ORIGINAL RESEARCH

An Android based blood bank information retrieval system

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Background: Blood Bank record keeping has been carried out manually over the past decades using paper file management system which is slow for information retrieval and processing and also prone to errors in an emergency situation.

Materials and methods: This research work solves the above-mentioned problem with the development of both web-based and Android-based blood bank information retrieval system. The web application is used by various blood banks system administrators to update their available blood inventory information and the mobile application which has the mobile search engine is used to search for blood supplies from the registered blood banks.

Results and conclusion: The system also has a feature that allows registered blood banks to send a notification to registered blood donors on the application requesting for blood donation.

Keywords: blood bank, web-based, Android-based, information, retrieval

Introduction

The Human Blood is a specialized fluid that transport nutrients, oxygen, and waste products within and outside the cells in the body.[1] For blood to be in more excessive for usage at any time for those that require it as a result of blood donation it has to be gathered, stored and preserved for later use, this is called blood bank for transfusion. Blood Transfusion is the process of receiving blood into person circulation intravenously through the vein. Transfusions are used for various medical conditions to replace lost components of the blood. Past decades, transfusion takes place by replacing the whole blood that was used but in this modern days, the practice of transfusion replaces only the components of the blood that was lost such as red blood cells, white blood cells, blood plasma, clotting factor, and platelets. The blood groups A, B and O was discovered by Landsteiner during a laboratory experiment which he mixed blood samples taken from his staff when he then established the basic principle of A, B and O compatibility.

Blood Transfusion came into existence during the Second World War when voluntary donated for blood for storage which was used to treat the injured soldiers during the war. This process was done on a large scale which then became well known as a lifesaving procedure. In order to eliminate the problem of complete blood transfusion of the past decade, an American Surgeon[2] suggested that blood gotten from the donor should be grouped and cross-matched with the patient before a blood transfusion process can take place.

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In the past years, the number of voluntary donors has been increased compared to blood donors that are being paid. Though there is an increase in voluntary blood donor, because of lack of information about blood donation, many people are not being able to donate blood.[3] Because of this reason, there have been continuous losses

of acquirable blood from individuals who are willing to donate blood. Emergency patients, who are in need of blood, usually request blood through advertising on televisions or social media, with the series of advert placement of donation of blood the patient may still not get the required amount of blood needed at that particular time.
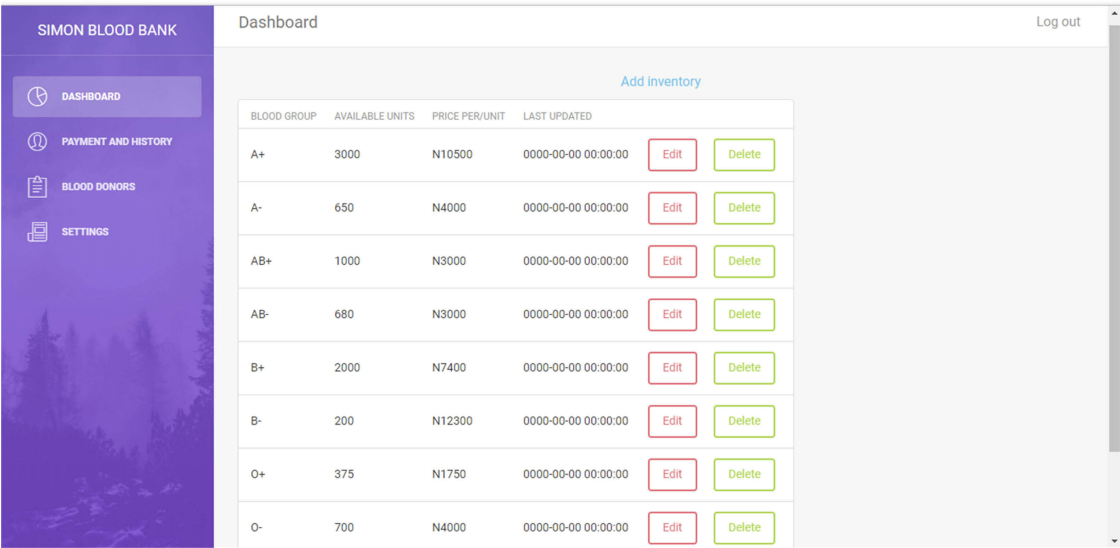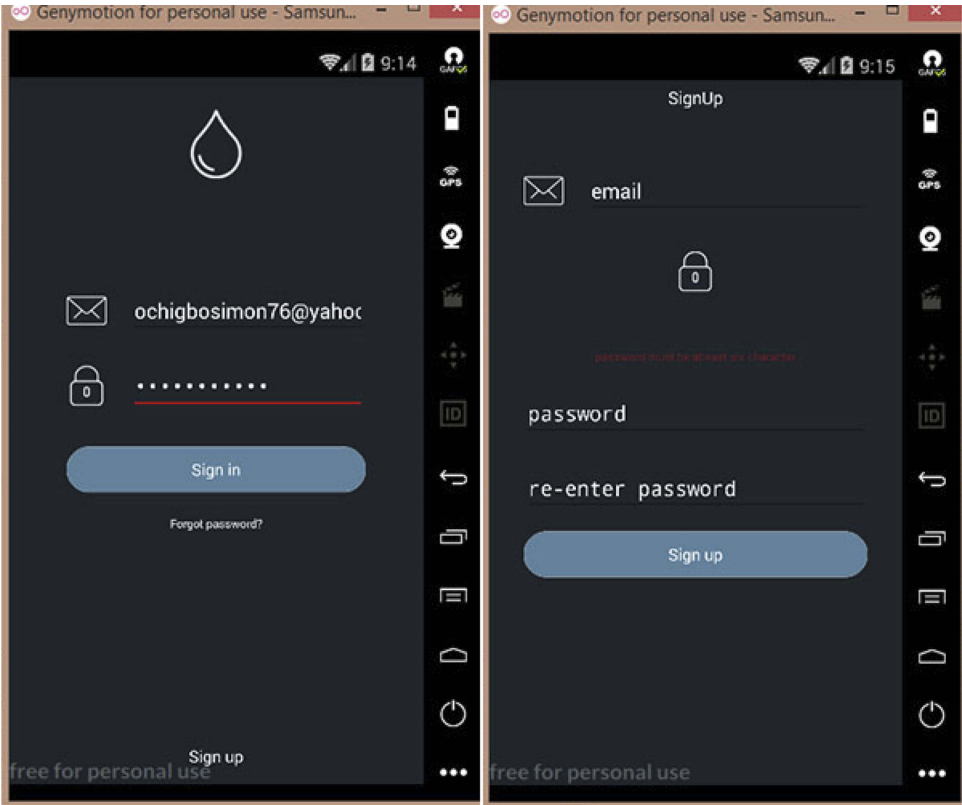

