BDoor App-Blood Donation Application using Android Studio

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Abstract:

In fashionable days folks ought to create use of the trendy technologies to seek out growth altogether sectors. During this sense, Blood, donation apps are the new hopes for the folks in The Asian nation for blood property. Nowadays, several blood apps are accessible in Asian nation however their utilization is extremely poor owing to some disadvantages. One such serious disadvantage is privacy and safety. Donor Contacts may be simply accessed by everybody. It causes several issues to the top user. All apps that are accessible within the play store focuses the property between the donors and therefore, the recipient at fewer intervals. The B-Door app was created to protect the donor's privacy and donor identity, as well as the recipient's safety, using the J48 decision tree algorithm. The proposed solution attempts to provide support for both emergencies and reserved time things. The core plan of the applying is to link blood banks, donors with recipients through a licensed hospital, NGO’s and alternative establishments to avoid misuse. This Application was developed through Android Studio and Flutter UI Framework together with base at backside and provides our result on Real time basis.

1. Introduction:

According to the survey conducted by World Health Organization (WHO) for the Year 2019, India wants eight crore units of Blood, however solely ten lakhs units are available on the market, that shows the intense shortage of blood. Blood and its parts are vital for human life as there's no substitute for human blood. No major operation will be performed while not the utilization of blood in any hospital or clinic. Since India has a huge population, the requirement of blood is rising on a daily basis. Statistics specifically show an alarming level. The quantitative relationship between the number of blood banks available and the number of blood banks required is not optimal.

Every day, at least 2,000 donations are needed on average, but the remainder are not enough. Things such as traffic crashes, hospitalization, birth of children etc. still want external blood supplies in an emergency. The barrier between individuals in need of blood would be reduced by blood-base applications. A Blood Door(B-Door) Application is developed to handle the social group downside mentioned on top of.
The platform accustomed to develop B-Door App using Android studio, Flutter UI Framework for front implementation and Firebase for Backend implementation.

2. Literature Survey

Blood transfusion is a critical element of health care. It contributes to saving ratings of lives yearly in each ordinary and emergency thing. Furthermore, it dramatically improves the anticipation and excellent lifestyles of patients with a number of acute and continual conditions. Blood transfusion helps voluntary blood donation. During the ensuing five-10 years, the delivery of blood is important to meet the stress of older populations. In addition, in the case of operation or treatment, medical institution employees ask the affected individual's cherished ones for blood donation or family need to be forced to be conscious of some donor who has the compatibility of the blood type with the affected person. This emergency scenario increases numerous demanding situations are trying to find out the donors. New techniques have to meet the demands of society.

A Geo-localised Blood Donor Management System [3] As an alternative technology, it employs Mobile Crowdsourcing. This is the practice of requesting or distributing a task to a wide number of individuals. Crowdsourcing systems that enlist a vast number of individuals to help solve a diverse range of problems. It gathers millions of users to create an item that would benefit the whole society. Crowdsourcing can be linked to a wide range of topics, and it poses a number of intriguing technological and social problems.

M-Health [4] It is a new wellness horizon that provides healthcare facilities through mobile devices and networking technology. Blood donation in health care is a complicated procedure that takes months to select a donor that has the same blood pool as the recipient. Android-based blood donation application is an M-Health solution to connect the requester and donor at any time and from any place.

The Android Smartphone Blood donation application [5] is an android-based total blood donation utility that keeps the information of blood donor volunteers. In instances of an emergency, the request can transmit the message to all eligible donors for donation, together with records from the blood institution and clinic. They used the cloud hosting infrastructure to keep application data anywhere and at all times. It is also a voluntary blood donation as a requesting applicant that is the superior attribute of our submission. The requester can transmit the message to the registered users along with an emergency sign for the blood needed, and a message will be transmitted to all voluntary donors of blood. When a volunteer confirms the donation of blood, it is recognised as a donor. Our software supports the collection of blood donations and ensures careful handling of the emergency situation.

Our project is meant to offer data on the requested blood and on the form of donors eligible in the organizations. The software program assists the requester to deliver the message at some degree within the maintained blood donation network and updates the recipient who's inclined to donate the asked blood at the identical time. We also created request-donor profiles to check our requests, reviewing them to help improve timely access to statistics and a quick response in the event of an emergency.

