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Blood & Charity Donation System Software Application

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ABSTRACT: Blood donation is a noble act but during emergency times people rarely find blood donors. In this paper, we present an architecture for and prototype of a blood donation system. We discuss our system features and functionalities. We developed our system with the idea of online donation system. This system will help the blood requester to find the donors of requested blood groups in the nearby location. Location information will send to the system by using GPS in our proposed system. Requesters can search donors from their current or destination location. As we proposed to find more than one donor parallelly and request for more than one blood group. This system search donor within 5km, as a result, finding donors and arriving at the destination will be easier and in the most short time period. In the future, we will implement the user information in the block chain.
Charity donation is also the part of our application.For this , we provide secure and direct donations to various NGO's or charities.We provide user or donor a government verified NGO or Charity where they can donate there money.User can also raise online donation campaigns using our application.

KEYWORDS: Blood Donation, Blood Banks, Hospitals, CharityDonation, Online Donations, Fundraising Campaigns.

I. INTRODUCTION

Charity and the blood donation gadget are interconnected pillars of altruism and compassion that play a essential function in saving lives and enhancing the properly-being of people and communities global. Charity, at its center, embodies the spirit of selflessness, as individuals and corporations come collectively to provide resource, support, and assets to those in want, regularly driven via a sense of empathy and a desire to make a wonderful impact. One of the maximum giant and existence-saving styles of charity is the blood donation device, wherein people generously donate their blood to assist the ones going through clinical emergencies, surgeries, and persistent illnesses. These twosystems, charity and blood donation, exemplify the electricity of humanity's collective goodwill, serving as a testament tour potential to make a distinction in the lives of others through giving part of ourselves to create a more fit, more compassionate global..

Every year our nation needs about 5.1 Crore units of blood butonly 2.5 Crore units of blood are available. Over 38,100 blood donations are required each day. A aggregate of 31 million blood elements are transfused every year. Each year above 1.1 million new people are diagnosed with cancer [2], they needblood typically daily at the time of their therapy treatment.Ourproposed blood donation applications aims to make thisprocess easier by allowing the people who are in need of blood to broadcast their need also to locate and contact the donors who are capable and interested to donate the blood. Nowadays smart phone is a commonly used device and almost everyone has a smartphone. Through the smartphone, it ispossible to participate in a task requested throughcrowdsourcing. There are many application influenced bycrowdsourcing including live traffic updates, noise pollution, health monitoring, transportation services, and WiFi advisorysystems.

In India, there is no specific regulation governing charitable donations and one can freely make such donations. Moreover, the Companies Act, 2013 (**"Companies Act"**) states that the board of directors of a company may contribute to bona fide charitable and other funds. Further, the Companies Act has made it mandatory for companies having a net worth of Rs. 500 crore or more, or turnover of Rs. 1000 crore or more, or net profit of Rs. 500 crore or more in the preceding financial year to formulate a Corporate Social Responsibility ("**CSR**") policy and spend on social upliftment activities. The companies are required to formulate a policy which indicates the activities to be undertaken by the company and the amountof expenditure to be made towards these activities. The board of directors of such a company are required to ensure that at least 2% of the average net profits of the company madeduring the three (3) immediately preceding financial years is spent in accordance with the CSR policy.

In view of the above, companies in India are permitted to make donations towards charitable funds and in some cases

CSR is mandatory. Further, as per the Income Tax Act, 1960 ("**Income Tax Act**") and rules made thereunder the term '*voluntary contributions*' includes all donations made including both domestic and foreign contributions and are treated as income received by a non-profit entity under the Income Tax Act.

II. BACKGROUND STUDY AND RELATED WORK

- Background Study:-

Blood Donation System:
The blood donation system is a vital component of healthcare infrastructure that ensures the availability of safe and sufficient blood and blood products for medical treatments and emergencies. Blood donation involves individuals voluntarily providing a portion of their blood, which can be used for transfusions in various medical scenarios, including surgeries, trauma cases, cancer treatments, and the management of chronic diseases. Blood donation systems are managed by blood banks, hospitals, and organizations dedicated to ensuring the safety of donors and recipients, as well as the efficient distribution of blood products.

Charity:
Charity has been an integral part of human society for centuries. It involves the act of voluntarily giving financial, material, or emotional support to those in need. Various forms of charity exist, including donations to nonprofit organizations, volunteer work, and acts of kindness directed towards individuals or communities facing adversity. The concept of charity is deeply rooted in religious, cultural, and ethical values, and it often aims to address issues such as poverty, hunger, education, healthcare, and disaster relief.

