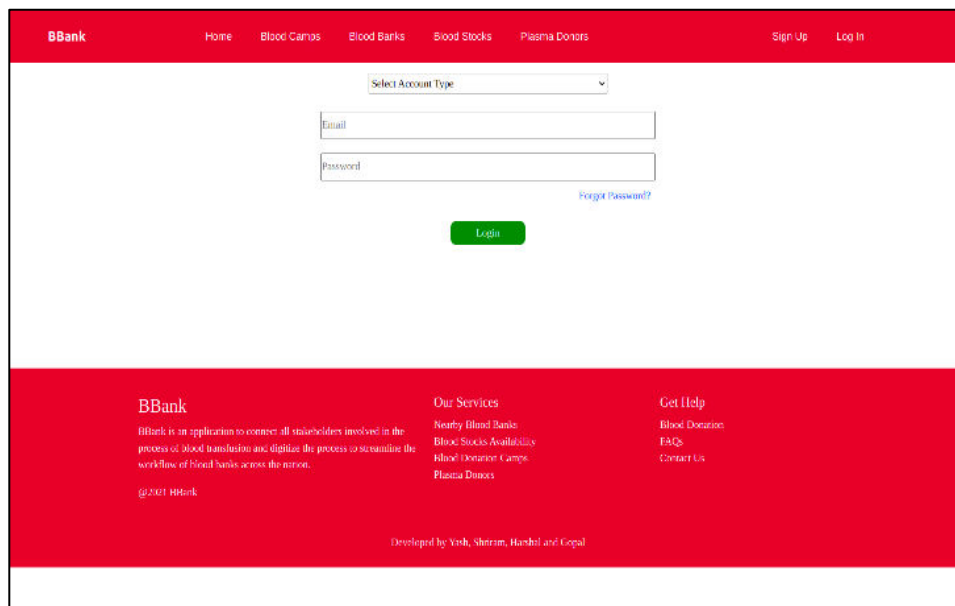
Fig. 1 Homepage

Fig. 2 Homepage lower section

Fig. 3 Registration

Fig. 4 Login Page

Blood camps can be viewed and filtered as upcoming or active depending on user's choice. Blood camps can be organized only by the banks that have been approved by the administrator of the system.
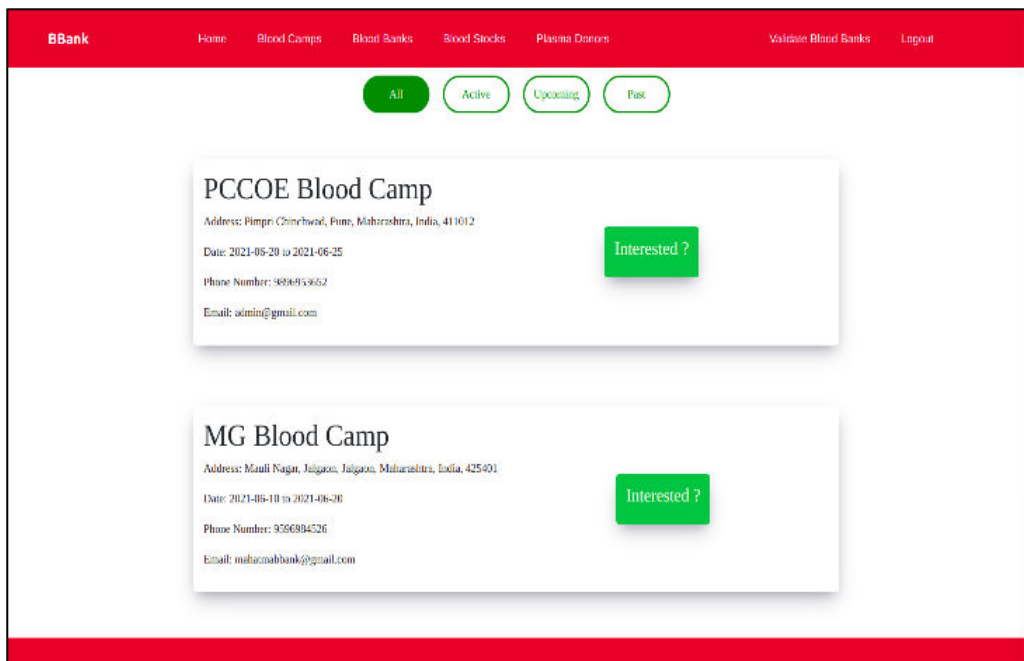
Fig. 5 View Blood Camps

Any user can get open access to the blood stocks and basic contact information of the blood banks along with stocks on the blood stocks page, so users don't need to compulsorily register on system to get such minimum information. This helps the application to prove less intrusive and gives the user an option to use the application as per their wish.
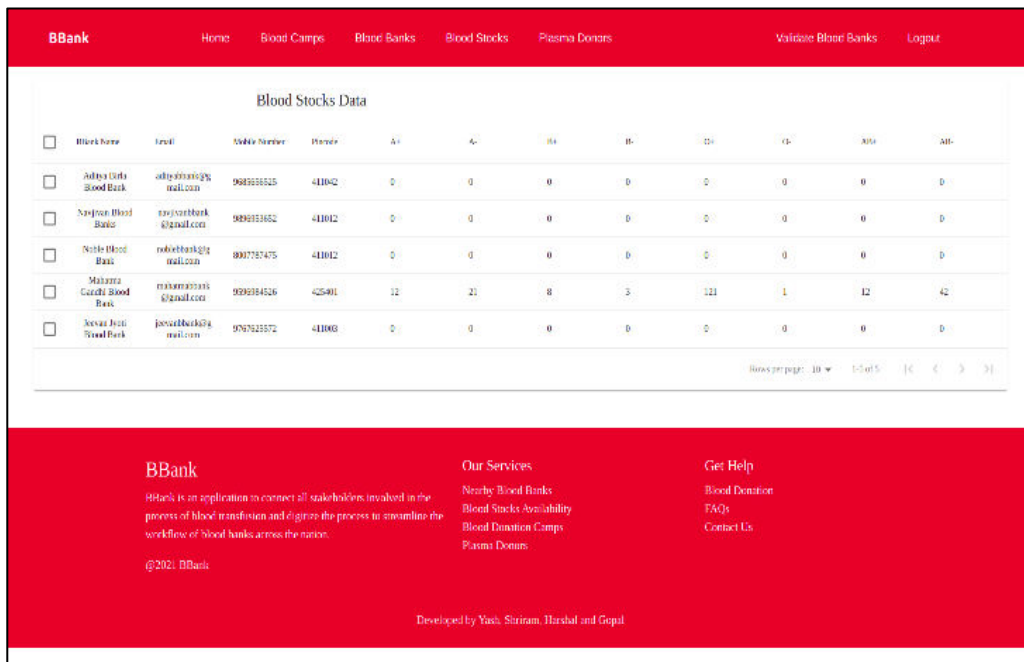

Fig. 6 Table of Blood Stocks

V. CONCLUSION

In In this paper, we discussed the previous implementations of the blood bank management applications. We proposed our application in which, we attempt to overcome previous limitations and develop a robust application that

regularly gives blood stock updates by its users and blood banks by providing real-time information. Plasma donor module provides minimum details of the donor to the beneficiaries in need, the basic information of the donor when they choose to volunteer to donate at a blood camp will be given through the user's permission. Respecting the privacy of the individual, our application has not taken location access and makes its users decide how they want to use the platform.

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