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Design and Development of Mobile Blood Donor Tracker

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***Abstract*— The number of smartphone users globally will exceed 2 billion in 2016, according to new statistics from eMarketer—after almost getting there in 2015. Next year, there will be more than 1.91 billion smartphone users nationwide, a figure that will boost an extra 12.6% to close to 2.16 billion in 2016.**

In this paper we are proposing an application for tracking Blood Donors called Mobile Blood Donor Tracker. Mobile Blood Donor Tracker is a mobile application that connect users with the Blood Centre to facilitate the blood collection from donors during emergencies, facilitate the communication of blood donors with each others, facilitate the communication of blood donors with the Hospital blood centre.

Keywords— Android; Blood Bank; Communication; Mobile; Tracker.

I. INTRODUCTION

Blood is the fuel of life and it is well known that blood should be transfused to those who need it during emergency freely. More awareness are made about blood donation so that more and more people come forward to donate blood. The blood must be collected from healthy donors only.

"A mobile application (or mobile app) is a software application or small program that resides or designed to run on Smartphone's, tablet computers and other mobile devices" [1,2,3,4,5,20]. They are typically obtainable through application allotment platforms, which are normally operated by the vendor of the mobile operating system, for example Apple App Store, Google Play, Windows Phone Store, and BlackBerry App World.

Mobile apps were at first offered for wide-ranging productivity and information retrieval, together with email, calendar, contacts, and stock market and climate information. On the other hand, community demand and the accessibility of developer tools drove swift expansion into other types, such as buying mobile games, factory computerization, GPS and position-based services, banking, purchase-tracking, and ticket ordering. The sudden increase in figure and diversity of apps made innovation a defy, which in turn showed the way to the making of a wide collection of review, suggestion, and formation sources, together with blogs, magazines, and devoted online app-discovery services. The attractiveness of mobile applications has kept to rise, as their usage has grow to be gradually more established across mobile phone users. A May 2012 study stated that through the previous quarter, further mobile subscribers used apps than surfed the web on their devices: 51% vs. 49.7% correspondingly. Researchers establish that usages of mobile applications powerfully correlates with user situation and depends on user's position and point in time of the day [6].

A. Mobile Application Development

Mobile app development is the procedure in which app software is developed for low power hand-held devices[15,16]. The applications can be pre-set up on mobiles throughout manufacturing, downloaded by consumers from diverse mobile software distribution platforms, or sent as web applications by means of server-side or client-side dispensation (e.g. JavaScript) to offer an "application-like" familiarity within a Web browser. Application software developers as well ought to consider a extended array of screen sizes, hardware stipulation and configurations since strong competition in mobile software and alterations inside each of the platforms. Mobile app development has been gradually on the increase, mutually in terms of revenues and jobs created. A 2013 market analyst states there are 530,000 direct App Economy jobs inside the EU 28 members, 61% of which are mobile app developers approximately [7].

B. Benefits of a Mobile Application

Letting you recognize what's happening in your region, to get exchange rates, movie times, social media communications, university student guide,

alerting you to travel information, to provide entertainment and letting you be familiar with special offers. There are more than 200,000 mobile applications out there now performing a massive variety of tasks. Apps have a tendency to be little, self-contained and determined on solving one particular task. [7].

C. *Research Objectives*

The aim of this research is to have a mobile application that: connect users with the Hospital Blood Centre to facilitate the blood collection from users during emergencies, facilitate the communication of blood donors with each others, facilitate the communication of blood donors with the Hospital blood centre.

II. RELATED WORKS

Literatures on the prior research work done by researchers in the Computing domain/ Android and Mobile computing are reviewed.

Advanced Tracking Technologies include a shadow tracker mobile apps that permit you to continue connected directly to your fleet by your Smartphone or tablet. This mobile application easily offers executives immediate insight into the location and position of their whole fleet from the palm of their hand! Swiftly inspection your mobile fleet's existing status as well as when a vehicle is stopped or moving along with the speed and location. View stop and alert past reports for each day check of your fleet's movement[8].

BrickHouse Security have GPS tracking device to keep track of persons, workers or anybody you want to keep an eye on with a personal GPS tracking device. Tracking devices for people are normally tiny in size, permitting them to be positioned easily in a pack or purse. You can select among a real-time personal GPS tracker, which permits you to verify in on your subject's site any time you want an update, or a GPS data logger, which supplies after-the-fact location and speed information[9].

