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Research paper

Prototype of We Share Blood an App for Searching Blood Donation based on Android Platform

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Abstract

The gap between the availability of blood stock in the blood bank and the need for blood in Indonesia is more than 50%. In the process, the patients who did not receive blood donor from the blood bank, to find the potential blood donors the patient usually sends a broadcast message which is this way is out of focus. Related to this, we proposed an alternative way to look for potential blood donors which geographically located around the patient by adopting Location Based Services (LBS).The methodology used in this research is the prototype method because this research focuses on the fast interaction between the user and the prototype application. This paper presents a design of a mobile app prototype for finding potential blood donors with match blood type information combined with its geographic location using LBS technology based on Android platform.

Keywords: *Blood donation, Location Based Services*

1. Introduction

The availability of blood at Indonesian Red Cross (PMI) in Bandung in July 2014 was rare; many patients were left unfulfilled.

"For nearly a week, the stock including Sunday (20/07/2014) blood groups A and AB = 0 bag. The blood type B = 290 O = 578 bags." *(http://jabar.tribunnews.com/2014/07/20/satu-minggu-lebih-stok-golongan-darah-a-dan-ab-di-pmi-kota-bandung-kosong)*

There are also some people who experience difficulty in obtaining blood at the hospital where he/she was treated then try to ask Red Cross outside the province, but at that time blood bags were out of stock.
Searching blood availability at the Red Cross website http://ayodonor.pmi.or.id was felt inefficient because of no feature enables us to gather information about blood donor potential around the city. Under these conditions, naturally, the blood searcher broadcast a message about blood donor necessity to specific messaging groups. These conditions have two shortcomings:

1. Donor hunters were panicking because of limited time due to blood urgency, while stocks in PMI nearly empty.
2. The broadcast receivers are not in the coverage area that allows them to donate blood.

Under these conditions, a hospital patient requiring immediate transfusion blood type may occasionally encounter quandary in search of blood type matching with by the patient quickly, so we need tools that can help inform the potential and nearby donor that fits the patient requirement.
Currently, in Indonesia, there is no mobile-based application which can spread information and find the right target blood requirement based on nearby geographical location. As illustrated in the United States and Singapore, there is similar mobile based application named Red Cross Connection (http://connect.redcross.sg/, 2014). This application encompasses volunteers for blood donation via social media, search for blood donation by sending a notification to the user (Foth, 2013). However, this application sent the notification without considering geographical distance.
Based on the above constraints this research will design an application to search potential donor with calculating the geographical distance by using LBS technology. This prototype application will be built based on Android and is planned to be cross-platform development.
The prototype will facilitate people looking for blood donors by combining blood type information, geographical information (location) and LBS technology on mobile applications, which resulting:

1. Assist the donor searcher when PMI has very few stock.
2. To be bridging the donors with the patients.
3. To facilitate the search for blood in the area which is very urgent.

Therefore this prototype is expected to gather blood donors, to improve blood donation, saving lives and keeping enough blood available to those in need.

2. Location based services

Location Services deliver information about the geographic location of mobile telecommunications devices. This includes mobile telephones, mobile interactive browsers, and devices attached to other moveable items such as people, packages, and vehicles. Location Based Services deliver end-user applications based on Location Services (Davies, 2000). Integration of network computing, positioning technology and wireless communication into three major factors in the development of LBS technology. LBS development framework illustrated below:

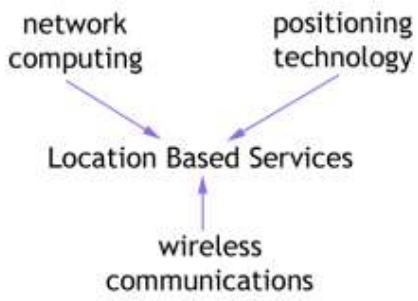

Fig. 1: Contributing Aspects of Location Based Services

The positioning technologies, including satellite-based systems such as GPS and Galileo, along with ground-based systems such as RFID and mobile phone triangulation, have already shown that it is possible to monitor the positions of certain types of objects in real time (Goodchild, 2010). The below figure illustrates how the location information provided to the device. Access to these location methods are provided through the positioning modules (Nokia, 2010):