3. B-Door Application

This section presents the drawbacks of existing system, major features of proposed system, software usage that constitute the core components of BDoor application.

3.1 Existing System

The people who donate blood to patients are not checked for properly. Will the donor have any possible medical problem and donate blood to the recipient, the danger may arise. One should always be verified donor medical records.

Medical histories would be like:

- No blood should be donated by an individual with anaemia.
- Donors who have blood-borne illnesses should not apply for blood donation.
- People unweighted by height do not donate blood from their heights.
• After a few years of pregnancy and during pregnancy, women do not donate blood. In the existing model, the above medical records are not employed. This could lead to impairment. Blood does not necessarily match the donor and patient's body state the two things below are not taken into account the location of the donor as well as the distance between both the recipient and donor.

3.2 Proposed System

3.2.1 Methodology

This blood donor identification mobile app is a ubiquitous app that is designed for the usage of any hospitals, blood banks, blood donors and the users (above 18 years of age) in our country, adhering to the World Health Organization (WHO) blood transfusion guidelines as well as National Blood Policy of India. It's the age of social networks, so smartphones must be used because blood donor are quick and convenient to reach. In combination with various blood banks, hospitals and individual blood donors, a B-Door app is used for the identification of blood donors.

Figure 1. Functional Diagram of Application. Figure 2. Mobile Application on Android and iOS

This mobile application, centralised for blood donation, allows NGOs and Hospitals to find blood donors in their neighbourhood. All information on the blood donor details will be included in B-Door application. The donor Integrity is verified using J48 decision tree algorithm and WEKA. Users can register as donors, hospitals, blood banks and Non-Government Organizations (NGO) in this Application. Our application allows authorised users to create request on the status of donor for blood donations in the nearby area.

Now-a-days there were a lot of mobile apps available in the play-store but no apps guaranteed the privacy of the donor and the safety of the recipient. People don’t like to share their information like address, phone number and etc. in online as there is a chance of misuse. Also, anyone can sign in as a donor in simple ways. B-Door app concentrated to overcome these issues by providing an authorized institution at the centre. If the system is centralized then all the blood transfusion through this system will be safe.
Block diagram of B-Door APP is shown in the figure 3. The authorized institutions can only access the donor details in this app and no one else accesses the information of the donor.

4. Product Functionality

4.1 First time users
- The user of the application has to sign up by entering his/her email, providing other mandatory details when he/she uses the app for the first time.
- The registration module is used to collect users (above 18 years of age) personal details like name, Blood type, Mobile Number, User Location, User government ID proof, User Image Upload, Address, Gender, and Date of birth.
- A registered user can volunteer for blood donation and get alert messages on blood donation programs in their locality within a radius of 50 km.

4.2 Hospitals/Blood banks
- The hospital or the blood bank approved by the government can register (sign up) in this app and create their account. They can advertise blood donation camps/programs to the users and donors registered.
- Add first-time donor information in the contact book and also update their blood donation details each time along with medical particulars (including donor’s weight, height, blood group, date of blood donation, donation type – whole blood, platelets etc., comorbid conditions, medication details etc.). This ensures the reliability and security of the app.
- Search for donor based on blood group, nearby location (default maximum radius of 50 km, can be modified if no donor found) using geolocation features in case of shortage of blood during an emergency.
- Send a message or call the donor via the app during an emergency.

4.3 Donors
- A donor is a person who has donated blood at least once. A user is updated as a donor either by a hospital or a blood bank after their first blood donation.
- Donor can keep track of blood donations made.
- Eligible Donor will receive special blood shortage alert messages or call from any hospital or blood bank during emergency.
- Donors will get notified on blood donation camps/programs in their nearby location within the radius of 50 km, only when they are eligible after a donation as per guidelines. This avoids unnecessary alert messages to the donor.

5. System Design

5.1 Android Studio
Android is the operating system based on LINUX (OS). An android is open-source software, meaning it is free and can be used by anybody. It is mainly designed for handheld devices, including smartphones and tablets, for touch screens. The architecture of Android supports the complete Java language. In 2008 the first edition Android 1.0 was introduced and the newest version is Android 11. IntelliJ IDEA-driven Android Studio is an Integrated Development
Environment (IDE). IntelliJ’s versatile code editor and development tools bring even more value to Android Studio, which makes building Android applications even simpler. The components of Android Studio are shown in figure 4.