In Table 1, a comparisons between Advanced Tracking Technologies, Brickhouse Security, and Bload donor tracking systems in terms of the following features : Two way messaging, Internet Connectivity, Web Based interface, Mobile Support, Optimize Routing, and Text Alerts.

Table 1. Comparisons between Blood donor tracking systems and other systems

Features	**Advanced Tracking Technologies**	**Brickhouse Security**	**Blood Donor Tracking Systems**
Two way messaging	X	X	√
Internet Connectivity	√	√	√
Web Based interface	√	√	√
Mobile Support	√	√	√
Optimize Routing	X	√	√
Text Alerts	√	√	√

III. PROPOSED SYSTEM

Proposed blood donor tracking system application works on smart phones on Android platform. Fig. 1 shows the final use case diagram for blood donor tracking system app and fig. 2 shows the user interface of the blood donor tracking system app.

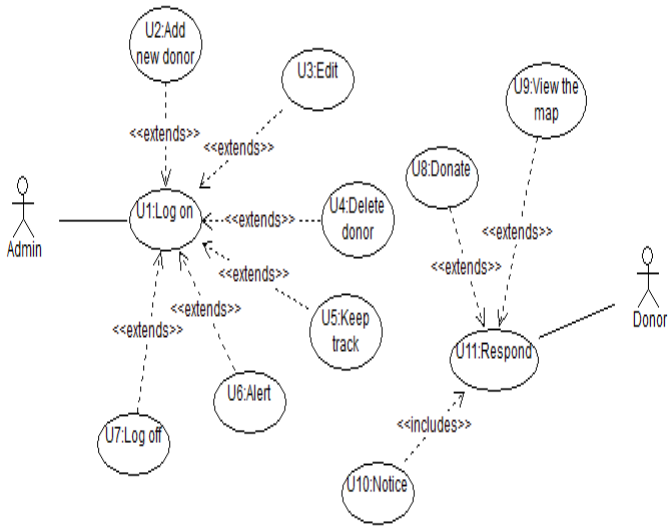

Fig-1: The final use case diagram for blood donor tracking system app.

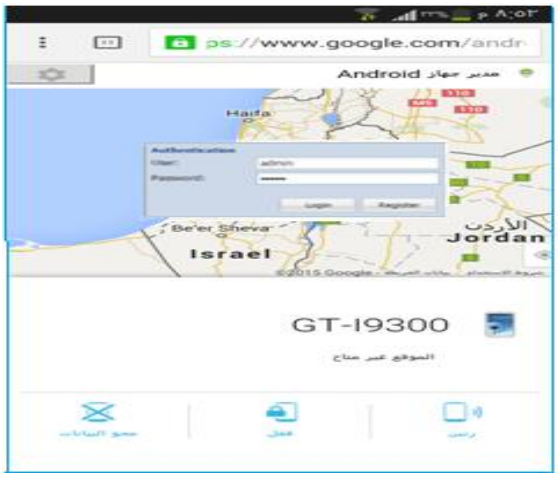

Fig. 2: User interface of the blood donor tracking system application

IV. TECHNOLOGIES USED

A. *MySQL database*

Programs that requires the database software to manage the low-level work of data simply use that language to send it commands. There exist numerous databases that maintain the use of SQL to access their data, such as MySQL and PostgreSQL. To put it in another way, MySQL is just the sort of one database software, among many. The same goes for PostgreSQL. The two databases are very famous among programs that run on websites. Our mobile App uses MySQL[10].

B. *Service based location*

A location-based service is a software app for a IP-capable mobile device that needs familiarity about where the mobile device is situated. Location-based services maybe query-based and offer the end user useful information such as "Where is the nearest ATM?" or they maybe push-based and convey coupons or other promotion information to consumers who are found in a particular geographical area.

A location-based service require five basic components: the service provider's software app, a mobile network to send data and asks for service, a content provider to provide the end user with geo specific information, a positioning element and the end user's mobile device. Furthermore, location-based services should be permission-based. That indicates that the end user should opt-in to the service in order to utilize it. In nearly all cases, this indicates installing the location-based service application and accepting a request to permit the service to identify the device's location.[11]

C. *Android:*

Android is a Linux-based open source platform. It is backed by Google with the foundation of Open Handset Alliance that includes 65 technical leader companies like HTC (see fig. 3), Intel, Qualcomm, NVIDIA, and T-Mobile. The G1, the first Android-based phone, was launched in 2008 by HTC. The Android Development Kit is available for Windows, Linux and Mac OS.

