

Donate Blood, an Android Blood Donation Application

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Abstract—Mobile Applications have gained importance and popularity with the advancement of smart-phones. We depend on our smart-phone apps for a myriad of purposes. Therefore, if there is an application which is associated with the noble act of donating blood, it grabs peoples' attention. These kinds of applications not only increase the awareness among people on blood donation and keep them updated, interested people can also know more about blood donation drives which in turn can save a human life. There are many applications based on Android which aids blood donation, but there are many credibility, security issues with these applications and lack dynamic location tracking. These applications need to be very fast for the real-time environment to deal with emergencies. A perfect user-friendly blood donation application is still not available on Android or Google Play. As the majority of the applications similar to this is for android platform, some can be installed while others cannot be installed properly as per [1]. The authors of this paper also explain and describe all the shortcomings of the other android applications. For this reason, we have decided to design and develop a blood donation application which will not only work as a real-time application, but also be able enough to provide all necessary updates to the both requester and donors, and also inform them about any blood donation drives or fairs, including all the future blood donation drives. Moreover, the application will only show the interested donors nearby with the desired blood group and fastest way to contact them. Enabling GPS to locate potential coordination for blood donation is in much need and is our novelty. Moreover, we will also try to motivate donors through a reward system.

Keywords—Android application, android SDK, Donate Blood, Google maps, GPS, interfaces and donation camps.

I. INTRODUCTION

We, humans, have realized the importance of blood transfusion, and have come a long way from the earliest recorded futile trials of blood transfusion in the 14th century to today's successful mastery of transfusion [2]. This was only made possible through cutting-edge research and development in human medicine as well as advancements in science. As medicines and medical technologies have outgrown various diseases, promises for synthetic blood also dawn upon us [3]. Despite of all the medical advancements, human blood is still the only alternative for blood requirements which is used in medical procedures. However, the sources such as blood donors and their information are limited and the access to the human blood pool remains available only to a few percentage

of the requested or needy ones. Many of the donors donate blood as an act of charity in blood donation campaigns or to the patients themselves if they come to know about the need. But, such information of needs is barely accessible to willful donors. Despite the availability of many potential blood donors, only a small percentage of donors donates blood. Moreover, most of the donors do not have the information of the patients they are donating blood to, creating a huge information gap between the donor and the patient. At last, less information is available to the requested patients and the family about the donors identity, health condition and safety of the blood provided. Blood banks provide a reasonable solution by conducting various blood donation programs that are advertised to reach more and more people, but this age of growing information technology has more promising solutions to reach its end users.

Providing health care services through electronic means (e-health) can be taken as a new perspective as regards to global health [4]. This improves the health care service delivery to people. There are many e-health solutions which are currently available to people. They are personal health records, emergency healthcare information and some more. One of the components of e-health is m-health, which is a public medical health practice and is mainly supported by mobile devices [5]. Through mobile devices, patients and healthcare providers, as well as interested blood donors, can communicate with each other. mhealth applications access has become easier now, thanks to the application repositories distributive models. Various mobile application stakeholders, such as Apple, Google and Microsoft have independent apps store in their operating system for software. Companies such as Facebook too, are stepping up to aid the same void [6]. Moreover, more than seventy percent of the population in countries like India and Nepal uses Android phone, which in turn has given us the motivation to create a blood donation android application.

There are few existing blood donation applications which can be found on the Android platform. One of them is "Blood Donor" [7], which is an application managed by American Red Cross. "Indian Blood Donor" is another Android application [8] which help patients and their family to look for blood donors in their city in India. "Simply Blood -Find Blood Donor" is another Android application which helps in finding interested blood donors around you [9]. Most of these applications either provide donors or users phone number available to everyone, cannot be downloaded and used properly, have lots

