

ONLINE BLOOD SYSTEM

Rutuja Chaudhari¹, Shraddha Gaikwad², Manasi Godase³, Nikhil Mali⁴, Tushar Pinjan⁵

¹Student, ²Student, ³Student, ⁴Student, ⁵Professor

¹Department of Computer Engineering,

¹Indira College of Engineering and Management, Pune, India

²Department of Computer Engineering,

²Indira College of Engineering and Management, Pune, India

³Department of Computer Engineering,

³Indira College of Engineering and Management, Pune, India

⁴Department of Computer Engineering,

⁴Indira College of Engineering and Management, Pune, India

⁵Department of Computer Engineering,

⁵Indira College of Engineering and Management, Pune, India

Abstract : Everyone is familiar with the blood donation systems but everyone is not satisfied with all of these systems. In this digital era, everyone is marching towards new technologies. We can get anything easily over the Internet but it contains some flaws also. Online Blood System is a web portal where the objective is to connect people on over internet with each other. Online Blood System uses K-Nearest Neighbor algorithm because of which it will be easy for acceptor to find donors in nearby areas. This system aims to provide maximum sources to acceptor who needs blood. Online Blood System also handles the emergency cases effectively. The user's data is safe and secure as the encryption of data has implemented in this system. The encryption of database has implemented using cloud services. Our system includes moderator factor which plays important role in entire project. Our system also invites hospitals and blood banks to register themselves on our website to increase the resources for blood.

Index Terms: Donor, Acceptor, Blood Donation, Cloud, KNN, Hospitals, Blood Banks

I. INTRODUCTION

We all know that the requirement of blood is universal. The blood is really important for the humans as it could save the life of lot of humans. As per the records everyday in India around 15,000 people die due to lack of blood. There are multiple reasons for this numbers and one of them could be that people are unaware about blood donations or people don't know the process of blood donation exactly. Humans are really lucky that they can share the blood to each other and can save one's life. The problem here is that humans are unaware about blood donation and about platforms which provides these facilities. Until now human tends to share blood using traditional methods but in this digital era humans can connect with donors or with the person who requires blood over the internet within less time and more security. Online blood system is a web application which provide platform to various people for the purpose of blood donation. There are many blood donation systems available over the internet but some of the systems are not efficient to satisfy the need of donor or acceptor. Most of the systems contains some errors and floors because of which it becomes steady as task for users to use these systems. Online blood donation system aims to overcome all these floods and to provide an efficient web application to users. Our system uses machine learning algorithm named as K nearest neighbor algorithm which helps a lot to make a system efficient and optimize. Online blood system also give priority to a private information of users which will be kept safe and Secure in databases.

Our system uses admin module to keep the spammers away from the website and to maintain a secure environment. The person who needs blood can directly search on the website or can contact directly to verified donors available over there. Those persons who wants to donate blood need to apply as a Donor on site and after that their profile will be check by admin. The profile status about acceptance or rejection will be sent two donors by admin via Gmail. Our system utilizes the cloud services where the database can be uploaded and encrypted with strong security keys. This system also provides a feedback form for a user which can help us to improve a website performance than the previous version. Most of the existing systems provides functionality which are not capable to take a load when a lot of users visits a website on the same time. Online blood system provides a platform to users where all the functionalities and features are at one place. Our system also provides a tutorial video for the new users who don't know to operate a website. The system also provides contact us form for the organizations who wants to sponsor a website in order to increase the reach of website and to get more visitors. The main objective of online blood system is to reduce the number of deaths which caused due to lack of blood and to aware people about blood donation importance.

II. LITERATURE SURVEY

In [1], this paper focuses on cloud computing as the main idea is to improve the blood bank management system. GPS technology is used in this project so that the location is been visible to the requester. In this project the requester is provided

with the donor's location and the location of nearby blood bank. The limitation of this project is that it may affect the security policy of identity of the user as they are using the concepts of cloud computing and GPS technology.

In [2], there is no need for the registration of the user. The user can directly search for the blood donor and can contact him/her immediately as the contact number is provided. This system is mostly effective in emergency situations. Google maps is used by the donors to search the requester location. Anyone can search for a donor but the only requirement is a browser enabled device and an internet connection.

In [3] paper, the system is a fully automated system which is implemented using various machine learning algorithms. This machine learning algorithms make the system faster and more efficient. They have developed an android application and used Raspberry Pi. A huge data is collected and this results in fulfilling all the requests of blood. The improvement is made in the response time and the system is made more unique so that it can overcome the disadvantages of other system.

