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# RECOMMENDATION SYSTEM FOR BLOOD AND ORGAN DONATION FOR THE HOSPITAL MANAGEMENT SYSTEM

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**Abstract**

Big data analytics is nowadays a growing field where real time applications developed. Among the various applications, recommender system application playing vital role in recommending the services and products to the end users. In this paper we developed online blood bank and organ donation information system for hospitals in case of emergencies. As this plays a major role in saving lives, it is necessary to maintain the database for all the related information about the blood banks and the organ donation. Making this process simpler by creating MySQL database and using geo-location information and haversine algorithm for distance calculation and TOPSIS algorithm (Technique for Order of Preference by Similarity to Ideal Solution) for ranking the blood banks. The RVD algorithm (Regular Voluntary Donor) is used to select donors based on satisfy the condition. The availability of organs is displayed as pop up message with the time and its details are displayed.

**Keywords**

Recommendation System, Collaborative Filtering, Rating

## 1. Introduction

The major point of this project is to make a flexible platform for making the blood reach the hospital doors, as it one of the important elixir of our life. Situations where the need of blood arises such as accident victims, patients undergoing major surgeries require whole blood, where the blood is used directly after testing [4]. Our paper is classified into various sections. The registration in the website is made compulsory for the security purpose. It will allow only registered and authorized hospitals, hence fake profiles cannot access the website and provides access to authorized users. The user can be a hospital management or a donor [10-21]. The website collects the complete hospital address and the required blood type from the hospital management. The database is maintained for blood bank details and donor details. The blood banks are classified into district wise for easy calculation [22-29]. The hospital address is converted into geo-coordinates by the geo-location. The haversine algorithm is used to find the distance between stored blood bank address and address of the hospital. The blood bank is ranked and displayed by TOPSIS [30-34]. There might be certain cases that the required blood may not be available. Here comes the need of selecting the donor using RVD. The database created using MySQL stores the blood bank details and the donor details.

First, the haversine algorithm is used for distance calculation, based on the longitude and latitude found out from the geo-location and this distance is used has as criteria for the ranking.

Second, the blood banks are recommended by considering multiple criteria, i.e., distance, availability and speed by using MCDM (Multi Criteria for Decision Making). TOPSIS is one of the best methods in MCDM for ranking based on preferences, and use those as ratings given by the hospitals to the blood banks for the above mentioned criteria [2].

Third, the donor details are used in case of null availability of the blood bank using RVD algorithm [3]. Finally, for the organ donation system services will be put up on the website with its information and its time span, like a digital advertising pop up box at the front end. Hence all the above mentioned sections are integrated to build a recommendation system for blood and organ donation for hospital management system.

## 2. Literature Review

The blood is the body fluid that all humans and other animals' life is based on and accounts for 7% of the human body weight. It is mainly composed of about 55% of blood fluid called plasma that has 60% liquid part (water) and 40% solid part. And the main thing is that, Blood is needed at some regular intervals and at all times as it has only finite time of storage. Red blood cells about 45% of whole blood that can be stored for about 42 days [4].

The recommender systems can provide the users with appealing or useful objects among a large range and variety of possible choices in a personalised way [9].

The most influential people in an online social network by Social Network Analysis were proposed. Its uses cluster-indexing Collaborative filtering for accurate SNA recommendation results.

The study includes SNA, rating pattern and amplifying approaches are effective. In this model, it directly incorporates social network information extracted from the real world and social media [1].

The conditions that must be satisfied for the purpose of donating blood are the donor should not donate blood if he or she has undergone any of the major surgeries in the recent past three months [5]. It should be mandatory that donor must not be under any influence of alcohol 48 hours of time period before donating and all so prohibit smoking on the day before the donation. The donor medication history must be checked for the recent few months.

The web application for blood donation management which provides platform for mobile application that provides an online edge between blood donors and patients who need blood[6]. The interested donors must register their profiles with the website.

The web application acts as a dynamic site for constant updating of both the blood donors and blood requester. They use Google Map to find out the exact location of a registered donor and update the location of a donor [7].

The track of literatures related to blood bank management system and organising the already present research based on the

process phase to throw light on the undiscovered issues, optimization of the route for the blood supply from the blood bank to the hospital door.

