Original article

Developing Location-Based Blood Donation Application

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ARTICLE INFO	
  	ABSTRACT *Donating blood is one of the most admirable humanitarian acts because of the benefits it provides to both the donor and the recipient. Blood donation is required at an emergency situation that necessitates the delivery of the blood as soon as possible, whether from a blood bank, despite the possibility that they might be in a short supply, or the blood donation centers whose main aim is to provide the appropriate blood type in a short period of time. To save others` lives it is necessary to locate the nearest available donor whose blood type matches the recipient's blood type. In order to interact with donors, a record of their information should be made so that anybody at the emergency location may communicate with them directly. We proposed a system that will assist in swiftly reaching the proper registered donor based on their current location and blood type. Finally, a GPS based android application was developed to facilitate the communication between the donors and the requester.*

INTRODUCTION

Metformin is Mobile devices have become an essential element of our everyday tasks. As our reliance on mobile technology increases exponentially in many aspects of our lives. It is worth noting that mobile applications have simplified many of our daily tasks and assisted us in performing many of everyday duties. These applications are available in a wide variety to support a broad range of tasks, whether educational, entertaining apps, services apps, or communication apps. However, communication apparently is the main purpose for using mobile devices, whether for social networking, academic activities, or in health care services. It seems that the latter has witnessed a turnout in recent years due to its importance and impact on our daily lives. Surprisingly, the number of health related apps reached over 325,000 in September 2017. where 78.000 new health apps were uploaded to major app stores in the previous year. indicating that Android has surpassed Apple in terms of accessible health apps, about 26% of these apps provide services for the "Heart, Circulation, Blood" category [1]. So the emergency communication apps are highly in demand, making an emergency call on a mobile device is the quickest method to request help. However, sometimes it is hard to find a blood donor nearby. We proposed and developed a mobile app named "Blood Bank "which makes it easier to find donors nearby the seeker at that moment using the Android operating system, Google maps, and cloud computing.

Related works

The American red cross has launched a program called "Blood Donor" that allows users to register for blood donation drives and camps in their area using their postal addresses [2]. The software has an attractive approach to build a user's profile and reward the donor with points in order to motivate people to donate blood. The application aims to promote blood donation, but it does not handle the problem of a user in an emergency.

Moreover, Indian Blood Donors is a user-suitable blood donation software that allows donors and consumers to communicate information [3]. A phone call can provide direct access to the donor or receiver. This app's feature allows users to contact the contributor directly, however it does not guarantee fast responses.

A blood donation called "Blood for sure" recognizes the user's location and nearby donors [4]. This application provides features such as first aid tips, location of the nearest ambulance and blood bank service, and locating the nearest blood

bank service in the user's area. As a result, several resources are available at the same time, making the interface slow and unfriendly to use.

An "App Blood Donors" presents an effective technique for validating each donor via a web portal system, after which the donor must pass health checks provided by blood recruiting center employees before being issued the username and password for the suggested application [5]. However, this technique decreases user participation and makes the entire procedure complicated and time consuming.

The "Blood bank" service is a free service provided by Al-Madar Company in Libya to patients in need of a blood transfusion, and it facilitates access to donors in the shortest time possible by searching in a system and determining the region and type of blood required [6]. However, it does not provide a service to locate the nearby donors.