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of security issues, as well as does not involve blood camps and blood donation organizations properly. These not only lead to a huge communication gap between the donor and the requester but also creates a security issue when it comes to user privacy. In developing countries like India and Nepal, people are dying and suffering from not getting the blood transfusion on time and half of the population know less about blood donation, and cannot be easily reached by blood requesters. These reasons have motivated us to create an application which is likely to solve some of these issues mentioned above up to some level. The novelty of this project is that the application will show the requested users location and phone number of blood donors nearby whose blood group will match with the blood requester. Because donors may be traveling a lot for various reasons such as work commute, seasonal recreation, they might be near the blood request location; if they are close then, the application will notify them of the request. Also, it allows donors to see requesters and requesters to see donors more closely in maps. Moreover, we will be associating many hospitals and blood organizations to communicate with donors and requesters, making it easier for the donors to help the requesters and patients.

We have designed the Android application Donate Blood such a way that it will inform interested blood donors about any need of blood or blood donation camp so that they can help others, while allowing any organization such as blood banks, Red Cross to use it to post information about blood needs and their blood donation camps thereby allowing users to find out about such events. It would provide a complete on-line service and database of all such users who would like to serve others by donating blood. Interested blood donors can register with Donate Blood, then log in using phone number and password. After logging in, users can see the request for blood or can post any request for blood requirement. For posting request, the information such as patients name, hospital details, blood group needed and how much pint needed must be filled up. In case of seeing the requests for blood, users can just log in and see the different blood requests posted. Moreover, in cases of emergency, users in the immediate vicinity will get notifications of any immediate request so they can donate blood. We are also planning to give rewards depending on reward points for every user. After posting any request, changing any information on Me page, redeeming rewards points, and inviting friends the user must press the update button to update all the information in the database. Figure 1 shows how our application looks like and the login page of Donate Blood.

In this paper, Section II describes the detailed problem statement and why this application is important. Section III discusses the technical specifications, design and interfaces of Donate Blood. The comparison of our application with some of the similar applications are explained in Section IV followed by analysing the results and outcome of our application in Section V. Section VI mentions some of our ideas which we will incorporate in Donate Blood in the future. Section VII concludes our paper.

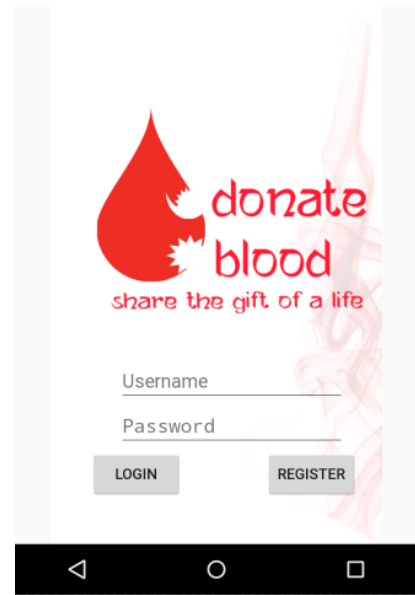


Fig. 1: Login page of Donate Blood

II. THE PROBLEM

A lot of problems persist with today's blood donation systems and applications. According to most medical experts and doctors, blood donation today faces a lot of challenges. Firstly, blood banks don't have enough donors to fulfill their blood requirements. Though donors can donate blood every fifty-eight days, most of the people are unaware of the concept blood donation and why it is critical in so many situations. There is a lack in awareness regarding where to donate blood and when it can be donated, lack of any centralized database, no regular donation centers, unavailability of correct information about someone's blood group, lack of interest and minimum encouragement from the government and blood organizations.

In countries like Nepal and India, where the population is nearly twenty-eight million and more than one billion, thousands of people die every year due to unavailability of blood during emergencies. Firstly, even if donors are available on proper time, screening of blood group and management is not done properly. Secondly, blood is required immediately when a person is injured and needs any critical operation. Websites with databases of such donors are not updated regularly. Other blood donation problems include but are not limited to slow internet connections, no updates, phone errors, and misuse by third parties. Also, already existing blood donation apps have the flaw of just listing phone number of the potential donors just to anyone. In many of the application, no information is needed to login and anyone can get access to the details of the logged in users. This also generates issues with privacy. Potential users could be deterred from signing up due to such privacy issues.