In [4], they have proposed the system in which different machine leaning such as Logistic Regression Algorithm, Naïve Bayes Algorithm, Support Vector Machines, Random Forest Algorithm, K-Nearest Neighbour Algorithm and Decision Tree algorithm approaches have utilized. In this system they have considered the data base obtained by "Blood Transfusion Centre" so in order to select the best algorithm they divide the dataset into 80, 20 ratios as training and testing datasets. By using machine learning approaches and algorithm, system becomes efficient. Usually the systems take fewer loads due to implementation of such algorithms. By The entire system can be automated because of which user gets required thing easily. Even though the system fully automated it still has some demits that are if one of the queries is not running properly at an instance due cache or server error then it will take a time to run properly due to less human intervention.

In [5], this project is an android application which focus mainly on cloud computing. It is a computer system that will connect all donors. The system will create a database to hold data on stocks of blood and will keep a record of all blood transfusion in each area of each city. It is an open platform where people can see which patients need blood supplies via the website. Instant communication and location tracking is done by sending SMS from their local clients who needs blood to donate blood in cases of need.

In [6] paper, they have proposed the system where they have designed various modules for Blood Banks, Blood Camps, Search donors, Organize blood camp, Search nearby places, Requirement for blood, Request for blood, Speed dial, Medical first aid, Profile update. The system is designed in such a way that the Acceptor can search required blood; the list of the users registered on the same system will be displayed to them by location or type of blood. In this system they have used GPS with the help of it the Acceptor can see the nearby hospitals. In the above proposed system, they have not designed a module for the donor where we can verify the donor and as a result even the unverified donor can also donate blood. In order resolve this problem we have designed the module for donor so can only list of verified donors will be displayed to the Acceptors.

III. EXISTING SYSTEM

Existing systems give rise to certain problems which affects the user experience and interaction. In existing system, the navigation route or track is generated between donor and acceptor using GPS. This could compromise the security of both donor and acceptors. Many scammers can take advantage by randomly connecting to any person to call him or her at non-secure place. Also, the system is not capable to handle emergency situations because of lack of availability of blood resources. The existing system uses GPS (Global Positioning System) to track the donors but as a result it gives global records. It do not shows the nearby locators to quickly get in touch with each other.

IV. PROPOSED SYSTEM

Our primary motivation for this project is to improve the quality of life via the utilization of technology that could save one's life. So we are providing the platform for the donors who are willing to donate but don't want to deal with a traditional method. Not only donor but acceptor can also save their time by searching the required blood group directly and contact the nearby donor. Thus this application provides the required information in less time it also helps the user for making quick decisions. Our goal is to satisfy the quick decision-making parameters of users using our system. The OBS (Online Blood System) uses machine learning algorithm termed as KNN (K-Nearest Neighbor) which helps to locate donors in nearby areas using real-time longitude and latitude.

V. METHODOLOGY

On the basis of such requirements like functional and non-functional requirements, the algorithms can be identified. Once the algorithm has identified then it will deduce the mathematical model. From that mathematical model, time and space complexity will be known and therefore the efficiency measurements can be done. We have developed this project not only to help the person in need but also the person in extreme emergency case. While the person in emergency case the user will need to just add the required blood group and current location with the help K-Nearest Neighbor. algorithm we can notify the nearest person to the user. We don't only focus on the Acceptor and Donor but also on Hospitals and Blood Banks too. The Donor who is willing to donate blood 1st need to register by uploading the required documents, the request will be sent to the admin and after verification processes the Donor will be notify the status about their profile. Once the profile is verified the donor can donate the blood to the nearby acceptor. Hence, SRS documentation process for OBS system contains dependencies because of which proper execution gets carried out. SRS documentation also frames about the models which are very much useful in step by step process. For Example, OBS uses waterfall model in which first phase is requirement itself. It is all about gathering of information and performs execution of it.

5.1 Advantages

- This application reduces the time to a greater extent that is searching for the required blood through blood and hospitals.
- Thus this application provides the required information in less time and also helps in quicker decision making.
- It provides simple user interface to navigate easily through website.
- No interference between Donor and Acceptor. Moderator System plays important role for sure.
- If user has emergency then he can search donor by city, country or Blood group and directly contact to donor and also he can request to him.
- System has help section which includes Tutorial Video Integration.
- System is highly optimized due to use of machine learning algorithm and advance technical language libraries.
- Speed of website is much better than existing systems external as well as internal plugins.

