Yarmouk University

Faculty of Information Technology and Computer Sciences

Department of Computer Science

Project Title:

Blood Donation Application

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Abstract

The only source of blood supply is the people who come to the health center and donate blood.

many people die due to lack of blood in blood banks or due to the fact that not all hospitals have blood banks, our Blood Donation application is a social network application for blood donors that facilitate the process of blood donation, especially for the emergency cases in which the right donors can reach the patient as soon as possible.

المصدر الوحيد للدم هو الناس الذين يقومون بالتبرع في مراكز التبرع المخصصة.

العديد من الناس يموتون بسبب نقص في الدم في بنوك الدم أو بسبب عدم وجود بنك للدم في جميع المستشفيات, تطبيقنا "Blood Donation" هو شبكة تواصل اجتماعي للمتبرعين بالدم لتسهيل عملية التبرع بالدم, خصوصاً للحالات الطارئة بحيث أن المتبرع المناسب يستطيع الوصول للمريض بأسرع وقت ممكن.

1. Introduction

In general, every person has one of the following blood types: (A+, A-, B+, B-, AB+, AB-, O+, O-), so if someone lose some units of his/her blood s/he will be in danger, then the only way to keep his/her life save is to find a donor who can give him/her depending on some rules of blood donation, where not all types of blood are fit the others, so if a wrong person donate a blood to another person that his/her blood type does not fit donor's type, the recipient will immediately die, and the following figure clarifies the rules:

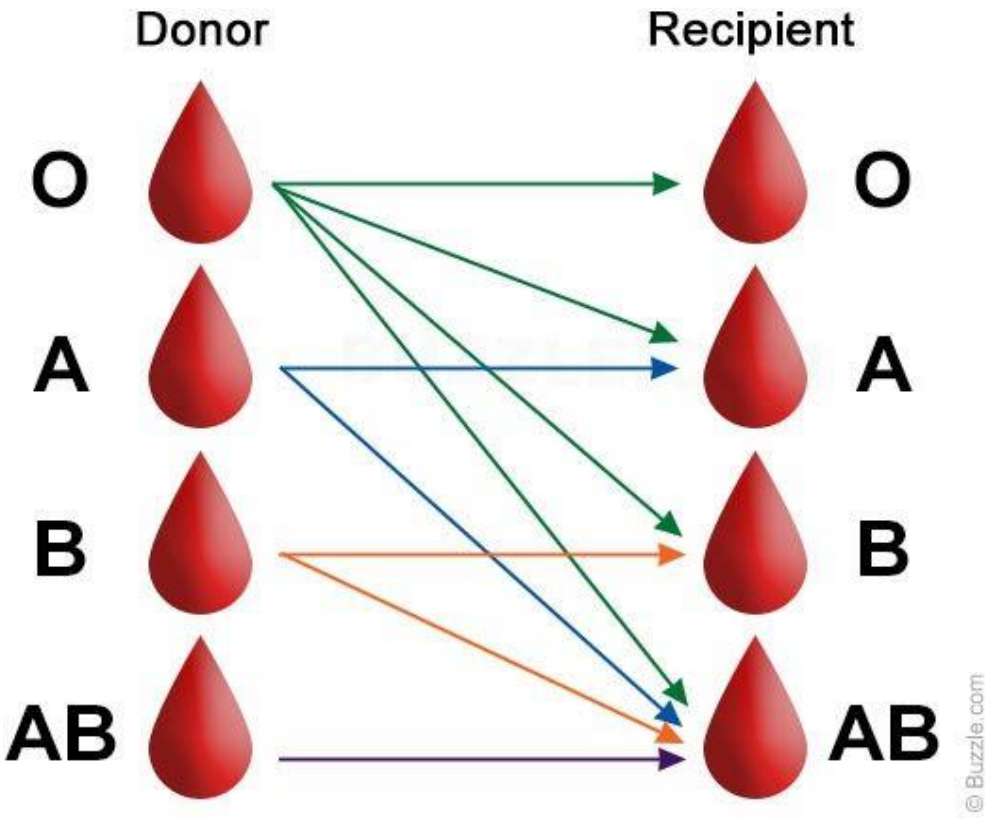

Figure 0. Blood donation rules

Blood donation occurs when a person voluntarily has blood drawn and used for transfusions and/or made into biopharmaceutical medications by a process called fractionation (separation of whole-blood components).