Fig. 3: HTC Dream

D. *Android Architecture*

Android system consists of 4 layers, as shown in the figure 4:

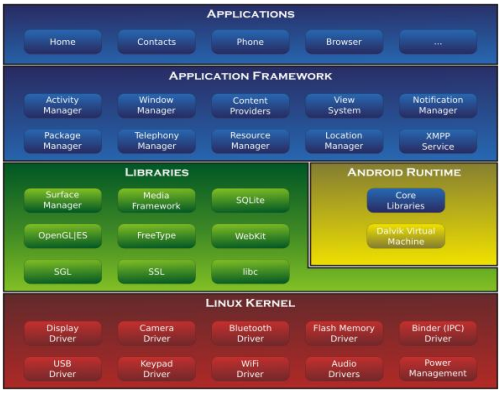

Fig. 4: Android System Architecture

- *Applications*

Android is usually shipped with a group of required applications together with an email client, SMS program, calendar, maps, browser, contacts, and others. All applications are built using the Java programming language [12].

- *Application Framework*

By offering an open development platform, Android provides developers the capability to build tremendously rich and innovative applications. Developers can benefit from the hardware, access location information, run background services, set alarms, and others. Developers can access the framework APIs used by the main applications. The application structure is designed to make the reuse of components much simpler; an application may make known its capabilities, and other applications can make use of those capabilities. The same mechanism permits elements to be changed by the user. [12]

- *Android Runtime*

Android includes a set of core libraries that provides most of the functionality available in the core libraries of the Java programming language. [12]

- *Linux Kernel*

Android relies on Linux version 2.6 for core system services such as security, memory management, process management, network stack, and driver model. The kernel also acts as an abstraction layer between the hardware and the rest of the software stack. [12]

E. *Java and XML*

Android uses the Java class library to build applications for the Android software environment. Java on Android makes use of XML for variables such as strings and integers. XML is used to control the layout and style of an application. This separate layer convention is similar to Hyper Text Markup Language (HTML) for content and Cascading Style Sheet (CSS)

in style. There are differences because of different languages and functionalities since HTML is not a programming language as Java is. However, from a conceptual level, this comparison can be made. As far as practical aspects are concerned, Java defines the button's functionality, while XML defines the buttons' text, color, font-weight, and size[17].

F. Google Maps

A desktop and mobile web mapping service app and tools offered by Google, present satellite images, road maps, and road view perspectives, as well as functions such as a road planner for traveling by foot, vehicle, bicycle, or with public transportation. Furthermore, supported are maps embedded on third-party websites [13] via the Google Maps API, and a locator for inner-city businesses in various countries around the world. Google Maps satellite images are not renewed in real time; but, Google put in data to their major database frequently. Google Earth maintain states that the majority of the images are within 3 years old.

The opt-in re-designed edition of the desktop app has been there since the year 2013, along with the classic 2013 edition [14]. The re-designed edition was met by user critics concerning speed, not showing some general functions, hiding a scale bar, and lack of other features that contain My Places and sharable tailored links to parameterize split road view and map views. It is possible to go back to the old edition.

Fig. 5: Google map

V. TESTING

Blood donor tracking system pass through many stages of testing from unit testing until final user acceptance:

A. Unit testing

Individual components of Blood Bank are tested to insure that it is work correctly.

B. Module testing

Related collections of dependent components are tested.

C. Sub-system testing

Modules are integrated into sub-systems and tested. Blood Bank interfaces are tested.

D. System testing

Blood Bank tested as a whole. Integrated Blood Bank components of web and mobile applications and their interfaces are tested and the errors corrected in maintenance phase to meet the functional and non-functional requirement.

E. Acceptance testing

Testing with customer data checked and it is acceptable. Blood Bank is tested using a real data supplied by the users and system performance is acceptable.

F. Checklist System Testing

This checklist is specifically designed to test the characteristics of the blood donor tracking systems. Obviously, it tests only generic characteristics not the functionality of the system. For this, a separate test approach and test script must be created.