1.2 Modules Working

i. Admin

In this module, initially there will be admin login and once admin logged in then interface will pop with options. Here, admin will able to see hospitals, Blood banks who registered on website. It is totally in control of admin to approve or reject the donor's profile. When donor registers on website and send request for approval then he or she has to submit national id or proof in order to do verification. These documents will be verified by admin and then admin will take further decisions. Admin will send mail to applicants about their profile status.

ii. Donor

In this module, there will be two options such as User Login and Donor Login. If user has account and already sent request for approval of profile to moderator then he or she can login in donor profile. One condition is here that if admin approved the request of donor then the name of donor will be added in the list of verified donors and after that only, donor will able to donate blood. Until then, donor can check status of approval where he or she will be displayed as 'Approved' or 'Rejected'. Once the profile get approved, donor will receive blood request from nearby location. Donor can directly chat with the person who need blood

iii. User

In User Module, there are two entities named as User Registration and User Login. If new user is visiting site then he or she will go through User Registration where his or her current location will be saved in database. After new user registration, it totally depends on user whether he or she wants to donate or receive a blood. If he or she wants to donate the blood then user can opt-in for Donor Registration. If he or she wants to receive blood then user can see list of verified donors only. Hence, this maintains the security of acceptor who needs blood.

iv. Emergency Mode

In this mode, user who require blood in emergency can opt in for this entity. There is no registration required for user in order to search blood. Hence, this module is very effective in urgent cases where maximum resources will be provided to acceptor to get blood anyhow.

v. Hospital and Blood Bank

In this module, the hospitals who want to contribute in society can register their hospital on website. Because of their registration, so many people will get benefit while searching blood. After registration, hospital can login via Hospital Login where it can add various doctors.

Blood bank module works same as hospital module where blood banks will register itself on site and that will be beneficial for users. This is one of the kind of source from where user can get blood. In case, if any user fail to get blood from donors then he or she can directly contact to blood banks in nearby sector and can fulfil requirement. The main advantage here is that in every detail or information, the contact number has mentioned so that they can directly contact to each and can figure out problems.

vi. Tutorial

This is the mini functionality where integration of YouTube video will be carried out. This tutorial video will help user to navigate through the system. User will get familiar with system quickly with the help of this video module.

5.3 System Design

After developing a particular system it is necessary to design various types of diagrams that gives a short summary about components used in the system. System architecture also deals with the flow of the entire system because of which the developer as well as the organization can understand easily the working model of particular project or system. There are various ways in order to define system architecture. Online blood system also uses such kind of diagrams in order to define the system architecture and it also represents the dependencies between different components and models. Especially relationship can be defined with the help of entity relationship diagram which include entity, attributes and type of relationship between two entities.

- Entity Relationship Diagram

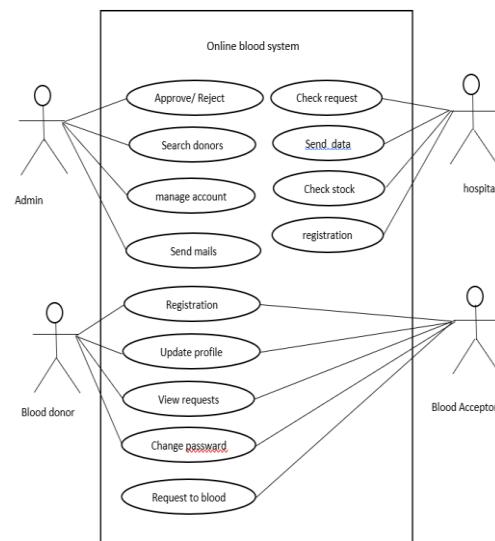


Fig -1: Use Case Diagram

As shown in Figure 1, one actor is participating in multiple functionalities or goals because of which the system becomes more efficient and we get clear idea about the flow of system using this use case diagram. At partial stage of project completion initially we have one use case diagram but at the end of a project completion of project there will be many use case diagrams which will reflect the execution of particular actor and its participation in various functionalities. In use case diagram the main important entities are named as actors and goals where actors could be any person or external organization and goals are the functionalities which and external person wants to achieve. In the similar way online blood system includes four external entities named as Admin, Donor, Hospital and Acceptor which performs various functionalities in order to achieve the main goal.

- Data Flow Diagram

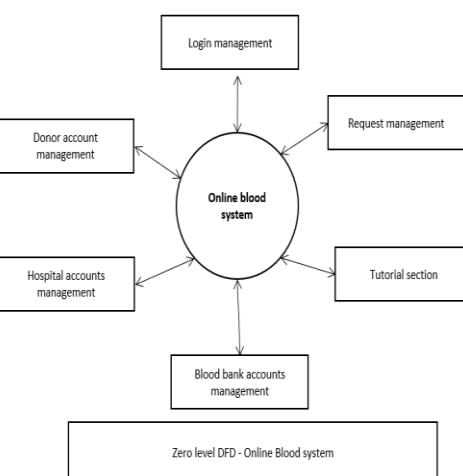
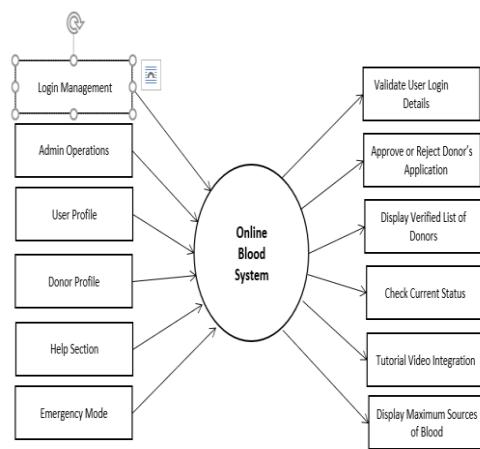