It is known that lots of people die due to excessive bleeding after some accidents such as car accidents, or some diseases such as blood anemia, so our application was developed to help such people.

Blood donation has benefits not only to save lives, but also for donors, such as:

- Anti-cancer benefits (maintaining healthy iron levels).
- Free health checkup.
- Burns calories.
- Other.

Blood Donation application is user friendly and gets the job done with the least number of steps/clicks possible and is implementing initiatives throughout the country to increase the number of blood donors in diverse communities and raise awareness of the need to give blood. It also works to find rare blood donors to meet the specialized needs of patients all over the country.

2. Background and Literature Review

2.1. Background

There are many applications that are concerned with blood donation to save people lives, as well our application will, and a great thing that our application will work in Jordan/Irbid where is no enough blood banks.

2.2. Literature Review

Turhan, S. has developed an Android application using Android Studio, the application has two major tasks: 1) sending user's location to the application and 2) receiving notifications from the application. The system calculates the distance between the donor and the health center to find the nearest donor. She also implemented Google's Maps in her application to determine the user's location (Latitude and Longitude) [1].

K M Akkas., et al have created a website and an application that people can register and become a donor or a recipient, when a person registers himself as a donor, he/she will have a username and password so he/she can login to the system. If a person is registered as recipient, he/she can search for required donors based on location using Google Maps and blood group [2].

Naren J, he included cloud storage of blood group information. He proposed a framework to use cloud computing in order to store blood group information in every respective possible state or country. The cloud-based storage of blood groups will not only help patients, but it also facilitates the hospitals and health centers to retrieve this information rapidly and can also contact the nearest blood banks as per requirement [3].

Bhowmik, A. et al they created a mobile phone application by which anyone will be able to look for their desired blood group at the nearest location and they decided to develop the same idea with other platforms such as Windows phone and iOS [4].

Naser, et al they designed a mobile application in order to track blood donors. This application directly connects the end user with the donors in time of emergency, this app also provide service such that the donors can interact among themselves, also with the Hospital blood center [5].

3. Contribution and Objectives

3.1. Contribution

- Our application uses Push Notification Service to inform people that someone needs blood.
- Our application will show the donor the shortest path to the hospital, so he/she can arrive as soon as possible.
- Our application will show all eligible requests in the “Home” page within the application in case the notification was dismissed by mistake.

3.2. Objectives

- Reduce the percentage of death due to lack of blood.
- Keeping blood available at any time.
- Privacy for both recipient and donor’s information.

4. System Analysis

4.1.1. Functional Requirements

- Registration and login: The user should create an account by filling the required information (Name, blood type, age and phone number.) in the registration form. Also, the application will automatically save user's location. Then the user can login to his/her account.

- Request blood: The user should submit a blood request by filling a form with the desired blood type, quantity, hospital name and other personal information.

- View blood requests: The user should see all blood requests which match his/her blood type (with respect to the blood donation rules).

- Shortest path: The user should get the shortest path from his/her current location to the specified hospital.
- Communicate with requester: The donor can call the requester to get more information or to see if the requester got enough donors.

- Push notification: The users will receive notifications of blood donation requests that match his/her blood type (with respect to the blood donation rules) every time a new request is made.

4.1.2. Non-Functional Requirements

- User friendly Interface: The application shall be easy to use.
- Availability: The application shall be available 24/7.
- Security: The users shall verify their accounts before start using the application by clicking on a confirmation link sent to their email.
- Accuracy: The application shall show the requests to the right donors only.
- Privacy: Users information in the database shall be private and no one can access or modify them.