G. Mobile Blood donor tracking systems Application Checklist Testing

The mobile checklist is Split into Four Different Fields[18,19]: Device specific characteristics. These are characteristics that are related to the device on which the app is installed, Network specific checks, App checks. These are things to check that have to do with functionality that is frequently used in an app, and App user interface checks.

- ***Device Specific Checks***

Table 2: Android App Device Specific Checks

#	Description	YES/ NO?	Remarks
1.1	Can the app be installed on the device?	Y/N	Y
1.2	Is an incoming call?	Y/N	Y
1.3	Does the app behave as designed/desired if there is an incoming SMS?	Y/N	Y
1.4	Does the app behave as designed/desired if the charger is connected?	Y/N	Y
1.5	Does the app behave as designed/desired if the charger is disconnected?	Y/N	Y
1.6	Does the app behave as designed/desired if the device goes to sleeping mode	Y/N	Y
1.7	Does the app behave as designed/desired if the device resumes from sleeping mode	Y/N	Y
1.8	Does the app behave as designed/desired if the device resumes from lock screen?	Y/N	Y
1.9	Does the app behave as designed/desired if the device is tilted?	Y/N	Y
1.10	Does the app behave as designed/desired if the	Y/N	Y

	device is shaken?		
1.11	Does the app behave as designed/desired if a local message is coming from another app(think of: calendar reminders, to-do task etc.).	Y/N	Y
1.12	Does the app behave as designed/desired if a push message is coming from another app(think of: twitter mentions, whatsapp message, word feud invitation, etc).	Y/N	Y
1.13	Does the app interact with the GPS sensor correctly (switch on/off, retrieve GPS data)?	Y/N	N
1.14	Is the functionality of all the buttons or keys on the device defined for this app?	Y/N	Y
1.15	Verify that buttons or keys which have no defined function have no unexpected behavior on the app when activating.	Y/N	Y
1.16	In case there's a true "back" button available on the device does the "back" button take the user to the previous screen?	Y/N	Y
1.17	In case there's a true "menu" button available on the device, does the menu button show the app's menu?	Y/N	N
1.18	In case there's a true "home" button available on the device, does the home button get the user back to the home screen of the device?	Y/N	Y
1.19	In case there's a true "search" button available on the device, does this get the user to some form of search within the app?	Y/N	Y
1.20	Does the app behave as designed/desired if the "Battery low" message is pushed	Y/N	N
1.21	Does the app behave as designed/desired if the sound on the device is turned off?	Y/N	Y
1.22	Does the app behave as designed/desired if the device is in airplane mode?	Y/N	Y
1.23	Can the app be de-installed from the device?	Y/N	Y
1.24	Does the application function as expected after re-installation?	Y/N	Y
1.25	Can the app be found in the app store?	Y/N	N
1.26	Can the app switch to different apps on the device through multitasking as	Y/N	Y
	designed/desired?		
1.27	Are all touch screen positions (buttons) working when a screen protector is used.	Y/N	Y

- ***Network Specific Checks***

Table 3: Android App Network Specific Checks

#	**Description**	**YES/ NO?**	**Remarks**
2.1	Does the app behave according to specification if connected to the internet through Wi-Fi?	Y/N	Y
2.2	Does the app behave according to specification if connected to the internet through 3G?	Y/N	Y
2.3	Does the app behave according to specification if connected to the internet through 2G?	Y/N	Y
2.4	Does the app behave according to specification of the app is out of network reach?	Y/N	Y
2.5	Does the app resume working when it gets back into network reach from outside reach of the network?	Y/N	Y
2.6	Update transactions are processed correctly after re-establishing connection.	Y/N	N
2.7	Does the app still work correctly when tethering or otherwise connected to another device	Y/N	Y
2.8	What happens if the app switches between networks (Wi-Fi, 3G, 2G)	Y/N	Y
2.9	Does the app use standard network ports(Mail: 25, 143, 465, 993 or 995 HTTP: 80 or443 SFTP: 22) to connect to remote services, as some providers block certain ports.	Y/N	Y