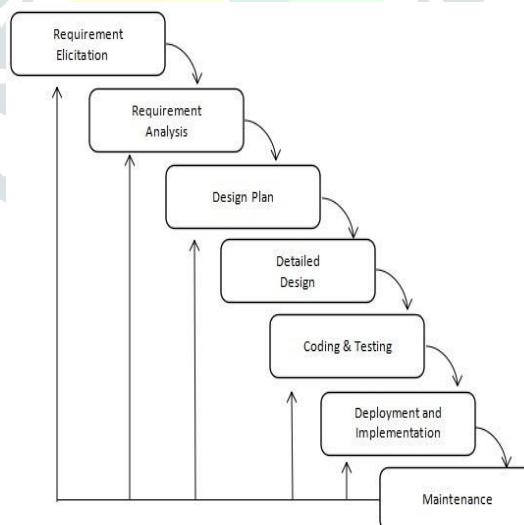
Fig -2: Data Flow Diagram Level 0

**Fig -3:** Data Flow Diagram Level 1

As shown in Figure 2 of data flow diagram level 0, we can figure out the simple flow of data for the operation of each module. It mainly deals with the management of the system and the capability of system to handle various models. This diagram can be also called as the shortlisting diagram at it categorizes every module for system which performs a particular task. Hence in online blood system it really becomes easy to identify the functionality of entire system with just one visual and hence data flow diagram is widely used in global system. Data Flow diagram level 0 deals with only the primary categories of module but in order to define or represent the subsystem sub-module of primary module, data flow diagram level 1 can be used.

As shown in Figure 3 of data flow diagram level 1 where the functionality of a particular model can be defined with very simple way. As shown in Figure 3, there are various nodes or category of system which performs the respective work regarding online blood donation. There are particular modules in online blood system such as login management, admin management which performs its respective task and that can be represented using data flow diagram level 1 which is really helpful to graphically display the overview of system. From the representation of these two diagrams we can conclude that there is certain difference between level 1 and level 0 data flow diagram. In level 0 data flow diagram different external entity data connected to only single node and get carried out its execution in proper manner. Level 0 data flow diagram the percentage of detailing is less than 60 percentage because of which we use level 1 data flow diagram in order to get more details about the system. In level 1 data flow diagram the detailing of system is extremely good and it becomes really helpful to understand the system in general.

5.4 Data Model and Description

**Fig -4:** Iterative Waterfall Model

Online Blood System could use classical Waterfall Model but it doesn't use that model because classical waterfall model does not include any type of acknowledgement. In system like OBS, acknowledgement is necessary in order to verify parameters and their execution. If any system receives acknowledgement or feedback then that system will surely head towards efficiency as errors or bugs can be solved at initial phase. Iterative Waterfall Model is very different from Classical Waterfall Model. The entity or functionality which makes Iterative Waterfall Model different from Classical Waterfall Model is nothing but the feedback or acknowledgment. Iterative Waterfall Model provides feedback to its previous phase for the confirmation of successful execution or for the purpose of occurrence of random bugs and defects. OBS uses same functionality in order to resolve errors in pre-phases and then resend the verified or cleaned sample. OBS uses the Iterative Waterfall Model because of its popularity as this model is widely used by many organizations to develop their respective system. Also, the Iterative Waterfall Model is easy to use and one can easily understand it. The additional part in Iterative Waterfall Model is Requirement Elicitation or it can be called as feasibility study. The feasibility study helps in order to get estimation about operational and technical execution. The project gets evaluated on the basis of time and cost. It mainly includes cost of building a system and time of

completion. Because of such functionality, the target or goal of system can be defined precisely. Feasibility study of OBS includes Time of Completion, Cost of Building and Technical Efficiencies.