Figure 1 Admin homepage.

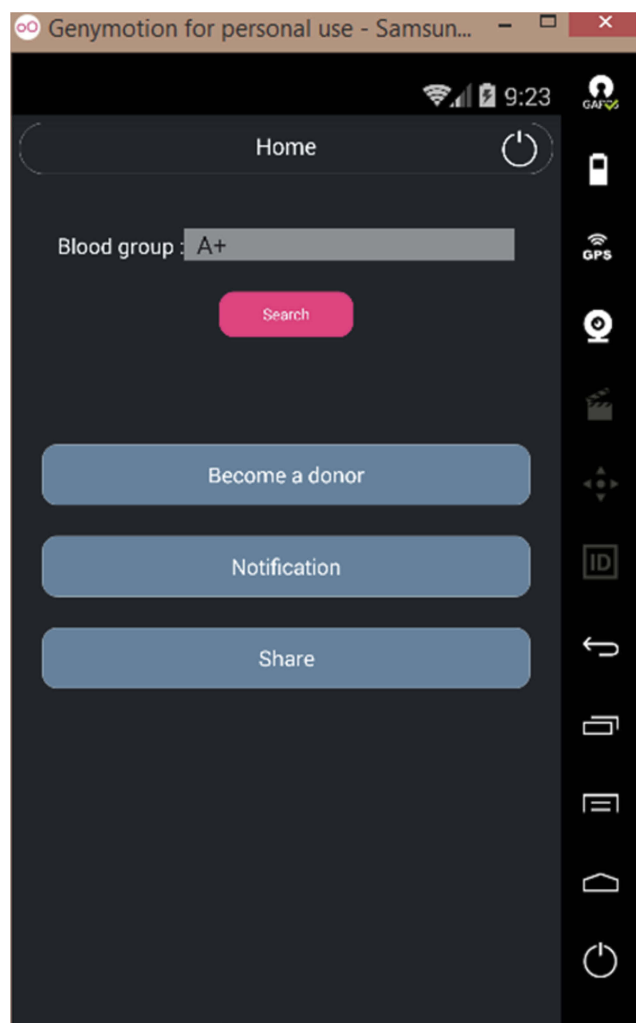**Figure 2** User's registration and sign-in.

Figure 3 Android platform home page.