- ***App Specific Checks***

Table 4: Android App Specific Checks

#	**Description**	**YES/ NO?**	**Remarks**
3.1	Has the app been tested on different type of devices and different versions of Android OS?	Y/N	Y
3.2	Stability check: if the app has a list (for instance of pictures) in it, try scrolling through it at high speed.	Y/N	Y
3.3	Stability check: if the app has a list (for instance of pictures) in it, try scrolling to before the first picture or behind the last picture.	Y/N	Y
3.4	Is downloading of the app prevented in case it's bigger than the OS	Y/N	Y

	allows downloading when connected to cellular networks?		
3.5	Integration: does the app connect correctly to the different social networks (LinkedIn, twitter, facebook, etc).	Y/N	N
3.6	The app does not interfere with other apps when in background/multitasking mode(using GPS, playing music, etc.).	Y/N	Y
3.7	Can the user print from the app (if applicable)	Y/N	N
3.8	The search option in the app displays relevant results	Y/N	Y
3.9	Verify most common gestures used to control the app.	Y/N	Y
3.10	What happens if you select different options at the same time (undesired multi touch, for example - select two contacts from the phone book at the same time)?	Y/N	Y
3.11	App name should be self-explanatory	Y/N	Y
3.12	Does the app limit or clean the amount of cached data.	Y/N	N
3.13	Reloading of data from remote service has been properly designed to prevent performance issues at server-side. (manual reloading of data can reduce the amount of server calls)	Y/N	Y
3.14	Does the app go to sleep mode when running in the background (prevent battery drain)	Y/N	Y

- ***App User Interface Checks***

This checklist is based on the recommendations of Apple and some other experts. This checklist is not a substitute for a usability test, to get a good feeling of the user experience of an app a user experience test is always the most reliable method.

Table 5: Android App User Interface Checks

#	**Description**	**YES/ NO?**	**Remarks**
4.1	To keep controls as unobtrusive as possible for instance by fading them out if they are not used for a while.	Y/N	Y
4.1	Make it possible for users to go back to a previous screen for instance by adding a back or cancel button	Y/N	Y
4.2	The main function of the app should be apparent immediately. It should speak for itself.	Y/N	Y
4.3	Use at most one action on the screen that is highlighted as the most likely for the user(Example: in iOS a blue button represents the default or most likely action).	Y/N	Y
4.4	Minimize user actions by using a picker or a table view where users can select a certain choice over a data entry field where users have to type a choice	Y/N	Y
4.5	In an app, the user should not be able to store files locally, outside the app sandbox.	Y/N	Y
4.6	In an app, the user should not be exposed to the permissions of a specific file	Y/N	Y
4.7	If there is a long list of data to scroll through, provide a search option above the list.	Y/N	Y
4.8	If performance is slow, indicate a progress status icon (“Loading…”), preferably with specific message.	Y/N	Y
4.9	In case of ‘live’ filtering of data while the user enters his search query, verify the performance.	Y/N	Y
4.10	The appearance of buttons that perform standard actions are not altered in the app (for instance: refresh, organize, trash, Reply, back etc.)	Y/N	Y
4.11	Do not use standard buttons for other functions that they are normally used for	Y/N	Y
4.12	The app should respond to all changes in device orientation, as per the design	Y/N	N
4.13	Table elements should be about 7x7 mm in size, using the pixel density of the target device you can calculate the amount of pixels (chapter documentation contains a link to different devices compared).	Y/N	Y
4.14	Do not redefine gestures in your app that have a standard meaning (example: swiping from top to bottom enables the notification center)	Y/N	Y
4.15	Requirement to login is delayed in the app as long as possible	Y/N	N
4.16	If the app is stopped at an unexpected time, user data should be saved locally and available at start-up.	Y/N	N
4.17	Users should be warned of the consequences of deleting a document	Y/N	N
4.18	Keyboard adjusts to expected input (for instance numbers/letters when expected).	Y/N	Y
4.19	Are inactive buttons clearly distinguished from active buttons?	Y/N	Y

VI. CONCLUSION

In this paper, we presented the design and implementation of a mobile application called Mobile Blood Donor Tracking system, by which the system provide optimal solution for the problem of Detecting of Location of Donors by using modern mobiles and web technologies that provide the fastest and reliable reach.

Mobile Blood Donor Tracking system has been developed to be used during emergencies for people who needs blood by using alerting system and also provide an opportunity for communication between the donors and the blood bank centre and between donors themselves.

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