VI. ALGORITHM AND WORKING

In every system there is requirement of algorithm because of which system works on certain parameters and complex functionalities can be sort with simple methods. In similar way, OBS also includes algorithm named as KNN. KNN stands for K-Nearest Neighbor Algorithm. This algorithm has concerns with Machine Learning as well as Data Mining operations. As KNN comes from these two entities then there is no doubt of efficiency in system. In previously developed system, mainly GPS (Global Positioning System) was used to take the current location of user which was not efficient enough. Using this machine learning approach impacts on various entities. In OBS, KNN works on the basis of longitude and latitude which calculates exact distance between two entities.

In GPS approach, global donors come in result while searching but as OBS uses KNN then it will show only nearest verified donors to acceptor. The number of entries shown to acceptor is totally depends on the value of K. Hence, OBS uses this algorithm according to requirements which were abstracted in Iterative Waterfall Model. KNN is machine learning algorithm which categorized under Supervised Module. It mainly used for classification or regression. The K-Nearest Neighbor (KNN) algorithmic rule measures the space between a question state of affairs and a group of situations within the knowledge set.

In OBS, the algorithm works smoothly as all the computations perform in proper manner. When new user registers on website, then while registration user has to allow location. After allowing location, the user's location respective longitude and latitude will be stored in database. Now if other user who is under 10 km registers on site then his or her location will be also saved using KNN. As we know that functionality of KNN is that it shows the results of those tuples which are nearby and defined by K value. In OBS, K value will define the range of distance in unit KM so that the acceptor will come to know about the actual distance. The distance will keep changing as user registers from different location and it will be calculated automatically and will show accurate results. Because of use of KNN, time consumption of acceptor who need blood gets reduced and the trust on system increases as well. It clearly implies design of the project on the basis of algorithms. For KNN, It work by finding the distance between the mathematical values of these points.

Formula: It is basically calculate the nearest point using Haversine Formula as,

$$\text{haversin}\left(\frac{d}{r}\right) = \text{haversin}(\phi_2 - \phi_1) + \cos(\phi_1) \cos(\phi_2) \text{haversin}(\lambda_2 - \lambda_1)$$

Figure 1. Haversine Formula For OBS

6.1 Mathematical Calculations

Formula:

$$a = \sin^2(\Delta\phi/2) + \cos\phi_1 \cdot \cos\phi_2 \cdot \sin^2(\Delta\lambda/2)$$

$$c = 2 \cdot \text{atan2}(\sqrt{a}, \sqrt{1-a})$$

$$d = R \cdot c$$

Where ϕ is latitude, λ is longitude, R is earth's radius (mean radius = 6,371km);

Note that angles need to be in radians to pass to trig functions!

Const R = 6371e3; // metres

Const phi1 = lat1 * Math.PI/180; // ϕ , λ in radians

Const phi2 = lat2 * Math.PI/180;

Const DeltaPhi = (lat2-lat1) * Math.PI/180;

Const DeltaLambda = (lon2-lon1) * Math.PI/180;

Const a = Math.sin(DeltaPhi/2) * Math.sin(DeltaPhi/2) + Math.cos(phi1) * Math.cos(phi2) * Math.sin(DeltaLambda/2) * Math.sin(DeltaLambda/2);

Const c = 2 * Math.atan2(Math.sqrt(a), Math.sqrt(1-a));

Const d = R * c; // in metres

Table -1: Table showing Data of Location

Sr.No	Location	Latitude	Longitude
1	Pimpri	18.617258068755497	73.74613582322704
2	Shivajinagar	18.533025573753257	73.83603370217823
3	Dombivli	19.214031418236537	73.08207166140649
4	Dadar	19.020162266432894	72.83823945504861
5	Malad	19.19184350715093	72.80814350784992

Source: Nigdi

Latitude: 18.648964989771898

Longitude: 73.77045729012457

Destination: Pimpri

Latitude: 18.617258068755497

Longitude: 73.74613582322704

Haversine = ACOS ((SIN (18.648964989771898) * SIN (18.617258068755497)) + (COS (18.648964989771898) * COS (18.617258068755497) * COS (73.74613582322704) - 73.77045729012457)) * 63713549128345

Distance is 4.36km

Table -2: Table showing Data of Location with Distance

SR.No	Location	Latitude	Longitude	Distance
1	Pimpri	18.617258068755497	73.74613582322704	4.36 Km
2	Shivajinagar	18.533025573753257	73.83603370217823	14.632Km
3	Dombivli	19.214031418236537	73.08207166140649	95.87km
4	Dadar	19.020162266432894	72.83823945504861	106.4km
5	Malad	19.19184350715093	72.80814350784992	117.9km

VII. RESULTS AND DISCUSSION

Whenever any system comes to result then the deciding factor comes into picture. On the basis of development, the reaction of people can be understood. This helps a lot to development team after the stage of deployment. In OBS, we have focused on every entity and one of these entities is the list of verified donors. As compared to other systems, OBS contains approximately 85% of verified donors. This helps to acceptors to put their trust on site and to connect with verified donors only whenever required.