With the rapid usage of a smartphone with series of features and faster computation process blood bank search activity can be integrated on the mobile phones for easy search of available blood from blood banks or blood donors in nearby areas in cases on emergencies without any delay.

The application developed in this study is based on both the web and Android platform which will play an important role in making blood readily available for patients who needed blood thereby increasing the likelihood of saving their lives. The web application would act as a centralized database for blood banks, where blood banks go to register and are able to update their blood inventory details in real-time. The mobile application will be able to search through the centralized database for available blood type needed from all the blood bank registered. In some cases when blood banks do not have the available blood type or are running low on blood supplies,

registered volunteer blood donors on the blood donor app can be alerted for the need for them to donate their blood. This study is aimed at developing an application that will include all the relevant features to provide a means of communication between blood seekers, blood donors and blood bank.

Related reviews

Several authors have worked on blood bank management system, only the most recent and most relevant ones are mentioned:[4] the work presents the situation of the information processing system of the Malaysian medical information and emergency systems. The work also focuses on the development of an integrated Emergency, Healthcare, and Medical Information System (HMS) that can help overcome numerous issues in the current systems in Malaysia. The aim of the project is to combine the real-time and mobility technologies with medical emergency systems.

In Kanobe, the author worked Web-based blood donor management information system for the Red Cross Society, Uganda (WBBDMI), and the work which describes the development of a blood management information system which helps in the management of blood donor information and records and also controls blood supplies in various parts of Uganda based on hospital demands.[5] The Web-based donor blood management information system offers very important features, one of which is quick access to donor's information collected from different parts of Uganda. This helps in monitoring the results and performance of blood donation activity such that the important objectives of the organization can be checked. The system provides the management timely, confidential medical reports that aid planning and decision making and thereby improving the medical service delivery.

Esah and Rahman developed a management information system for managing of blood bank based on information provided by the donor and recipient of blood.[6] This system consists of three modules which are the donor module, the patient module, and the blood module. However, some crucial issues were left aside in their approach, such as the person responsible for the administration of the system.