The means of optimization developed for the many health related problems, emerging from resource collection and management in the hospitals to the delivery of the care services in a region [7].Other approaches for Blood Donation system (BD), and providing necessary blood supply to Transfusion Centres (TCs) and the hospitals.

The computer based information system are time consuming, laborious, easy to use compared to the manual systems. It provides with the oversight reviews of the important features, merits and demerits for the existing Web-based Blood Bank Information Systems. This shows the comparison existing and inventory management system[8].

As inventory management system holds the precise and exact information like the measure of the availability of a blood type. It includes the donor inventory and seeker inventory [8].

## 3. Proposed Model

The one of the most important factors for ranking is distance, as time plays a major role in saving lives, so there is a need to provide the nearest and the best available blood bank service. Hence using distance to find the nearest one and this can be done by using the Geo- location without using Google maps API.

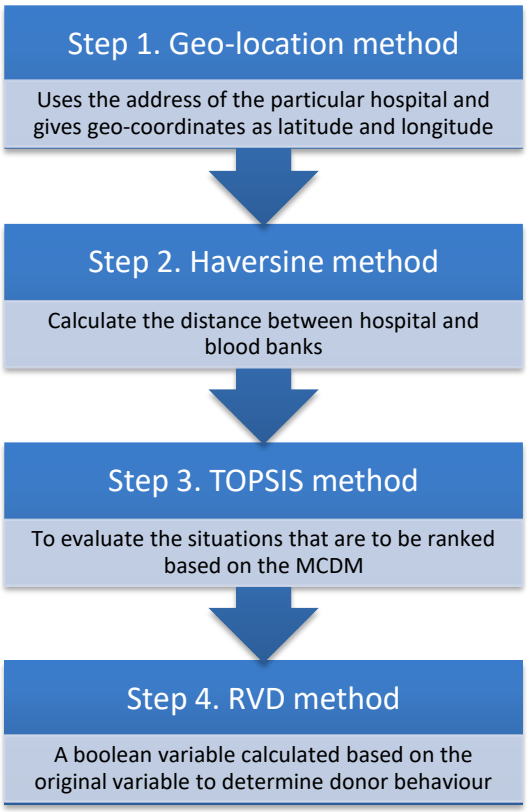


**Figure 1. Procedure of execution**

### 3.1. Geo-Location and Haversine Method

It is an algorithm that uses the address of the particular hospital and it gives geo-coordinates as latitude and longitude. It is better than the code using the Google maps API because it has restrictions in many places that cannot be found and not recognized properly. Hence by using the Haversine method we can calculate the distance between hospital and blood banks and this can be used to find the amount of time the service can be provided.

Haversine dist

$$H = 6371.01 * acos(sin(slat)*sin(elat) + cos(slat)*cos(elat)*cos(slon - elon))$$

where slat is the starting latitude, elat is the ending latitude, slon is the starting longitude, elon is the ending longitude.

### 3.2. Topsis Method

The topsis method is one of the oldest method that is used for the recommendation propose, in this method the preference based recommendation is done [2]. In our paper we are providing the recommendations to the hospitals on the basis of the rankings given by the by other hospitals of the blood banks available and this is done on the basis of certain criteria like speed of service, availability of blood, quality of service and the rank is evaluated.

On considering the above criteria the evaluation is done by empirical calculations by finding the positive ideal solution and negative ideal solution and ranking based on these values in the descending order from the positive ideal solution to the negative ideal solution.

$D_{iw}=\sqrt{\sum(t_{ij}-t_{wj})^2}$ , $i=1,2,....,m$

$D_{ib}=\sqrt{\sum(t_{ij}-t_{bj})^2}$, $i=1,2,...,m$

where $D_{iw}$ gives the distance between the target alternative i and worst condition ($t_{ij}$) and $D_{ib}$ gives the distance between the target alternative i and best condition ($t_{ij}$)

{IDEAL SOLUTION= (NEGATIVE IDEAL SOLUTION) ÷ (POSITIVE IDEALS SOLUTION+NEGATIVE IDEAL SOLUTION)}

Ideal Solution $S_{iw}=d_{iw}/(d_{iw}+d_{ib})$, $0<= S_{iw} <=1$, $i=1,2,....,m$

where $S_{iw}$ =1 if and only if the alternation solution has the best condition and $S_{iw}$ =0 if and only if the alternation solution has the worst condition. The flow of the topsis is like in the Figure 2 as in [7].