- Related Work:

Charity:

Nonprofit Organizations: Numerous charitable organizations, such as the Red Cross, UNICEF, and Médecins Sans Frontières, work globally to provide humanitarian aid, disaster relief, and healthcare services to underserved populations.

Philanthropy and Donor Networks: Philanthropists and high- net-worth individuals often establish foundations and donate significant sums to support various charitable causes, ranging from education and healthcare to environmental conservation.

Volunteer Programs: Many communities and nonprofit organizations operate volunteer programs, allowing individuals to contribute their time and skills to help those in need. These volunteers often engage in activities like food distribution, tutoring, and shelter support.

Blood Donation System:

Blood Banks and Red Cross: The American Red Cross and similar organizations in other countries manage extensive blood donation systems. They collect, test, and distribute blood and blood products to healthcare facilities.

Mobile Blood Drives: Various blood banks and organizations conduct mobile blood drives, bringing the donation process to communities, workplaces, and educational institutions. This approach helps increase blood donation rates.

Online Platforms: Websites and mobile apps like the American Red Cross's Blood Donor App allow donors to schedule appointments, track their donation history, and receive notifications about blood shortages and urgent needs.

Medical Research: Scientific studies and research projects continually aim to improve the safety of blood donation and the efficacy of blood products. Advances in blood component separation, pathogen screening, and storage techniques have enhanced the system's reliability.

III. MOTIVATING SCENARIO

Smartphone and tablet development has influenced the rapid growth in m-health. Already, most people use devices like smart health trackers and fitness bands that capture or provide information and data on health. So there is no doubt that mobile applications will help a blood donor or a person who needs blood in an emergency to find out how, when and where blood can be donated, saving them a lot of time and struggle. There are few blood donation or search blood donor-based applications available in the different app stores. But there is a question about the usability of these applications. Ouhbl et al [12], the author of Free Blood Donation Mobile Applications analyzed and assessed the characteristics of free apps for blood donation based on their features and functionality. In this paper, they found a total of 169 free blood donation applications, where 63% were found in Google Play, 17% in the Apple App store and rest from other app stores.

Imagine a small, tight-knit community nestled in a rural area, where the spirit of giving and support runs deep in the hearts of its residents. In this community, people have come to rely on one another during times of need, and they cherish the bonds that connect them. What makes this community truly exceptional is its dedication to charity and the blood donation system.

Within hours, residents mobilize their resources, sending out calls for volunteers and donors. The local charity organizations spring into action, setting up donation centers, arranging transportation for willing volunteers, and coordinating support for the injured and their families. The town's community center turns into a bustling hub of activity, with people of all ages, backgrounds, and professions coming together, driven by a common purpose - to save the lives of their neighbors.

As the day unfolds, there's an outpouring of support from those who have never donated blood before. People stand in line, patiently waiting their turn, knowing that their contribution could be the lifeline someone desperately needs. The community's unity is palpable, as residents encourage one another, share stories of hope, and reflect on the importance of coming together in times of crisis.

In the end, the response is overwhelming, with more blood donated than the hospital ever anticipated. The injured receive the critical care they need, and the community's bonds grow even stronger. The scenario serves as a powerful reminder of the profound impact charity and the blood donation system can have on a community, uniting people from all walks of life in the noblest of causes - saving lives and reaffirming the strength of humanity's collective heart.

IV. SYSTEM MODEL AND PROBLEM FORMULATION

In this paper, we propose a system protocol, which helps a user to request for a blood donor also search for donors of any blood group in his or her nearby location. In the emergency situation, our proposed system will help the users to find out a blood donor which will save their time and relief them from the tension of finding blood donors. In this system a user USER is a tuple of ⟨ uid, status, USERS ⟩, where uid is the unique user ID, status is a Boolean type attribute, that can only contain the value of Interested or Not Interested and USERS is the finite set of the user. All the users having the status attribute as "Interested" are considered as Donors. However, the status of the users is not important to search donors or request for blood. Thus if any user wants to search a donor or request for a blood donor will be considered as a requester. Fig. 2 illustrates our system precisely. Our system will work with two processes side by side. Search donor option will let him find available donor near his location where place a request for blood will let him to place a blood request referencing the location of hospital and a date where and when he need the blood. All the available donors also the donors, who will come to that location will receive notification of that request.
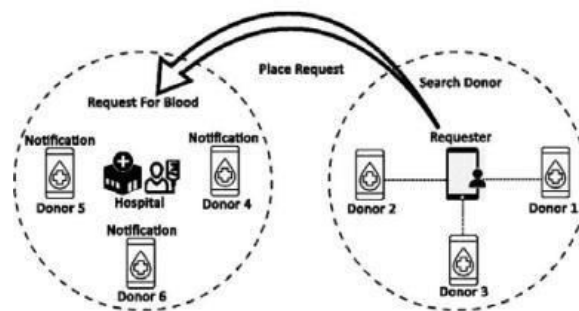