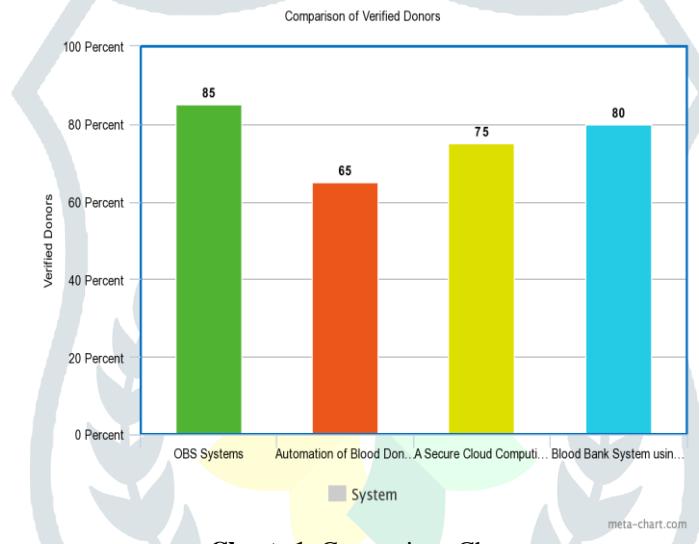


Chart -1: Comparison Chart

This comparison gives the faint idea about our system which includes unique functionality as well as reduces the security concerns.

In order to get opinion of people and to get the exact idea of demand of blood system, we have conducted a small survey. This survey has conducted to get the votes of people to know whether they are satisfied with the present systems or not.

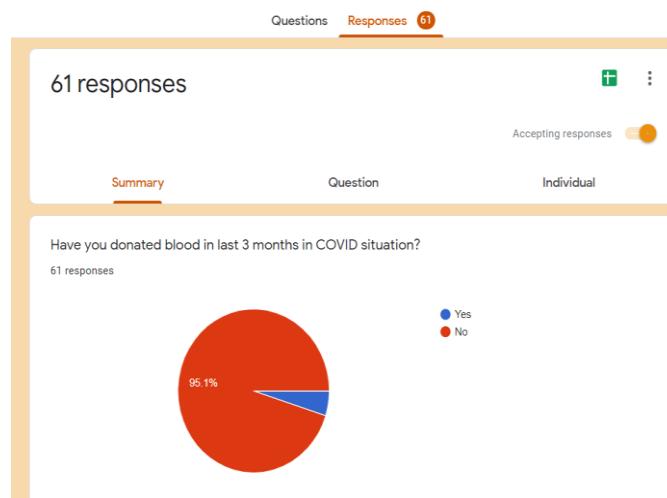


Fig 6: Survey Result 1

This survey contains some questions where observation is that a lot of people are really unaware about blood donation updates. In above fig, the question is about blood donation in last 3 months in which 96.1% of people didn't donate a blood in tough pandemic situation. Most of the people are willing to donate blood but they are not getting any secure platform. Hence, there are huge number of people who didn't donate blood.

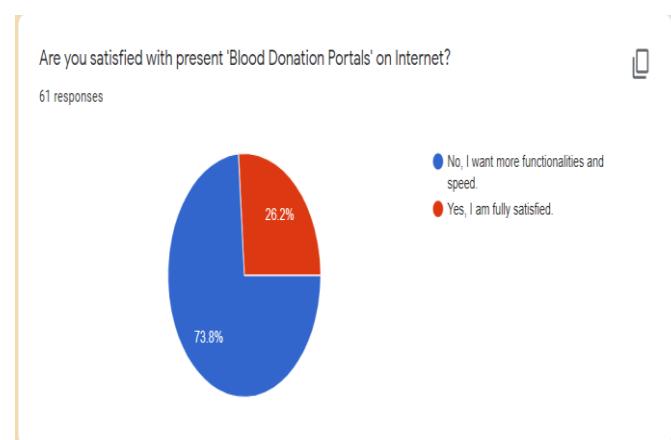


Fig -7: Survey Result 2

From the above results, it can be conclude that more than 70% of people are not satisfied with the present blood donation portals over Internet. The reason could be the functionality and response of those portals. People always expects a good result from any site but if the site is un-responsive then it spoils the user interactions. Even so many government approved portals of blood donation systems are available over internet but these portals also has some demerits. Overall 26.2% people are satisfied with present blood donation portals and it is true that a very few systems has overcame the demerits of previous system and working efficiently. But especially in country like India, the demand of blood is very high and hence our objective is to balance the increasing demands with perfectly working resources.