To answer all these limitations and problems, a system is required which is readily accessible to both donors as well as requesters. What can be better than smartphones which are used by most of the people nowadays? The system should notify the blood donors on time on donation camps and

emergency situations, places where mobile connection is slow, the application should work with minimum internet access, proper system should be maintained where the donors will make appointments from before and the records should be accessible by the responsible parties at any time, and at last there should be database which should be available at all time and store all the information. This is where our application Donate Blood comes into play.

III. THE SOLUTION

We have aimed to bridge the gap between the blood banks, blood requesters, donors and hospitals through Donate Blood. As per [10], there is a need for management between blood donors and requesters as in these situations, the management of information exchange is extremely important. Our Donate Blood application will allow users to send notifications to requesters and notify potential nearby donors. Interested donors will be able to notify the requesters of their interest. Requesters, patients, and family will be able to see nearby donors in Google Maps API incorporated in the application, and donors will be able to see the blood request post in their vicinity. There will be corresponding notifications for such activities. We are targeting anyone who is in need of blood and anyone who is capable of donating blood.

Our application will run on any users Android OS and we are developing it using Android SDK. Android SDK, which is an open source framework for developing mobile applications has APIs and Middleware to support the run [11]. We write the application in Java and XML. Moreover, for the database, Android SDK will be using the SQLite database which is already available in the IDE for storing users information and every other data [12]. SQLite uses most of SQL standard and is ACID compliant, which is widely used as database engine. In the future, we will try to associate cloud computing with our application. As per [13], cloud computing can prove an important life-saving aspect while delivering blood to the patients in emergency situations. For Google Maps API, we have used Google location finder and the key provided by Google for any map activity project. Users location will change as the user will move from one location to another, getting notifications near his or her vicinity for any emergency blood requests. The following subsections will elaborate on our application design specifications.

A. High Level Design

If we take Donate Blood as a system, then it has many subsystems which can be seen in Figure 2. The following points describe all the subsystems of Donate Blood.

1) *Login/Register*: The register part deals with how the user first registers with Donate Blood and provide the information needed to register. The login part deals with logging in Donate Blood by providing user name and password.

2) *Security System*: The security system deals with keeping all the user information safe and not sharing with others without consent from the user. So for example, no user can

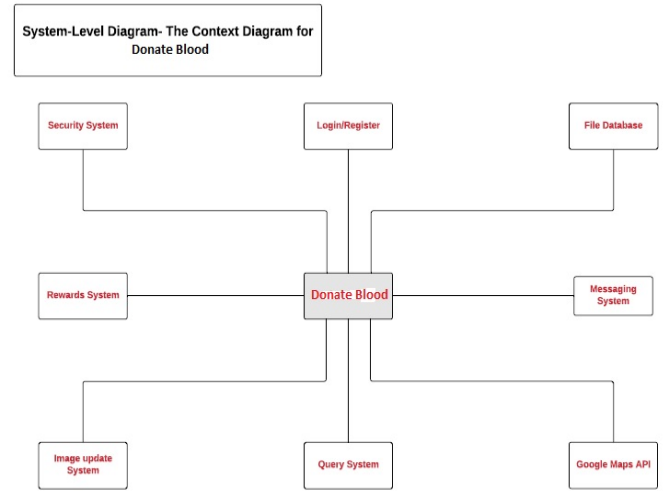


Fig. 2: Context Level Diagram of Donate Blood

log in to any other users profile and the only way to do it is by giving the password. Moreover, there is no way for any user to gain access to Donate Blood database to get other users password. In [14], the author describes how important it is to keep all the health information of users secured from being public when dealing with android applications which are susceptible to data leakage.

3) *File Database*: The file database system manages and stores all the user information, any data which has been updated in Donate Blood as well as the reward system. We are currently designing the database file which has two tables.

4) *Rewards System*: The reward system deals with updating all the rewards points to the database, redeeming reward points as well as gift hampers and how the organizations will send gift hampers to the users.