In emergence, requester will able to search for donors in his nearby location. Our proposed algorithm, search for all the

donors with the same blood group within an area. For every searching, this area is calculated as a circle by taking a 5km radius. For the search donor option, the system finds out five donors of the requested blood group within this area.Whenever donors accept the request donor and requester can contact each other. This process is part of the search donor domain. In Figure we can see a requester is searching for donors and he receives a list of the available donors in his nearby location The charity and blood donation system faces several critical challenges that demand strategic solutions to optimize its functioning. At its core, the key problems involve motivating donors to engage and contribute, efficiently allocating resources, ensuring equitable accessibility, maintaining safety and regulatory compliance, and embracing modern technologyfor data management. These challenges highlight the complex and interconnected nature of the system, where charitable organizations, blood banks, healthcare institutions, donors, and recipients must collaborate closely to create a more effective and inclusive framework. Addressing these issues necessitates innovative approaches, robust communication, and a commitment to humanitarian values, ultimately enhancing the system's capacity to save lives and provide vitalsupport to those in need.

V. PROPOSED MODEL

For using the first time, a user must need to authorized himselfor herself through a registration process. As a result, they can get an authorized user account for using the application. For the registration process, the users have to fill up a registration form by providing his or her information such as full name, email, password, mobile number, blood group, status, etc and the system will asking for allowing to trace users' location. After submitting the registration form, our system will send a email verification code to the email provided by the user. When the user verifies the email then he will be able to log in to the system. The consumer has to provide the email and password for login. When an user log in to the system, the current location of the user gets automatically stored in the database.
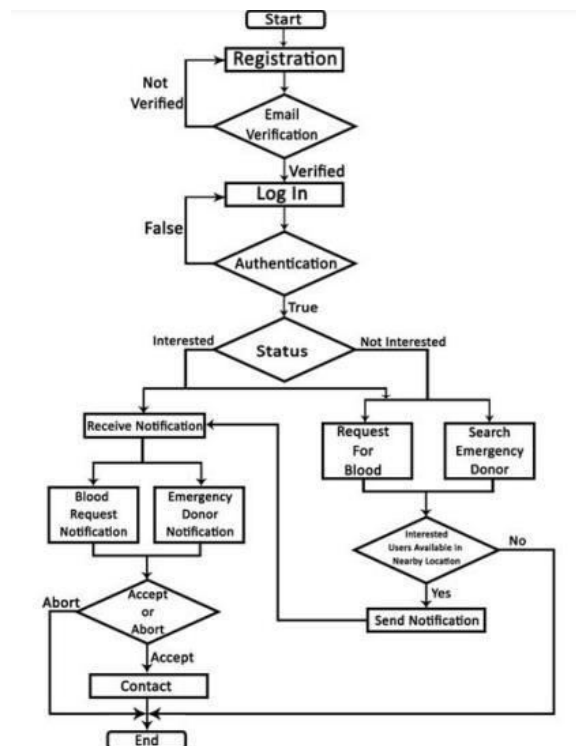
In our proposed model any user can request for blood also donate blood, which indicates that any user can perform both role of requester and donor. We can explain our model based on two section. In the first section, we explain the model of requester's perspective and in the other section we explain the model of donor's perspective.

For using the charity module in application, user just want to register in application and can proceed for online donation to a NGO or Charoty.All the NGO's or Charity are government verified.Donor can donate without any tension and risk,safe and secure transaction is done.

A. Requester Perspective

In our system any user can place a request for blood. To place the blood request user need to provide patient name, contract number, blood group, and hospital name. When the user selects the hospital, the system automatically stores the location of the hospital as the blood donation location point of the request. Any user willing to donate blood will receive this blood request notification if his or her current location is within the radius of 5km from the blood donation location point. For the emergency need for blood, the user can able to search donors or users who are willing to donate their blood. Users can search donors of any blood group but only get the donors whose current location is less than 5km away from the location of the requester.