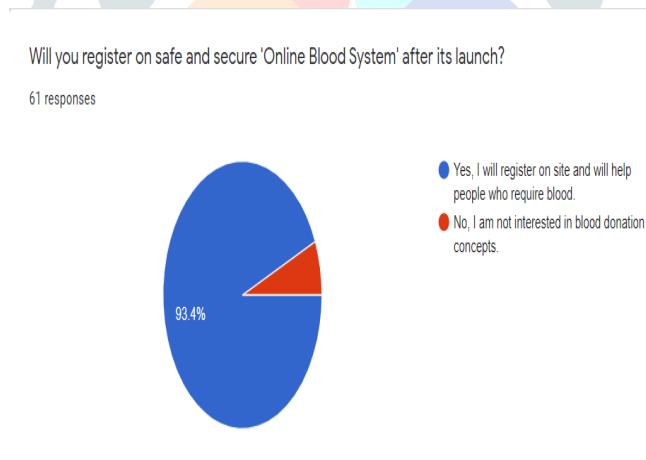


Fig -8: Survey Result 3

As per the above results, 93% people are interested to get themselves registered on Online Blood System (OBS) after its deployment. We also have objective to win the trust of people so that people can get benefit from our system. The main challenge before Online Blood System is to increase the reach of website through various sources so that people will come to know about our system. Once people start to use it then they can surely send feedbacks about website. Those feedbacks will be really helpful to fix the bugs of system. People are really looking forward to use new system like Online Blood System which can overcome the disadvantage of older systems. Our system surely passed the demand ratio of current scenario where need of blood and need of platform for that is the primary process for people.

7.1 Website Screenshots

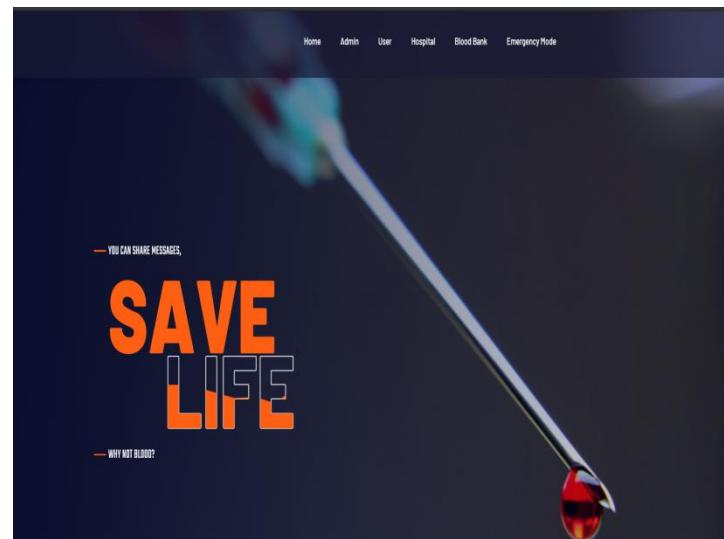


Fig -9: Home Page

This is the homepage of Online Blood System (OBS) with a simple message. As shown in header menu, there are various functionalities through which user can navigate easily except Admin Module.