Lowalekar and Ravichandran, They reviewed the existing web-based information system for blood banks, shows the comparison of various system and provides ideas to help improve the system.[7] They also studied the current blood banks system and identified problems that are peculiar to Indian blood banks. They concluded their review by
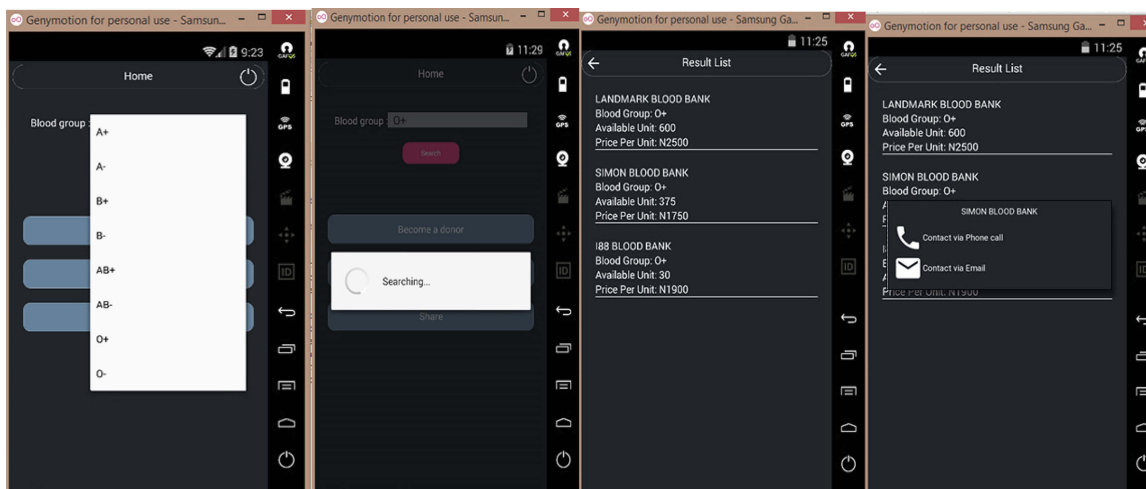
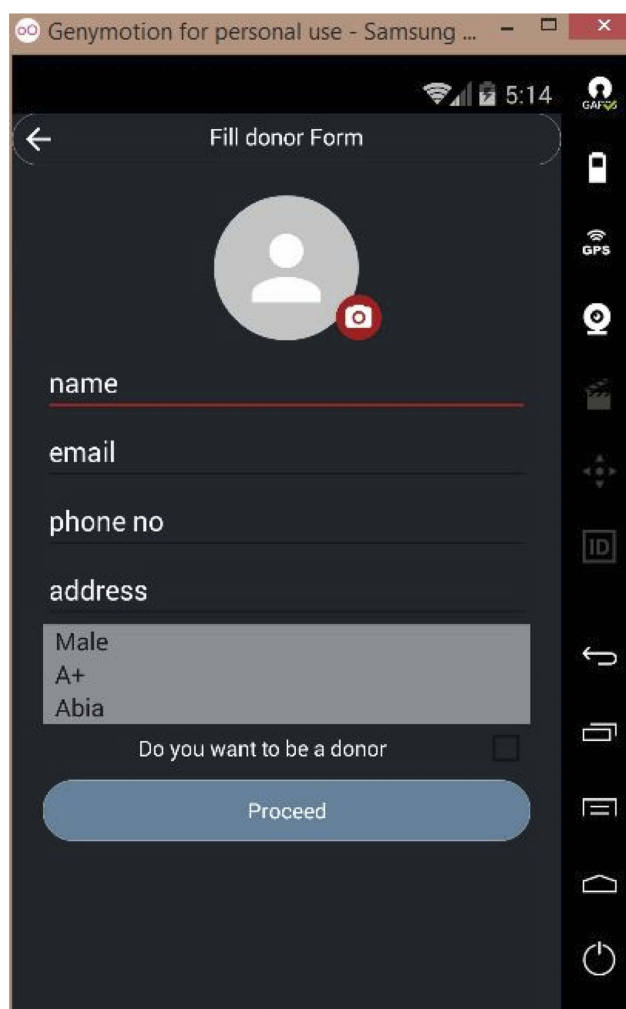**Figure 4** Mobile search engine activity.
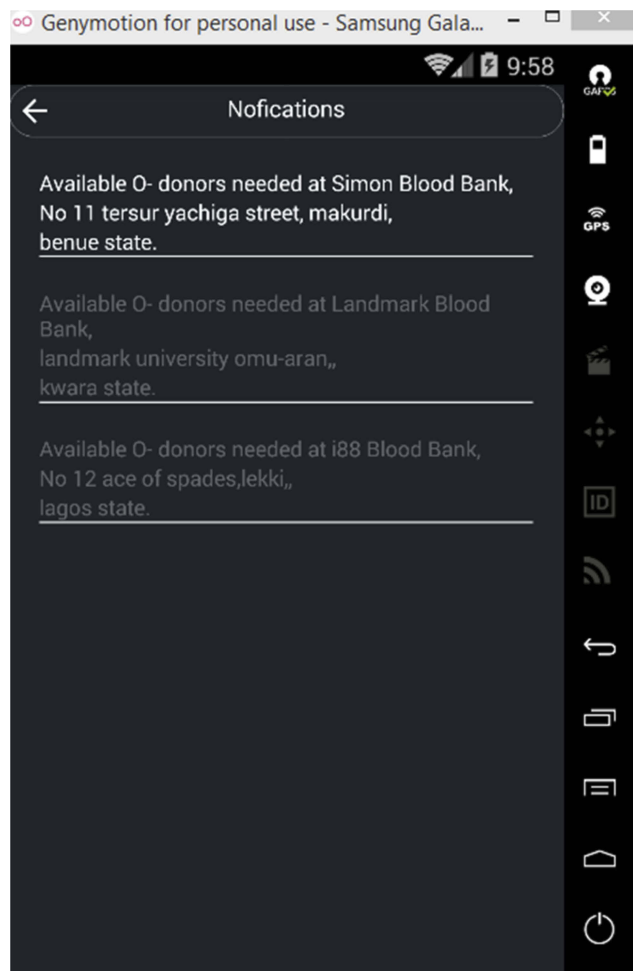

Figure 5 Fill donor form.

Figure 6 Notification.

identifying several opportunities for micro modeling in the context of Indian blood banks.

Ekanayaka and Wimaladharma developed a system where all the blood donors have gathered into one place automatically and inform them constantly about the opportunity to donate blood via SMS to the donor's registered mobile phone.[8]

Various related work reviewed, developed only a web-based system. As discussed earlier, in this study we proposed both web-based and Android-based application for the better and effective information management of blood banks.