4.2. Use Case Diagram

*Use Case Diagram Explanation

Figure 1. shows that the user (either patient or donor) must register to use the application, also verification must be done through their e-mail, then the system will automatically redirect them to the login activity, the user should login, in case the user entered wrong email or/and password the system will show a message says that the user has entered a wrong email or/and password, otherwise it will redirect the user to home activity, patient can request blood and the system will send notifications for all eligible donors, also the request will be displayed in home activity for eligible donors so they can view requests and select the appropriate ones by clicking on directions button to get the shortest path to the patient's specified hospital so they can get to the patient as soon as possible.

Include: means that the prosses is a must.

Extend: means that the prosses will be triggered if there was an error.

Arrow with empty head: it means inheritance in which the actor that the arrow points to is the parent and the other side gets all attributes that parent has.

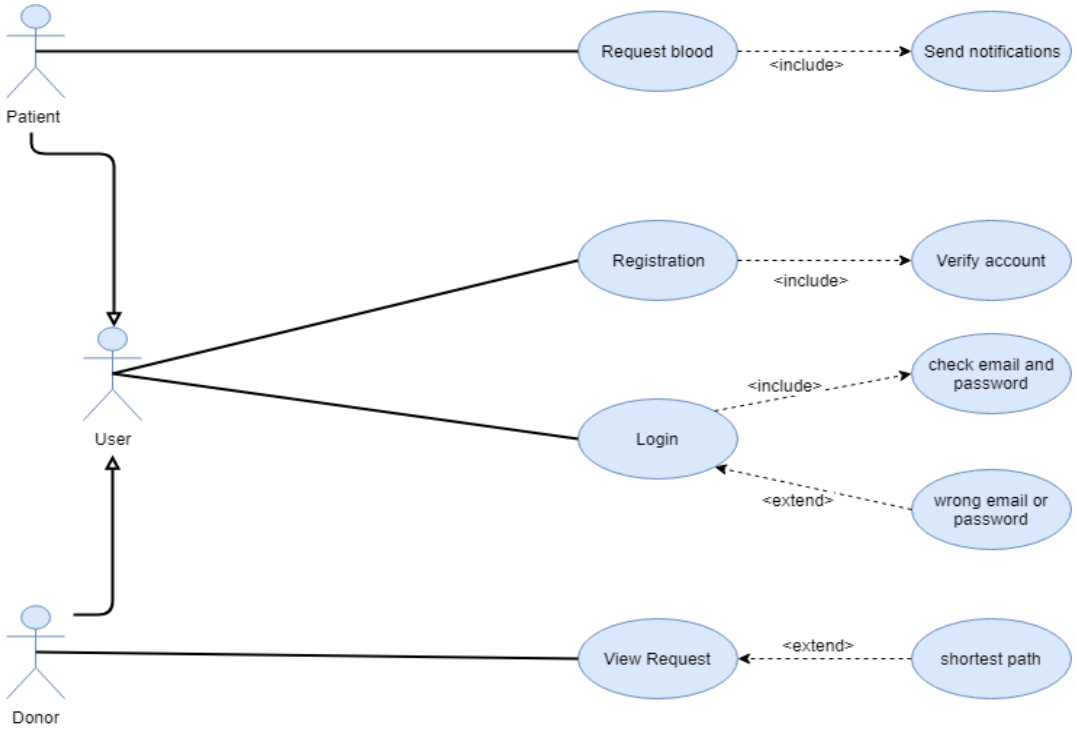

Figure 1. Use case diagram

Table 1. Registration for both donor and patient

Use Case	Register
Actors	Patient Donor
Description	Both patient and donor must create an account by filling the registration form with valid information.
Precondition	The email address used in registration must be valid and not used before in the application.
Postcondition	Both patient and donor must verify their account by clicking the link sent to the email used in registration.

Table 2. Login for both donor and patient

Use case	Login
Actors	Patient Donor
Description	Both patient and donor must login by using email and password that they already used in registration.
Preconditions	Both patient and donor must be registered on the system. Both patient's and donor's accounts must be verified before logging in to the application.
Alternative flow	In case the user entered wrong credentials, the application displays error message.

Table 3. Blood requesting for patient

Use Case	Request Blood
Actor	Patient
Description	The patient request blood by filling a form with the following information: patient name, blood type, quantity, hospital name and phone number.
Precondition	The patient must be logged in before making any requests.