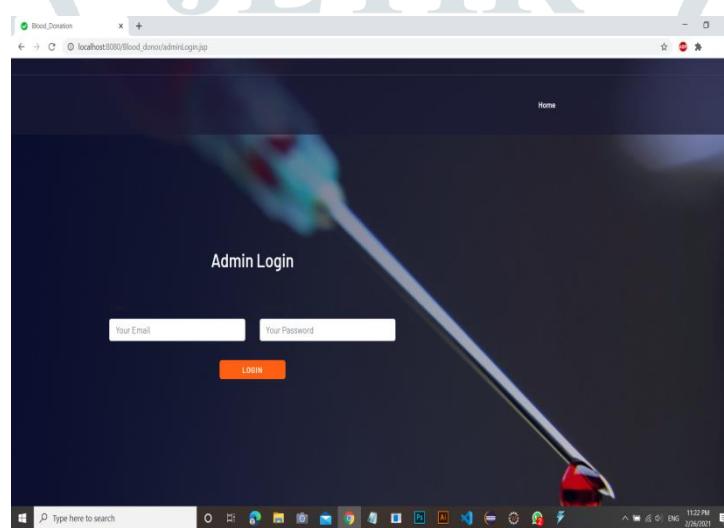


Fig -10: Admin Login

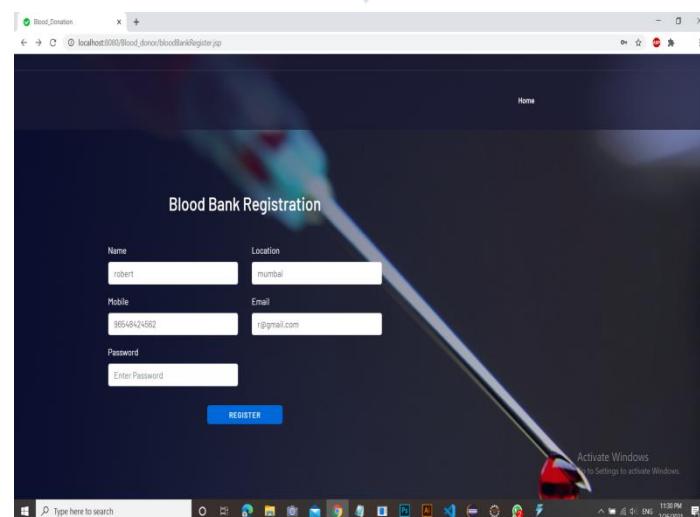
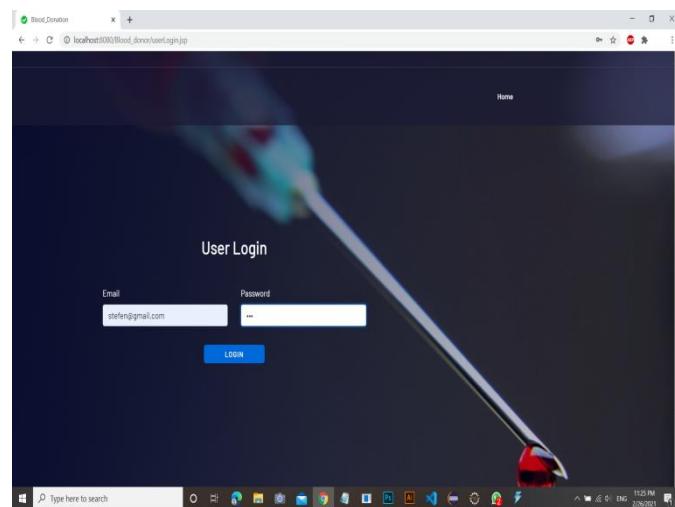
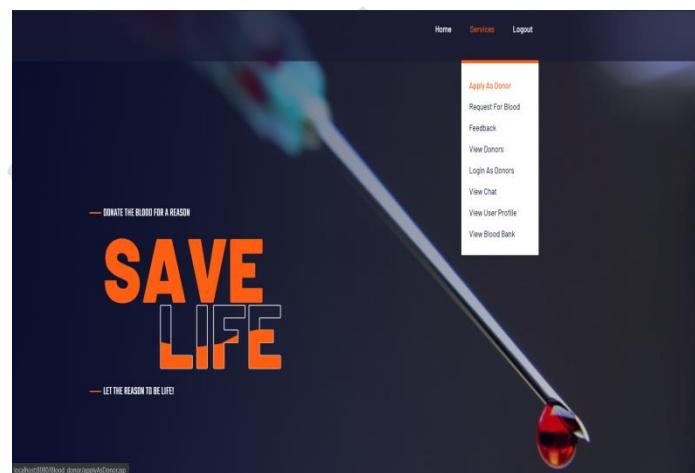


Fig -11: Blood Bank Registration

**Fig -12:** User Login**Fig -13:** Applying as a Donor

VIII. FUTURE SCOPE

The future scope of our project is really wide. As our system is related to health and medical field, more needy functionalities could be added. On the current basis, our system has mainly highlighted the problems which occurs in blood donation system but in coming period we will try to put light on other facilities also which can be helpful for people. In our system, integration can be done with the help of different algorithms. The provision of plasma and its related execution could be done in Online Blood System.

There is high scope of integration of Organ Donation System with present Online Blood System. Various parameters will be used to process each module perfectly just like Online Blood System. Our primary task for upcoming period is to develop a mobile application for android of Online Blood System. The functionalities which are present in Online Blood System will be available for android version also. As it will be developed for android, advancements can be added on primary basis to improve the performance and to serve the nation.

IX. CONCLUSION

Universally, blood is known as the most important and essential element that gives life to many persons. It saves countless number of lives across the world in various circumstances. In today's world, where we can do many things from home, just by pressing one click, we can take advantage of that concept by making online solutions for the shortage of blood donors. The online blood management system helps to reduce the use of paper, so the probability of errors should be minimal. Researchers believe that improving the management information system for donating blood will make revolutionary improvements in the system. This web-based blood system is a small contribution to serve mankind. It can save lives by educating the public about the benefits of blood donation, encourage them to donate, and manage the records of donors and people who need blood, to help the people who need blood to find the nearest donors as possible in quick, perfect, and a safe way – with less effort.

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