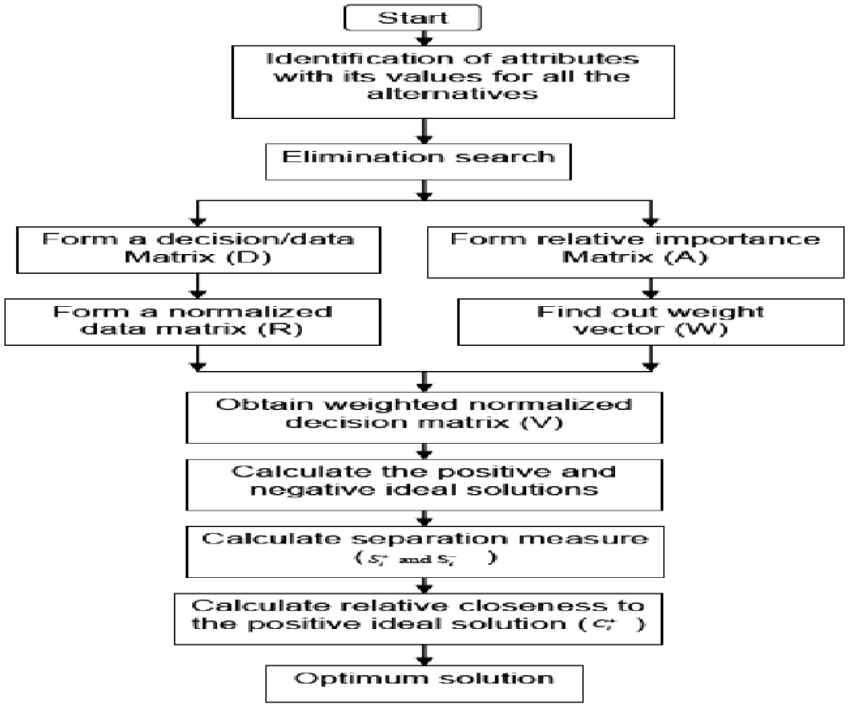


**Figure 2. Flow chart of TOPSIS**

### 3.3. RVD (Regular Voluntary Donor) Method

This method considered only in case the blood is not available in the any blood banks, the next option is to find the possible donor for blood donation .This is done by selecting the available donor and those are fit enough to donate the blood. The method for selecting the donor is done by the RVD algorithm [3] by choosing the donors, who are regular and voluntary based on their attributes including Recency for the months since last donation, Frequency for the total number of donation. The RVD value is a Boolean variable that is calculated based on the above variable and the donor is selected and the priority is based on the location, this is because the time is one of the important factors in saving a life as soon as possible. The RVD value can be True or False (1 or 0) and if the value is 0 then the donor is not considered for the donation purpose.

Please note the data used is only for the demonstrative purposes.

IF (Frequency>10 (times) AND Recency <=1 (months))

RVD_value=TRUE

ELSE

RVD_value=FALSE

Hence the RVD value is calculated this way and the donor is selected by satisfying the condition and thus gives the information about the donor.

## 4. Conclusion and Future work

This whole problem for managing the blood and organ requirements can be accomplished by using a recommender system where it lets the hospital to match the particular requirement with the currently available things. In case the match is found then the nearest match is selected and by this way the congestion in communication and time delay is reduced. In case of null availability, then it goes for the second option where it traces the availability of the donor with particular traits that are required to be matched, in the same way the organ donors are connected too and always the organ donation has to be done in time before the organ goes in vain.

Hence from this project we can endure the knowledge that recommendation systems can be used for the giving the best suggestions for products which are item – based and similar user profile not only for products but also for selecting the best blood bank and donation services.

The main limitation in this is that, the concept of the recommender system which is actually a system which suggests anything based on the ratings and the review which have been considered earlier. If there is any new blood bank that had been started, the recommender system cannot take this into the account for recommending that particular one. It can be the part of the system by placing its review from the hospitals and the donors along with the ratings information it can join the recommender system and this is one of the drawback of the recommender system.

This paper works with the static data set where it can improved in future by making it as a dynamic model by updating the data continuously so that this model can be made more useful for the use in real time

and gives high accuracy of the data. It can make this as a feasible model by comparing the result of both the data set methods and consider the efficient one.

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