Table 4. displaying existing requests by donor

Use Case	View Requests
Actor	Donor
Description	The donor can view all blood request that she can donate to.
Precondition	The donor must be logged in before making any requests.

4.3.1. Data Flow diagram (Level 0)

Figure 2 shows that when the patient make a request, he can delete it in case he did a mistake such as inserting wrong information, if s/he did not delete the request, the system will send a notification for all eligible donors; also donors can show requests anytime by visiting home activity in the application, so if donor clicked on “directions” button on the notification or on the post in home activity, the system will redirect the donor to the map with the shortest path from his/her current location to the specified hospital.

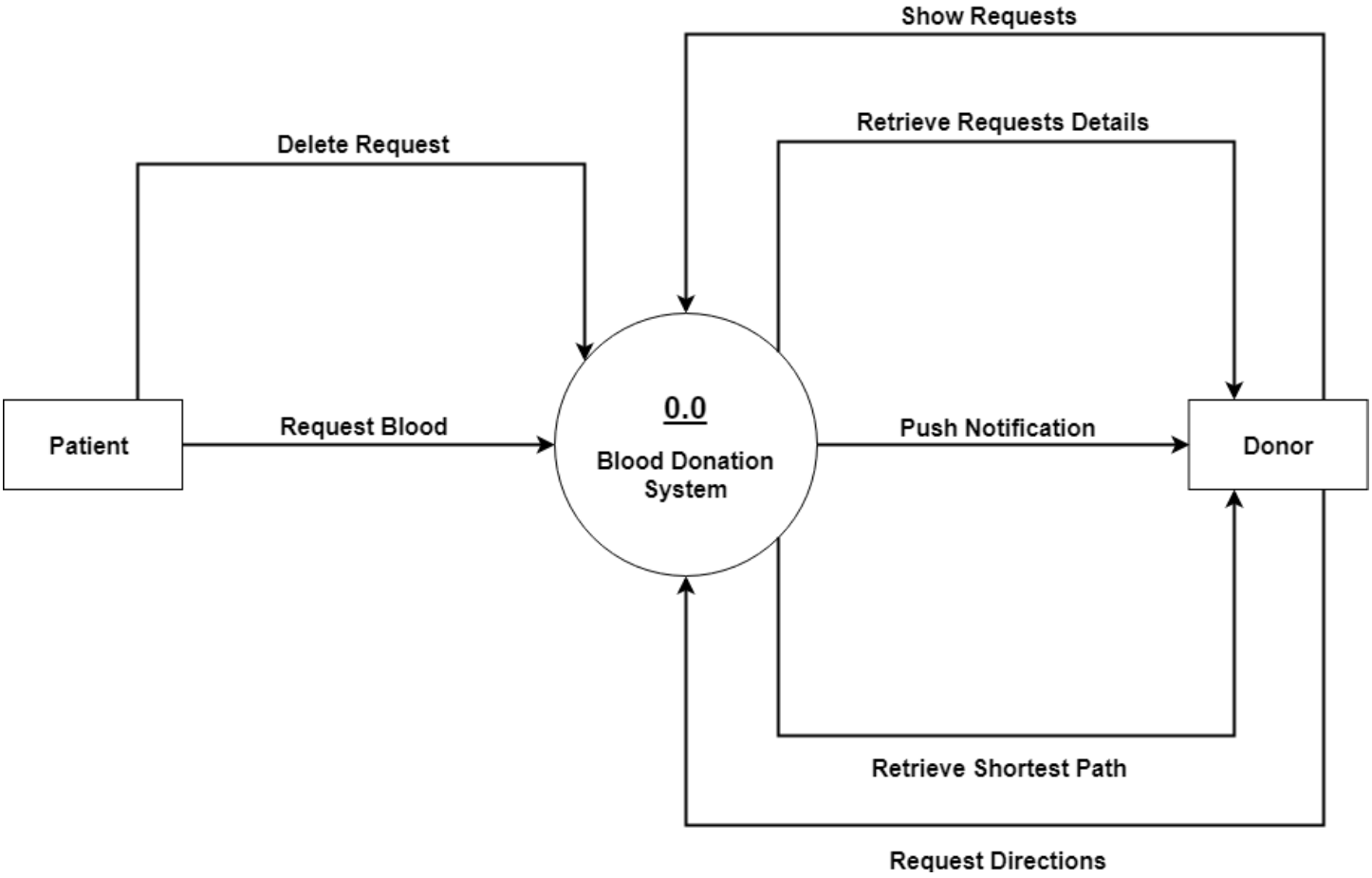

Figure 2. Data flow diagram (level 0)

4.3.2. Data Flow diagram (Level 1)

Figure 3. shows that both donor and recipient must enter their information to create an account, there information will be stored into the database, also the database contains the requests that will be displayed for eligible donors in the home activity in the application, the recipient can also delete the request, then it will disappear completely from both home activity and database.