Proposed system

The idea behind the blood bank app is to deliver the service to the app's user as quickly as possible, by using Global Positioning System technology (GPS) to find donors nearby the health care center where the person in need of blood donation is located, not only detect the nearby donors at that moment, but also the one who has the appropriate blood type for the recipient. Once locating the nearest appropriate donor, his/her contact's information are displayed on the mobile's screen. the app's user will subsequently be able to contact the donor through his/her mobile No. to request a blood donation. This process is straightforward, enables the user, whether he is a member of the community, the director of blood bank, or worker in healthcare centers such as medics and paramedics, with the service of requesting a blood donation in a short time frame. It is also possible to contact more than one donor at the same time if a large amount of blood is required.
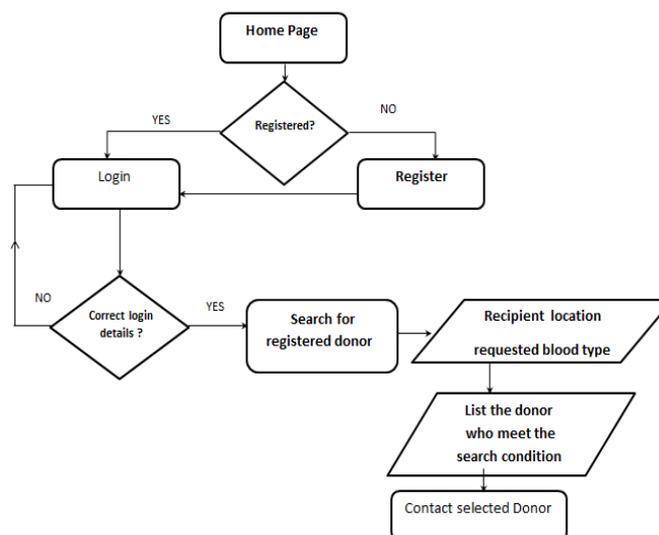

Figure 1. Proposed system Flowchart

The flow of the proposed system's main processes is represented in Figure 1. Registration is clearly required before a user can login to the system and access its services, in order to acquire user information which will be used to contact them when blood donations are required. This information will be used to build the app's database. Authentication of user information is applied in the registration form in order to confirm the information reliability and accuracy.

Figure 2. shows the use case diagram for the proposed system. It displays the various roles that system users perform along with the processes that are allocated to each user. It also shows the hierarchy of processes' performance.
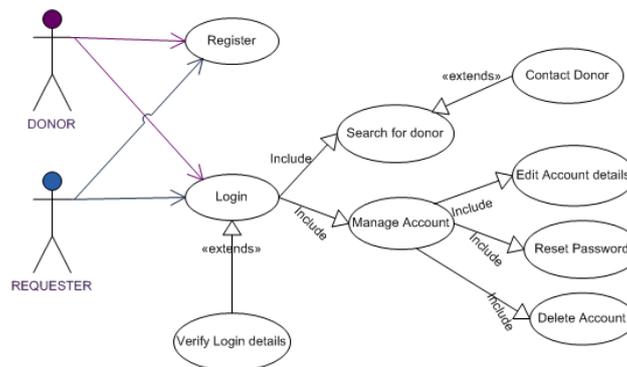

Figure 2. Use case Diagram

Implementation

To develop the blood bank application Android Studio IDE was utilized, according to Ouhbi et al the majority of applications chosen in their study were created for the Android operating system [7] due to the widespread use of devices that use the Android operating system. Plus, it offers the geolocation feature, giving the user the option to view maps on their screen in order to locate donation centers or donors. The interface was developed using a software tool called Fragment, which increases the efficiency of the application [8]. Moreover, the app uses a web server to send and receive users' data including GPS data sent from their mobile to detect location. Besides, the database is built using Firebase which is ideal for the functionalities required by mobile application database as well as cloud server database [9], which is responsible for keeping information about people who would like to donate blood or in need of blood donation. Cloud Firestore was employed to make the application work on a global scale and to develop firebase services like synchronizing data in real time with the fastest speed of reading, data entry, and querying [10].

Workflow of the application

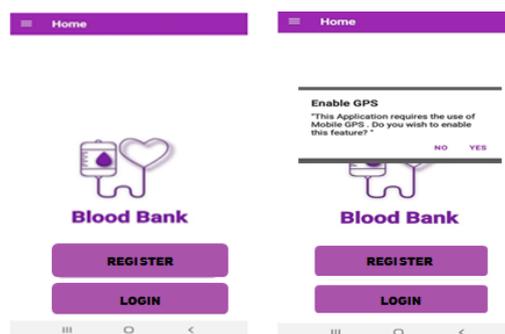The application's workflow and image-based description are as follows:

Figure 3. Home page

Step1: User opens the application, then checks the internet connection and enables GPS service as Fig.1, The application will use GPS to help users find nearby blood donors. Homepage shows users the main operations. First operation "REGISTER "is for new users, used only once. It allows the user to fill in his/her information on the form shown as Fig. 4. This information will be stored on the app's database. Second operation "LOGIN" which leads to the Login form (Fig. 5), and can be utilized by authorized users to access the app's services. and to do so, the login details should be Correct for security purposes. Otherwise, an error message appears asking for correct login information.