5) *Messaging System*: We are currently working on the messaging system and it will enable one user to send private as well as public messages to other users.

6) *Image update System*: Through the image update system, any user who changes his/her profile picture can update the picture and it will also be updated in the database.

7) *Query System*: Any user who is looking for blood donation information, blood camps and blood requirement near their vicinity, as well as blood donors nearby, can use the query system to get all these information. The query system also deals with viewing requests and searches.

8) *Google Maps API*: Through the Google maps API, any user can see his/her location in Google map through our application and can also search for donors, blood donation camps and requesters nearby in their vicinity through the map.

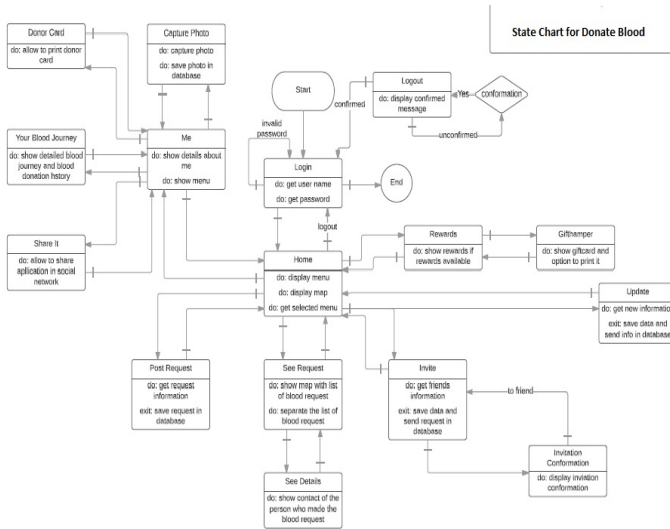


Fig. 3: State diagram of Donate Blood

B. Behaviour to User Inputs

With each user input, our application Donate Blood reacts accordingly. For example, if users want to check their profile picture, then they have to first log in, which takes them to their homepage. From there, they have to press the button "me", which takes their to their profile page and they can check or change their profile pictures. On the other hand, if users want to see blood requests, after login in, they have to press see request button to check all the blood camps and requests near to their area. Fig 3, which is the state machine or statechart diagram of Donate Blood explains this in a better way, how the objects behavior change when the states are controlled by external and internal events, such as users input.

C. Flow of Data

Fig 4 shows the graphical representation of the flow of data through our application Donate Blood when any user logs into the application till the user's session finishes. It shows all the output which the user receives whenever the user presses any button. For example, when the user chooses home button, there are some categories such as see a request, post request, me, invite, rewards and update the database. If the user wants to see the different blood requests near their vicinity, by pressing see request button, they get to see all blood requests nearby.

All the snapshots of the user interfaces as well as how the application works is shown in section results.

IV. RELATED WORK

There are some related applications and articles for blood donation which can be found in Android play-store and in literature. This section reviews some of these existing work and applications. The authors in [15] have mentioned that most of the blood donation applications are made for Android OS and have mentioned the difficulties of accessing and installing these applications. They have also mentioned why the applications are not used by everyone, because they are