Materials and methods

The proposed system is both a web and mobile-based project. The web page would be restricted to the admin of the various blood bank registered on the platform. Admins are provided with a webpage to update the various inventory of their blood bank. Mobile phones are portable devices; so far they can be moved easily

Table 1 Performance goal of the proposed system

Parameter	Result	Existing System
Action	The Web-based App is meant only for the System Administrator, while the mobile app is used for an individual in search for blood from the blood bank.	Both the system Administrator and other users using the web app
Efficiency	The system is efficient in term of limited time taken to produce the result from the input data.	It takes a long time or the result might come at an odd time.
Usage	It can be useful at any-where at any time since it is mobile computing techniques	It is more like a stationary technique.
Time	It takes lesser time in searching for blood donor or available blood in the bank.	Since it is webpage it may not load faster or better due to bad net-work connectivity.

from one place to another. A mobile phone is the best choice for medium of communication for this system; the search engine would be built for the mobile platform. By using this system, persons in search blood are able to search on the mobile platform and a list of blood banks with available blood will be shown. Donors who are willing to donate their blood can register in this application by providing their details.

Features of the system
Search
A search activity function is implemented, which gives the users the ability to search for available blood.

Notifications
The application will alert blood donors when they are requested for their blood via text or phone call and the message will be displayed outside the app's User Interface.

Results and discussion
This section explains all the program implementation and the entire process of program implementation. It covers areas such as input interface, output interface, menu interface, system testing, system maintenance, writing and testing of the

computer program, routines that make up the new system to function very well and for it to achieve its objectives.

Figure 1 shows a platform where the various administrative decisions take place. This is the page that admin of the blood bank gets access to when he logs into the system. This page gives access to the add inventory page and to edit and make changes to already added inventory. The admin can also view the list of all the donors available on the system and send a message to them in times of emergencies or when the blood bank is low on blood.

This Figure 2 allows new users without an account to register with their email and password and the sign in to gain access to the application functions.

Figure 3 displays the activity that a mobile user sees when logged into the application, the user can become a blood donor, can see the notification and also share the app for others to download and install.

Figure 4 displays the user/hospital in search of blood can search available blood group from the database using the mobile application. The mobile application interfaces the database. The user selects the blood group from the drop-down menu and then clicks on the search button. A list of all blood banks with the blood banks with the available blood group will be shown. Then the user can select which blood bank to contact via email or phone call.

Figure 5 displays the user click whenever a user clicks on the "become donors" button on the home activity, they are brought to this activity to fill the donor form else if they are already registered blood donors, they would be redirected to the notification activity.

Figure 6 shows that a registered donor will get notified whenever the blood bank is need of blood, donors will receive an alert on their mobile devices and would be able to view the message on this activity.

Performance goal

Based on the output generated, it can be concluded that this proposed system is easy to use and makes information management of blood bank being present everywhere at once. The search activity on the mobile phone and notification to the users when the bank is running out of particular blood cells make the proposed system flexible, efficient, and reliable. The mobile app is user-friendly, the user does not need to read or consult an expert before it can be operated.

Table 1 displayed the performance goal of the proposed system in term of action performed, usage and time of operation compare to the existing system.

Conclusion

The blood bank information system was developed out of a need to make finding blood supplies or a willing donor on time and using lesser time in searching for either of the two. This system should be made available to everyone because it will help the search of blood supplies doing emergency cases faster, in doing so helps to avoid health complication and also avoid possible deaths due to delays in search of blood.

Disclosure

The authors report no conflicts on interest in this work.

References

1. Mondal PK, Prodhan UK, Al Mamun MS, et al. Segmentation of white blood cells using fuzzy C means segmentation algorithm. *IOSR J Comput Eng*. 2014;1(16):1–5.
2. Ottenberg R. Transfusion in the new millennium. In: *Rossi's Principles of Transfusion Medicine*. 4th ed. Hoboken: Blackwell Publishing: 2009:1–14..
3. Catassi CA, Peterson EL. The blood inventory control system-helping blood bank management through computerized inventory control. *Transfusion*. 2010;7(1):60–69. doi:10.1111/j.1537-2995.1967.tb04835.x
4. Hameed SA, Hassan A, Shabnam S, et al. An efficient emergency, healthcare, and medical information system. *Int J Biom Biostat*. 2008;2 (5):1–9.
5. Kanobe F. A web-based blood donor management information system for the Red Cross Society, Uganda (WBBDMI). [Master's thesis]. Accra: Makerere University; 2009.
6. Akar IF, Mohammad TA, Ismail Z M. CBBR Centralized Blood Bank Repository. *IJISE*. 2015;3(1):85– 97.
7. Lowalekar H, Ravichandran N. Blood bank inventory management in India. *Opsearch*. 2014;51(3):376–399. doi:10.1007/s12597-013-0148-z
8. Ekanayaka E, Wimaladharma C. Blood bank management system. Technical Session-Computer Science and Technology & Industrial Information Technology. 2015.