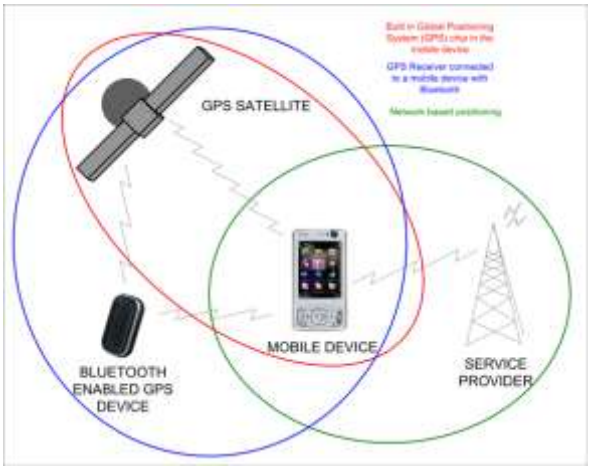

Fig. 1: Location Information

3. Research methodology

Software development process model to develop prototype of WeShareBlood is the prototype method (Pressman, 2010). The stages prototype method which is according to Roger S Pressman in the book Software Engineering: A Practitioner's Approach, 9th Edition are as follows:

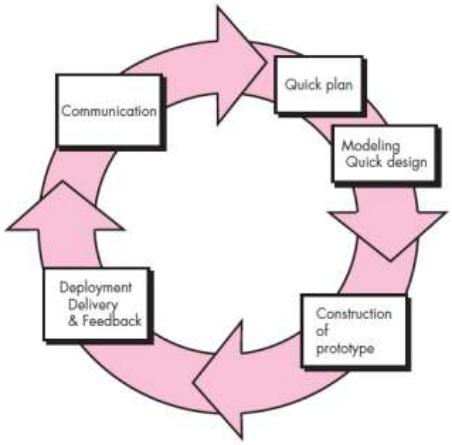

Fig. 3: Prototype Method for WeShareBlood

Prototype method through five processes, namely Communication, Site Plan, Site Modeling Design, Construction and Deployment of Prototype Delivery & Feedback. These processes can be described as follows:

1. *Communication*
   In this activity, researchers will formulate functional requirements of software with information from various sources and meeting with some people who have had difficulties in finding blood donors.
2. *Quick Plan*
   At this stage, a team of researchers translates functional requirements based on the results of communication in the form of fast planning software development. The result of this step is complete planning software development.
3. *Modeling Quick Design*
   At this stage, the planning is done very quickly. The plan represents all known aspects of the software, and the program became the basis for the creation of a prototype. This stage we make the system architecture which is translating needs or data that has been analyzed into a form that is understandable by the user with a display interface applications using Jquery Mobile. The application architecture is composed of people as users, smart phone or tablet that supports LBS technology as a tool to access application of WeShareBlood, Internet network to connect the device to the user's computer and a server with JSON Google maps, as well as a smartphone to display data. The app can show volunteer's position relative close to the donor searcher. Furthermore, it can accept blood need notification and share that information with social media.
4. *Construction of Prototype*
   At this stage, the team started the construction of a prototype based on plans which are provided from the previous stage.
5. *Deployment Delivery & Feedback*
   The prototype has been built and ready for a test. Potential users will evaluate prototype and give feedback to improve the requirements specification. If the app is still needed improvements, the research team will perform iteration starting from the first stage.

4. Discussion

Marcus et al. (2013) combining these two points of departure namely web and mobile based technological. This study seeks to identify best practices of employing mobile apps and social media to enhance the loyalty rates of young blood donors.

System Architecture
In this section, we explain about the system architecture as a picture or design of the current system implementation in the field. With this system, we can ascertain how the current system works in the field.