![Components of Android Studio](image)

**Figure 4. Components of Android Studio.**

### 5.2 Flutter UI Framework

Flutter was developed by Google and released in May 2017 and is an open-source mobile UI Framework. In a few words, a native mobile app with only one base with code can be developed. This means that users can build two separate applications with one programming language and one code base (for iOS and Android). A programming language known as Dart is also used to code with Flutter. In October 2011, Google created the language, but over recent years it has improved a lot. The Flutter Architecture is shown in the figure 5.

![Flutter Architecture](image)

**Figure 5. Flutter Architecture.**

### 5.3 Dart

Dart is a general programming language for open-source applications. It was developed by Google originally and later accepted by ECMA as standard. Dart is both a server and browser programming language. The Dart SDK, presented by Google, ships the Dart virtual machine with its compiler. The SDK also provides a -Dart2js utility, which creates a Dart script's JavaScript equivalent.
5.4 Firebase
It is Google’s one-stop platform for mobile and web apps. It began out as a stand-alone business in 2011. Then, in 2014, Google acquired the platform, and it has become its major software development platform. It is the backend application for Web, Android and IOS. It has an in-house database, different APIs, countless authentication types and hosting services.

![Firebase](image1.png)

Figure 6. Dart.

![Firebase](image2.png)

Figure 7. Firebase.

5.5 Decision Tree algorithm
A decision tree is a machine learning algorithm that has a tree structure, similar to a flowchart, with each internal node referred to as a non-leaf node. Each branch reflects a specific method outcome, and each leaf node, also known as a terminal node, contains a class label or distribution. In a tree, the root node is the highest node. The decision trees may quickly be modified to rules of grouping. The design of decision-tab classifications requires no domain awareness or parameter configuration, making it ideal for knowledge exploration and discovery. An analysis was performed in user datasets using the J48 decision tree algorithm implemented in WEKA. However, there is an attempt in the blood donor classification using sex, age and height to identify and predict the donor. J48 algorithm and WEKA tool have been incorporated with B Door Application. This enables authorized institutions such as the hospital, non-governmental organizations and blood banks to check available donors based on donor input credentials. The problems encountered in finding the real-time donor can be solved by an analysis of J48 decision tree classification through the blood donor data sets.

6. Working
The B-Door App is developed using Android Studio with the features such as

- Registration / Sign up for Hospitals, NGOs, Donor, Activists etc.
- Google map (Location Identification)
- Blood request
- Blood donation
- Secured User Account
- Instance Account Creation/Deletion
- Donor Integrity.

The work flow diagram of Blood Door Application is shown in the figure 8 and working principle is given in Table 1.
Table 1-Working Principle of BDoor App

| Step 1: | Donor has to register first if he/she wants to be a donor. |
| Step 2: | Donor registration requires to be authorised by the hospital, Blood bank or NGOs. |
| Step 3: | Once registered, then the donor can maintain his/her account according to his convenience. |
| Step 4: | Every authorised institution can get an ID from the app administrator. |
| Step 5: | These authorised institutions can search for a donor through their login ID. |
| Step 6: | They can call, notify, and message the donor as per the donor wish. |

6.1 Firebase services

6.1.1 Authentication

This service aims to facilitate users in registering and logging in. Firebase Authentication can use Google, Twitter, Facebook, GitHub, and cell phone numbers. The system to be built uses authentication with a mobile number. The choice of using a cell phone number is because it is also for information when the user requests blood so that he can be contacted immediately when there is another user who will donate his blood.

6.1.2 RealTime Database

It's a cloud-based database with no structured query language that can be used to sync and manage the data between users all over the world. As a consequence, any details or information that is modified on the database is often updated on the user side. This database is used to store all data used for applications, including user data, blood demand data, blood stock data, and blood donor schedule data.

6.1.3 Cloud Messaging

This service is used for sending users updates. Notifications to be submitted on the smartphone of the user include a new blood request or a new PMI mobile donor plan. Initially, geofencing can be used to filter active blood requests on the basis of the range.
The comparison of M-Health Application with B-Door Application is shown in Table 2.