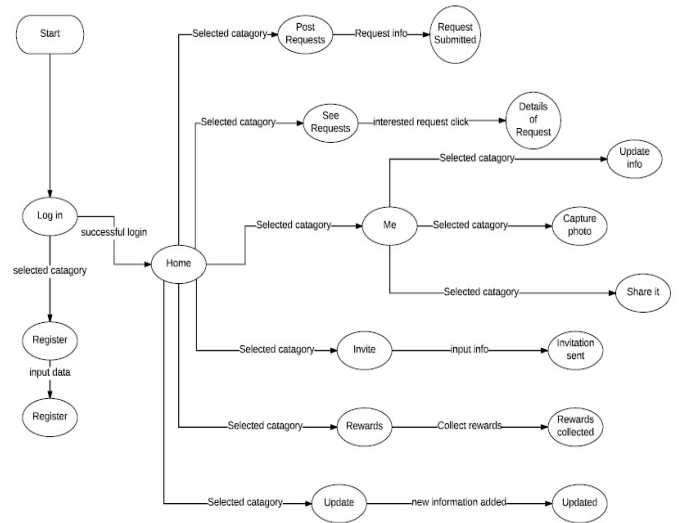


Fig. 4: Dataflow diagram for DonateBlood

only in one language. We are trying to incorporate Donate Blood in several languages in the future, which we think will grab attention of people all over the globe. In [16], the authors have mentioned a cloud-based blood donation service, users will get all the information of donors in alphabetical order. According to us, sharing details of individual can create security issues. In our application, users can message and contact other users only through the application messenger if they are in close proximity of distance, and if the blood group matches. Moreover, the user will be sharing their information only if they are comfortable with sharing.

In [17], the authors have given some guidelines for Android, iOS, Blackberry, and Windows phones to mainly analyze the compliance regarding using any blood donation application. The results have shown how Android operating system have the maximum compliance when it comes to these applications. The paper has suggested some good applications and developers for blood donation. After checking the suggested applications, we have found that two of them does not install properly because of limited updates and one of them just share information about users on its homepage. We are trying to overcome all these limitations through our application Donate Blood. The authors in [18] have proposed a web service information system, which will timely update donor's information and has push technology with security which will protect the contact detail of the users and donors. However, this paper only has the idea but don't have any prototype proof, results or interface snapshots. Lastly, in [19], the authors have developed a smart-phone application for volunteer blood donation which will notify nearby blood donors for any emergency situations. Our application is little similar to this, however, our application will enable users to communicate with each other through application messenger before sharing information and donors will be able to invite friends and have a reward system, through which donors will get rewards depending on their blood donation history.

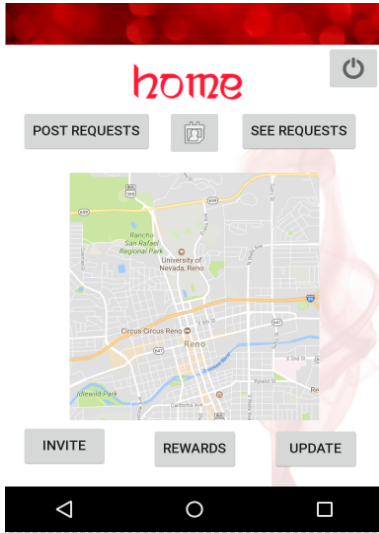


Fig. 5: Snapshot of Home page

V. RESULT AND EVALUATION

We have able to incorporate more than 60 percent of the application at this moment. The following subsections will show all the snapshots of the interfaces and how the application works.

A. Login Page

Fig 1, which has been shown earlier in this paper shows the login page for Donate Blood. This window/activity provides the first interface of the application to the user. It shows the logo of the application and has input fields to input username and password, and a login and the register button. Once returning user input their login credentials they can log in to their profile in the app and can access the database suited to them. New users will click on register and will be led to another page that will help them get registered to our application.

B. Home Page

Fig 5 which is the homepage is the most important activity in this application. It provides access to most of the functionalities to the user. It has a map in the middle which will show the places where blood is needed. Users can click on it to view the details of the blood requests and make necessary action to contact the requester. Users use Post Request button to post new requests to our database which will take them to a new window. Me button will take them to a new page which contains the details of this user. They can see requests in more detail by clicking on See Requests. There is a logout button at the top right corner which will allow users to log out of the system. In the bottom, users can see Invite, Rewards and Update button. Invite button will help them invite people to use this application. Rewards button will help them redeem their rewards. Update button will help update their profile in the application.