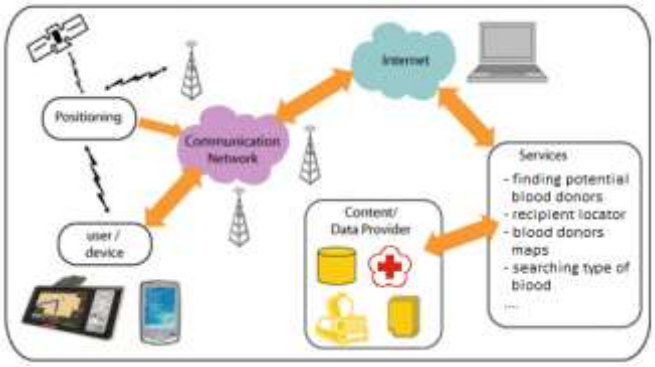

Fig. 4: System Architecture for WeShareBlood Application

The picture above is a system architecture of prototype WeShareBlood applications using LBS technology which explain the flow of related processes. It consists of user's mobile devices, communication network, positioning component, services and application provider, data and content provider from PMI or user (Steiniger, 2006). It starts with the user who uses the mobile devices as host for the application. The mobile devices will exhibit the maps containing the nearby donor location. It required cloud internet to retrieve data JSON and stored it to the server of content or data provider.

Prototype of WeShareBlood
WeShareBlood is an application which aims to save the lives of patients by capturing blood volunteer location and utilizing LBS to spread the information which is closest to the patient. Here is a description of the prototype:

1. To use the app, users must register for an account application or can access it WeShareBlood using the Facebook account.
2. Register to record the full name, blood type, address, and coordinates of an address on the map.
3. Users can see the other volunteers who have joined and can invite others to volunteer as well.
4. Users who need certain blood groups can fill the search form to enter data search for blood type, the number of volunteers needed and choose the address with coordinates on the map like figure 5.

Fig. 5: Searching Blood Donation using WeShareBlood on Radius 10 km

5. Notification is a broadcast information from other users who are in need of blood donors. Notifications appear as text notification list scroll down to click to bring up the Map.
6. The app will notify search result to the volunteer with coordinates position, not more than the radius of 10 km (depend on user) from the blood donor searcher.
7. Once the map appears, the user (blue balloon) can click on the location of other users (red balloon) who are in need of a donor who later will show the details and options for action in the form of calls and SMS. In the following case studies, user applications (blue balloons positions in complex Gem Stone Fruit) see there are three other users who are in need of a donor, then click on one of the red balloons. For example, Suryatiningsih (red balloon position in Cijagra, Buah Batu Street) are in need of blood donors as much as three squash.

Fig. 6: Result for Searching Blood Donation

8. Call action will direct users to call other users who need a donor, while SMS will direct the user to send SMS to other users who are in need of donors.
9. Find a donor. Users who need/look for certain blood groups can fill out the form "Searching for Donors" by entering the data type blood group is sought, the amount of pumpkin is needed and choose radius search, then click the search button as shown in Figure 7.

Fig. 7: Cari Pendonor Darah

Fig. 8: Hasil Map dari Cari Pendonor

10. The search results are displayed in the form of maps which, if successfully found it will look like Figure 8. In the case study below, the user (blue balloon positions in Permata Buah Batu Complex) sees there are three other users (volunteer) associated with blood types search. The user then clicks on a red balloon, for example, Ruli Hakim (red balloon position in Batu Indah Complex Canal Street Buah Batu).

11. If volunteers can not be a blood donor, he/she could share the information with social media.

12. Users can view historical blood donor and share it to social media.

13. Users can search for addresses of PMI on the map and receive notification in the form of an invitation from PMI. When donating blood, users can check in at the place.

5. Conclusion

After doing the planning, analysis, coding and testing of this research, we conclude that prototype WeShareBlood has successfully built on Android based functionality as a new media between donors and recipients so that it can assist the process of blood donation using LBS technology. Recipients can see the the position of blood donors on the maps and contact by phone or SMS.

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