Figure 4. Registration Form

Step 2:   As the use case diagram (Fig. 2) indicates that the app's services will be unavailable to the user unless a successful login is performed (the include relationship). after a login performed the main services are available now to the user. these services are:

1. Search for a donor: where users can search for t appropriate donor nearby his location as illustrated in fig.6. user select the desired blood type then click "Search donor "button, then choosing the donor location from the results appeared at the screen, the contact donor process is now accessible as in figure 7.
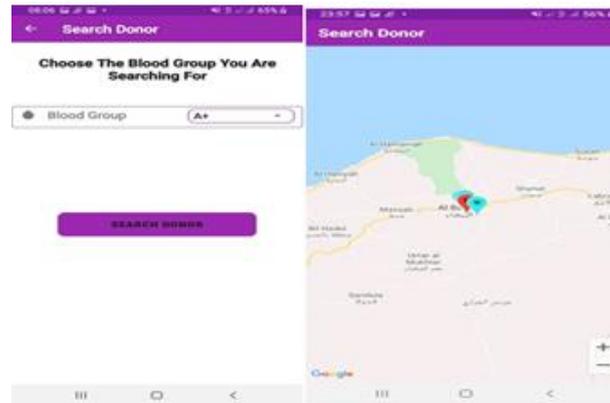

Figure 5. Login form

Figure 6. Search for donor

2. ***Manage account***: a user can manage the account information stored in the database, as seen in Figure 8, by doing the following:
   - ***Edit account:*** users could modify and update their information at any time using this feature. They may change (contact phone No, Email address, and their availability for donation, when they turn it off, their information will not appear in the search results even though they were around the requester at the moment of search
   - ***Reset password:*** change the password.
   - ***Delete account:*** to delete his/her information from the database permanently, if for whatever reason the user prefers not to be contacted about blood donation.
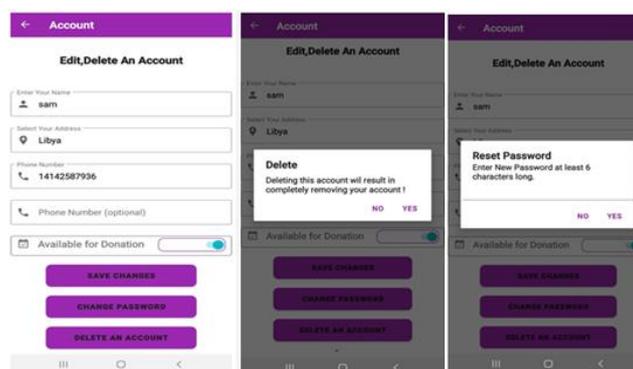

Figure 7. Contact donor

Figure 8. Manage Account

RESULTS AND DISCUSSION

The Blood Bank app has been tested and evaluated. Black Box testing technique was applied to test the app, hence it is the least time consuming testing type, this testing method is used for acceptability testing as well as whole-system testing [11]. This testing technique was applied to every functional requirement of the proposed system which has been mentioned in figure 2. It has been found that the user can register, login, search for a donor, and contact the donor. In addition, the app allows users to modify their information such as mobile No., availability for donation, password, etc. Furthermore, the process of locating a donor using this app has grown faster and more efficient. We have discovered that the larger number of donors registered through the application, the sooner the response to donate the necessary blood will be. This app should now be disseminated through relevant organizations such as the Red Crescent, and encourage the volunteers, medicals and paramedics to subscribe to it.

CONCLUSION

Blood donation is a kind of citizen's social responsibility in which an individual can willingly donate blood via our app. The Blood Bank's goal is to solve the problem of blood shortages globally and without borders. Due to the creation of the application for Android, which is used by a significant portion of mobile and tablet users, a wider audience can now access it. In addition, it locates the nearest donors based on the requester's location rather than a fixed or predetermined location; this gives the preference to its usage in any country where the application is promoted. The app makes it easier to communicate with registered donors.as well as maintaining a database of their information. Furthermore, the app locates only the registered donors who set their status to "available for donation" which is good for the users' privacy.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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