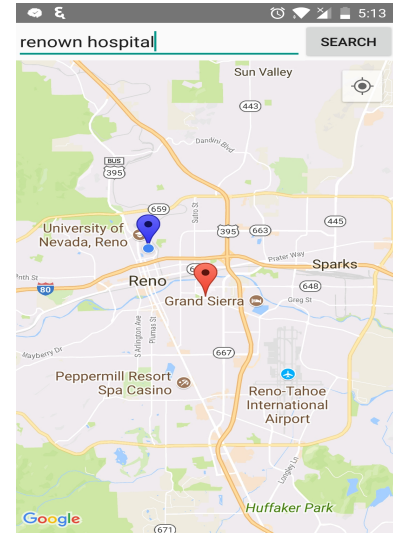


Fig. 6: Showing the result of the search

Moreover, from home page, you can press map button and it takes you to you current location. Now if you want to search for any nearby hospital, you type the name and it shows you total distance and route to that hospital as depicted in Fig 6.

C. Invite Friends Page

The invitation activity/window will allow users to input details of their friends whom they want to invite to use this application. Once they press the invite button, invitees details will be stored in the database and then they will be invited over email or text. The fields with the asterisk (*) in them are mandatory while others are not.

D. Post Requests Page

The Post request activity/window which will allow users to post a blood need request. They can enter details of the blood request and can submit the request by clicking submit a request. The new blood need request will be stored in the database, and all people can now see this request on their See Requests page. All the text fields with an asterisk(*) are mandatory, while others are not. Fig 7 and Fig 8 shows the change in page before and after posting any request.

E. Register Page

Fig 9 is the snapshot of the activity/window will allow users to get registered with this application. Once the user fills in all the details, they will click submit button to submit their information. If all the entered data are appropriate (not entering text in number), they will be registered in the application.

F. Rewards Page

The Rewards activity/page will show the users their rewards accumulated so far. It also gives them access to see the number of time they have donated blood and the dates of blood donations. At the bottom, there is Collect Rewards button

Fig. 7: Before Posting Re-request

Fig. 8: After Posting Request



Fig. 10: See Request page with no request in nearby vicinity

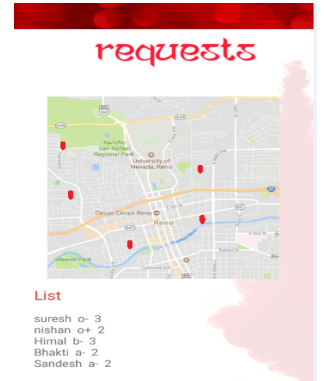


Fig. 11: See Request page with some requests in nearby vicinity

Fig. 9: Snapshot of Register page

which will allow them to redeem their rewards. This will prompt them to a new page which shows them a ticket showing their reward information.

G. See Request Page

The see request activity/page will show all the blood requests made in the application as a list at the bottom left part. It has a map in the central part which shows the closest blood requests requested near the vicinity of the user. Users can click on the blood requests on the map to find out more details about the blood requests. This will also allow them to contact the requesters. Fig 10 and Fig 11 shows how the map looks in see request page with no request and when there are requests in nearby vicinity.

H. Update Page

The update page which will allow users to update their profile information in the application. Because people might donate blood offline, they can update their donation history, and also their phone number and location can change. Once

they click the update button, their information will be updated to the database.

When any user uses our application, they can only share information after communicating with the requester or other users. The authentication page enables security and protection of user information. Moreover, as seen in the map snapshots, the request which is in the same vicinity and with only same blood group will be shown when the user wants to see requests. Last, but not the least, our database will keep all the information of users and system and users will be able to update them if necessary through the update page.

VI. FUTURE WORK

We are thinking of incorporating Donate Blood with Cloud computing in the future. This will make the application service much faster along with providing updates and notification instantaneously. We are currently working on the application map and messaging system. The users will be able to communicate with each other through the messaging system. Moreover, we will be making the option through which users can choose with whom to share information or not. We will be contacting different organizations and clubs for joining and educate their members about this application. Lastly, if everything goes well, we will try to incorporate Donate Blood in some other languages.

VII. CONCLUSION

In this paper, we have shown how Donate Blood can overcome the disadvantages seen in most of the related existing blood donation applications nowadays. Our application will bridge the gap between blood requesters and donors by providing a common platform where they can post and see requests. With the enhancement offered, we believe it will be really useful in our society.

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