Algorithm 1: Find Nearby Donor

Input: $RequesterID$, $ReqBloodType$, $RequesterLat$, $RequesterLon$, $USERS$

Output: $DonorID$

1 **foreach** $Authenticated\ user \in USER$ **do**
2   **if** $(ReqBloodType == user.BloodGroup)$ AND $(user.Status ==" Interested")$ **then**
3          $distance \leftarrow getDistance(ReqLat, ReqLon, user.Lat,$
4          $user.Lon)$
5   **if** $(distance \leq 5)$ **then**
6              $DonorID \leftarrow user.ID,$
7   **end**
8   **end**
9 **end**
10 **return** $(DonorID)$

VI. EXPERIMENTS RESULTS

A. Experiment Setup For the experimental purpose, we implemented our proposed algorithm in Python language. To check the performance of this algorithm, we took a data set of 300 data and then, we ran our algorithm on a computer having a core i5 3.4GHz processor with 8GB RAM. We collected 300 valid latitudes and longitudes, these latitudes and longitudes represent the current location of each User willing to donate blood and having the same Blood Group. Using this data set, we analyzed the performance and complexity of our proposed algorithm.

B. Results and Analysis Our data set consists of 300 Users' location. We need to measure the distance from the target location to the user's location and check whether the user's location is in the range of 5 kilometers from the target location.For measuring the performance and complexity, we made 6 test cases from our collected data set. The first test case contains 50 Users' location. The second, third, fourth, fifth and sixth test case contains 100, 150, 200, 250 and 300 Users' location respectively and so on. For each test case, we measured the time required to calculate the distance of all user's locations from the target location and check whether the user is in the range of target location. We ran each test case for 100 time and took the average CPU time required to execute the algorithm.

Number of Users vs Execution Time

Above Figure represents the CPU time taken to execute each of the test cases for our proposed algorithm. We plotted the number of Users in each test in the horizontal axis and the CPU execution time of the algorithm in the vertical axis. The graph shows that the CPU time requirement for the first test case is 145 microsecond and for the second test case it is 261 microsecond. Fig. 4 exhibits that the response time is linear with the number of users.

Algorithm 2: getDistance

Input: $ReqLat, ReqLon, userLat, userLon$
Output: $Distance$

1 $R \leftarrow 6371$
2 $Pi \leftarrow 3.1416$
3 $\Delta Lat \leftarrow (userLat - ReqLat)$
4 $\Delta Lon \leftarrow (userLon - ReqLon)$
5 $dLat \leftarrow \Delta Lat * (Pi/180)$
6 $dLon \leftarrow \Delta Lon * (Pi/180)$
7 $a \leftarrow (\sin(dLat/2))^2((\cos(ReqLat) * \cos(userLat)) * (\sin(dLon/2))^2)$
8 $c \leftarrow 2 * \arctan(\sqrt{a}, \sqrt{1-a})$
9 $Distance \leftarrow R * c$
10 **return** $(Distance)$

TABLE I
SAMPLE OUTPUT OF PROPOSED ALGORITHM

Test Case	Number of User	Number of Nearby User
Test Case 1	50	24
Test Case 2	100	34
Test Case 3	150	54
Test Case 4	200	60
Test Case 5	250	65
Test Case 6	300	79

VII. CONCLUSION

In this paper, blood donation is considered as a nonmonetary act, where a donor can willingly donate blood using our proposed system model. The major contribution of our study is, we provide a distance calculation algorithm and few parallels generate features in our proposed system. This distance calculation algorithm helps us to find donors within 5 km and calculates the distance between requester and donors. The parallel feature helps the users to find out the donors in a short time. A requester can search for multiple blood donors within his or her location or in other specific locations. Moreover, a requester can search for donors with multiple blood groups in the same location. As a result, finding multiple blood donors can easily find out. Moreover, we tested our system with many users. By the increasing number of users, CPU run time increased sequentially. We studied about the barrier of existing blood donation applications And also find out donors and donors location within 5 km. Therefore, we developed our model with the idea of crowdsourcing and tried to make the easiest usage methods, that encourage the user to use this system. In every modules with GPS [14], our algorithm can be implemented. This model will help the developers during developing any health related system or the modules developed with GPS. In future, we will develop our algorithm more congenial with more features.

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