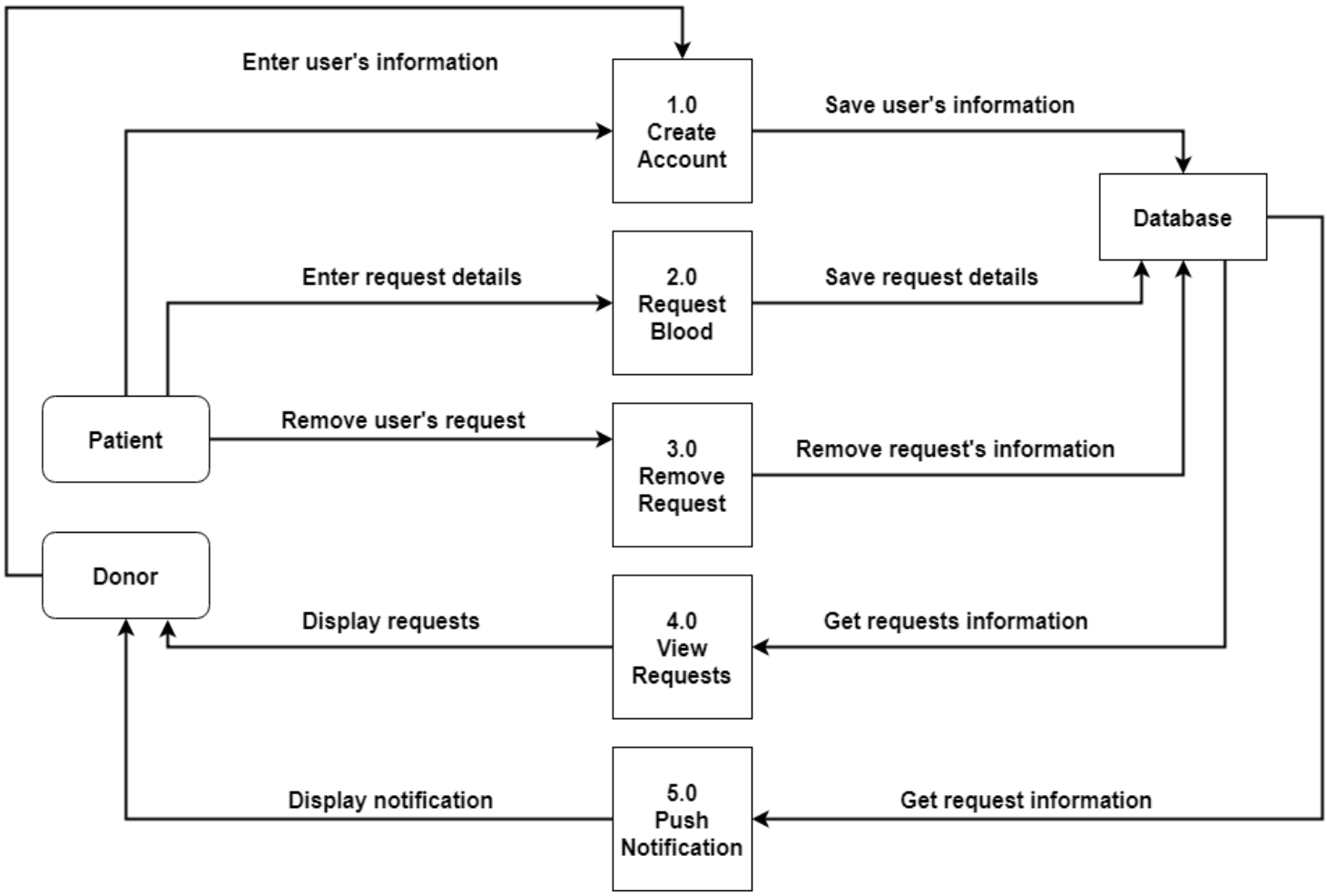

Figure 3. Data flow diagram (level 1)

5. Algorithmic Design

The following pseudo code shows that the system checks if the user (either recipient or donor) already has an account, then the user can enter his/her e-mail and password, then the user clicks “login” button, so if the entered e-mail and password were correct, user will be redirected to home activity in the application where he can see the eligible requests (requests he can donate for), here the donor can press “directions” button, if the donor pressed it, s/he will be redirected to the map with a blue line between his current location and the specified hospital, this blue line represents the shortest path, now in case the user is the recipient, “delete” button appears for him/her, so if recipient pressed it, the post will be removed immediately, but from the beginning, if the entered e-mail and/or password were wrong, a toast message will appear on the screen to alert the user to check the entered e-mail and password.

User can make a request by choosing request button form the three dots at the top right most of the screen, if the user did so, the system will redirect him/her to Request activity in the application, then the recipient should enter his/her (name, blood type, needed quantity in units, name of the hospital, and phone number)

And by clicking “Request” button, the notification will be sent to the eligible donors and the request will appears as a post in Home activity.

if the user clicks on “Logout” button that is provided in the three top right most dots, the system will redirect the user to the “Login” activity

in case that user doesn’t has an account, s/he can create one by clicking on “SignUp” button, if s/he did so, a new activity will appear for him/her to insert the specified information (e-mail, password, blood type, age, and phone number), the location will be accessible after getting a permission from the user, finally s/he will be redirected to “Login” activity.

5.1. Pseudo Code

```
If(user_has_account())
        Enter (email, password)
        Press (Login)
        If(isCorrect(credentials))