Table 2- Comparison of M-Health Application with B-Door Application.

| Parameter                                      | M-Health Application | B-Door Application |
|------------------------------------------------|----------------------|---------------------|
| Native App                                     | No                   | Yes                 |
| Authorised Institution Support                 | No                   | Yes                 |
| Search of Donors (Visible only to Authorised Institution) | No | Yes |
| Blood Donation Norms Satisfaction (During Account Creation) | Partially Yes | Yes |
| Verified Donor.                                | No                   | Yes                 |
| Account Deletion                               | No                   | Yes                 |
| Verification and Validation                    | SMS Based            | Email base OTP      |

7. Results and Discussion

7.1 Authentication Module

Sign Up
New user or donor can create an account to use in the blood donor application and create a password for account verification and create an identity.

Sign In
Donor SignIn to the account for viewing or editing location details and any other personal information.

Forgot Password
If donor forgot their password they have an option to reset their password.

Change Password
If donor or hospitals or blood banks want to change their password, they have options to change their password.

Account Verification
If donor changes their password or if they forget the password then we have to verify their account using mail verification.

7.2 Service Provider Module

Add New Donor
Hospitals or Blood Banks able to add new donor details.

List All Donor
Hospitals or Blood Banks is able to view all Donor who all use our Blood Donor Application.

Delete Existing Donor
Hospitals or Blood Banks can able to delete the existing customer’s details.

Edit Customer Plan Details
Hospitals or Blood Banks able to edit the existing Donor details as the Donor wish.

7.3 Screen Layouts

The Welcome page is first page of the app which contains multiple users Layout, where every user is categorized according to their function. figure 10 shows the multiple user login page.
The Donors can register their account using their email ID. Once registered, The Donor can sign-up by using his/her respective password. The login page for Blood Donors is shown in figure 11, which contains the E-mail and Password field and the forgot password option in case if the user forgets his/her password.

The profile of the Donor, where he/she needs to enter the required details. After registration Donor can maintain according to his availability. The registration page with Full Name, Email Address, Last donated date, Password, Contact Details, Blood Group and Location is illustrated in figure 12. The Hospital / other authorized institutions can search for donors using this BDOOR App and also through this page they can get support from the app administrator for finding donor in case of emergency. Figure 13 shows the Donate/Request Page of the User.
The donors with the respective blood type will be shown on the screen after the search. The Donor is determined with some inbuilt parameters. The Donor credentials page which contains the Details of the Donors is shown in figure 14. The nearest donor will be shown on the screen if the hospital wishes to find the nearest donor. The Donor Location page shown in figure 15 displays the Donors Location.

The information of the Donor can be accessed and the hospitals can contact through call, message and notification if the blood is required at reserved period. After the transfusion the donor last donated date will be updated and his account will not be visible in the search box for three months as per the terms and conditions of blood donation. The screen of Donor page which contains the information about the Donor is shown in figure 16. If the donor wants to delete his account in case of any disability, then he can delete his account. The Donor Account Deletion Page shown in figure 17 Indicates that the Donor can able to delete his Account.
If the donor forgets his password, so the e-mail with the link to modify the password will be sent to the user this enables the user to modify the password. The screen for Forgot Password Page is depicted in figure 18.

8. Conclusion

Blood donation is a kind of citizen's social responsibility in which an individual can willingly donate blood via our app. An authorised user at the centre and donor will keep his or her account, which is a significant innovation in our research. This system guarantees the recipient's protection and the donor's privacy using J48 decision tree algorithm implemented in WEKA. The authorised user will look for several blood donors in his or her area or in other particular areas, and then message, notify, and call them. Furthermore, we checked our platform with a few people. Applications with a better solution remove the obstacle to current blood donation. This Application has been created with the concept and has sought to make sure that the donor gives blood to community. This model is made user friendly so anybody can download and maintain his/her account.

B-Door app will break the chain of business through blood and help the poor to find donor at free of cost. This project will help new blood banks improve their services and progress from traditional to user-friendly frameworks.

9. Future Scope

In future, our algorithm more congenial with more features such as

- The analysis such as Frequently requested zone or hospital for Blood, Number of donors, mostly asked Blood Group, Age group of Patients need for blood etc. can be added as additional features.
- The BDOOR can be implemented using Artificial Intelligence and Deep Learning Algorithms.
- NGOs and NCC Units information’s can be made available in the application.
- Donors last donated details can be automatically updated in the App.
- Notification to Donors about the nearest Blood Donation Camp.
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