                Open (Home_Activity)
                Display(eligible_requests) //Filters the requests to fit the donor's blood type
                If(isPressed(Directions))
                        Shortest_Path(location(user), location(hospital))
                //end if
                Else if(isPressed(delete))
                Delete(request(user))
                //end else if
                Else if(isPressed(request))
                        Open (Request_Activity)
                        Enter
                (Name, bloodType, bloodQuantity, hospitalName, phoneNumber)
                //end else if
                Else if(isPressed(logout))
                        Open(Login_Activity)
                //end else if
        //end if
        Else
                Display(invalid(credentials)))
        //end else
Else
        Press(signup)
        Open(Signup_Activity)
        Enter(email, password, bloodType, Age, phoneNumber, getLocation(user))
        SaveToDB(information(user))
        Open(Login_Activity)
//end else
```

5.2. Flow Charts

Figure 4. represents the system flow (for both recipient and donor), at the beginning the system checks if the user already logged in, if yes, then the system will redirect the user to “Home” Activity where posts are displayed, so if the user is the donor so he can press “directions” button that will show him/her the map with the shortest path to the hospital, but if the user is the recipient, a “delete” button will appear to allow him/her to remove the request, and s/he can make a new request by choosing “request” form the top right most thee dots on the screen that will redirect him/her to “Request” activity that to enter request information to send them as notifications and post them; but if the user is not logged in, if s/he has an account, s/he can login directly using valid e-mail and password through the “Login” activity, otherwise s/he must create a new account before use the application, and that through “Signup” activity where user must enter valid e-mail and other information, and verifying it through the e-mail; the system will automatically redirect the user to the “Login” activity.

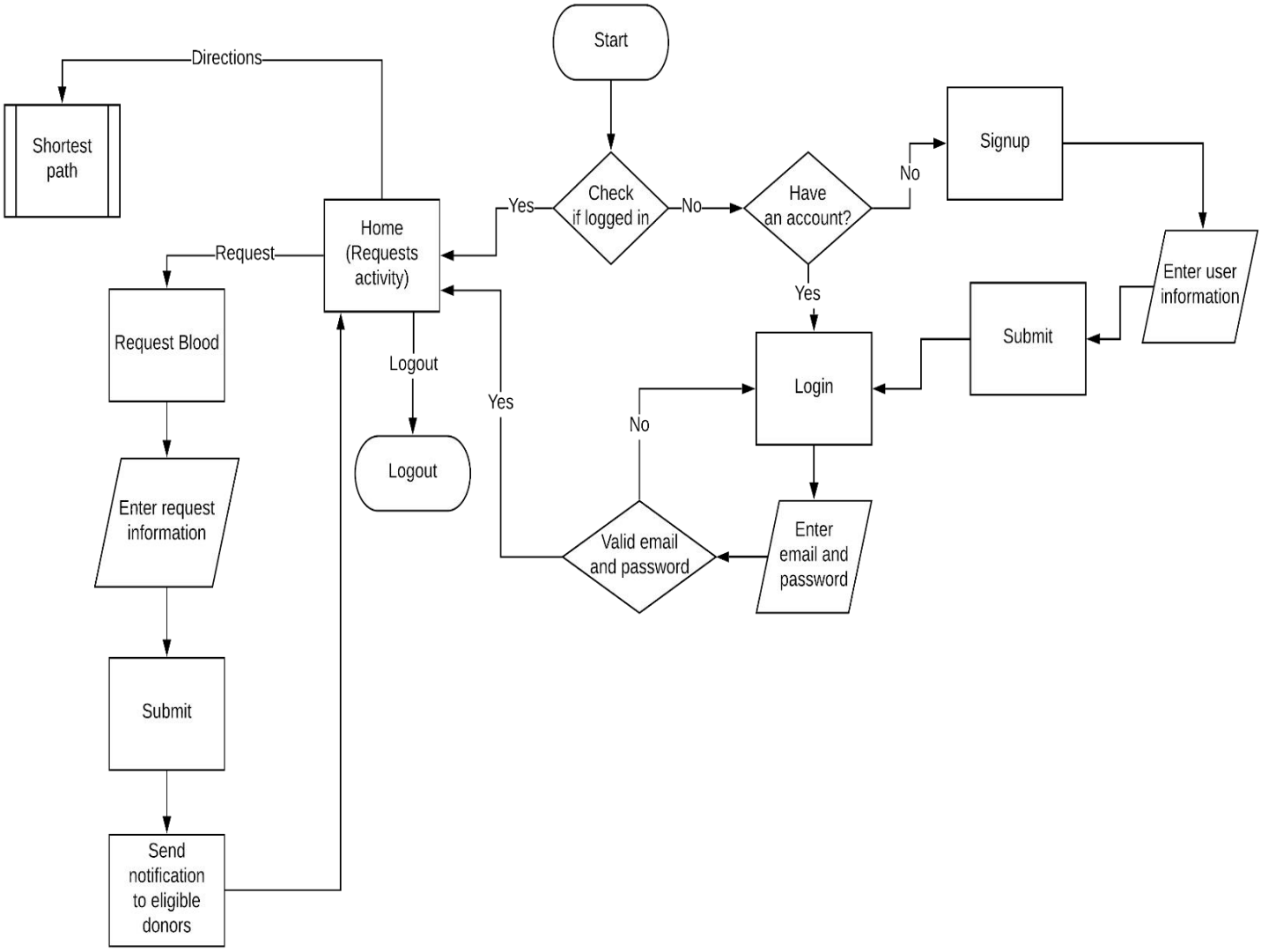

Figure 4. Flow chart for the whole system (for both donor and patient)

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[3] Naren, J. (2016). A smart application on cloud based blood bank. *Journal of Computer and Mathematical Sciences, 7*(11), 576-583.

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