First Aid Application on Mobile Device

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Abstract—An accident is an unexpected and unplanned situation that happens and affects human in a negative outcome. The accident can cause an injury to a human biological organism. Thus, the provision of initial care for an illness or injury is very important move to prepare the patients/victims before sending to the doctor. In this paper, a First Aid Application is developed to give some directions for preliminary taking care of patient/victim via Android mobile device. Also, the navigation function using Google Maps API is implemented in this paper for searching a suitable path to the nearest hospital. Therefore, in the emergency case, this function can be activated and navigate patients/victims to the hospital with the shortest path.

Keywords—First Aid Application, Android, Google Maps API, Navigation System.

I. INTRODUCTION

NOWADAYS, technology is rapidly used by human in every time and everywhere. Human tries to apply automatic systems or intelligent devices in their life as much as possible to make it easier and more comfortable. Smartphone is one of devices that affect human life in many ways because today Smartphone includes various functions to support different user interests. If we categorized types of Smartphone based on the OS installed, there are Android, Window Mobile, iOS, Linux, Symbian, BlackBerry OS and others. However, Android OS is one of the most popular system that has been chosen by developers to work with as it's open source and allow the software to be edited and redistributed by manufacturers freely. So, Android OS becomes popular so quickly in Smartphone market today. Also in education system, many universities have tried to support software markets by teaching mobile courses to their students. For exmaple, Hu et al. [1] recently presented the novel curriculum architecture construction for mobile application development courses. They proposed to combine the basic knowledge of mobile computing and programming skills on different software platform in the curriculum architecture for university students to understand more concepts about mobile programming and development cycles.

Trend of mobile application development is still growing up so fast. Also, trend of paper publications about iOS and Android from many researchers all around the world is significantly increasing compared to the last few years. For example, Gadhiya et al. [2] presently proposed a paper about

role of mobile augmentation in mobile application development. They suggested using various technologies in the field of mobile computing to help and to integrate a mobile augmentation in development phase. Later on, Tracy [3] presented mobile application development experiences on iOS and Android OS by suggesting the overview about those two OS types and giving some forecasting regarding the future trends of application development. Also, Gasimov et al. [4] highlighted the important aspects of mobile application development which should be considered by developers and investors in their paper. They investigated the mobile application development by providing possible answers of three questions: what available application exist in the market, how they are developed, and which are their potential future directions.

Furthermore, the publications on mobile applications are popular in research and development world also. Many issues are concentrated on using Google API in mobile application to solve different problems. For instance, Yunpeng et al. [5] proposed a study of agriculture search engine based on FAO ontology and Google API. They applied Google AJAX API to submit keywords to Google search engine and get retrieval results. They claimed that the proposed work can help users in agriculture field finding information and navigate to some degrees of knowledge. Moreover, Lee [6] presented technical architecture for land monitoring portal using Google Maps API and open source GIS. He designed the land monitoring architecture on the basis of open source GIS programs and web mapping API.

Also, many people interest in application about health care and medical issues. Thus, there are some laboratories or companies pay attention to produce medical application for specific users. For example, Sposaro et al. [7], [8] proposed an Android application for dementia patients and an Android application for fall monitoring and response for elderly persons. The authors focused on dementia patients and elderly persons to prevent them to lost when the symptom is active and alert when they fall on the ground, respectively. In addition, Challa et al. [9] also presented an Android application for healthcare by developing and designing a patient data viewing system. This system allows the doctors to remotely view the vital parameters of a patient and take action accordingly.

In this work, a First Aid Application is developed to give some instructions for preliminary taking care of patients in Android Smartphone. In addition, the navigation system using Google Maps API is also implemented in this paper for searching a suitable path to the nearest hospital. Therefore, this function can be activated and be used to navigate

patients/victims to the hospital with the shortest path in the emergency case. The information about the methods is given later in section II and III. The next section gives brief background knowledge about Android OS, Google API and some issues in Thailand regarding the hospitals. Section III describes our application design and implementation. Also, the state diagram of this application and some algorithm are illustrated. In section IV, future work is discussed. Finally, the conclusion is drawn in section V.

II. BACKGROUND

A. Hospitals Situation in Thailand

Today, there are two main types of hospitals opening and serving people in Thailand. Those are private hospitals and state hospitals. State hospitals are common places that always be chosen at the first place by the people because it is free of charge and available in everywhere. Thus, the government provides the hospital and health center to cover all of the country by using the administrative subdivisions. First of all, primary care stage, there are sanatoriums in every Tambon (sub-district) to preliminary serve and take care minor illness for all villagers. In case of serious illness that cannot be cured by sanatorium, the patient will be delivered to secondary care in the district hospital. In addition, if the district hospital doctor cannot look after the patient in any reason, the patient will be transferred to tertiary care in the state hospital immediately. The process should be ended in the tertiary care stage but in the crisis illness that the high technology or devices or specialist to are required, the super tertiary care is the final place to take care the patient. Almost all of super tertiary hospitals are in the universities those provide medical course for the university student. Thus, all devices and budgets are unlimited. The example of hospital locations in Phuket Province is given below. As shown in Fig. 1, the big red points with labels are the main hospital in districts and the small red points are primary health care centers.
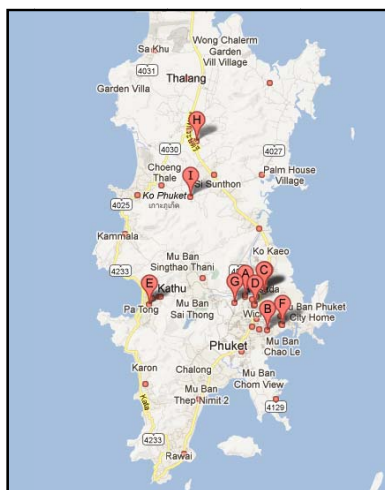

Fig. 1 Health care centers and hospitals in Phuket, Thailand [10]

B. Android Framework

There are 4 layers in the Android framework those are Applications layer, Application framework layer, Library and Runtime layer and Kernel layer as shown in Fig. 2. The first layer is at the top of all, Applications layer. The finished applications are compiled and run in this layer. The second is the Application Framework layer. In this layer, each application is built and created by using the underlying libraries and associated application source code. The next layer is Library and Runtime layer where the core system libraries, Google Java libraries and the Dalvik virtual machine are located. The final layer is the Kernel layer. This layer is used to communicate with other hardware components via the Linux Kernel (Now version 2.6.x).
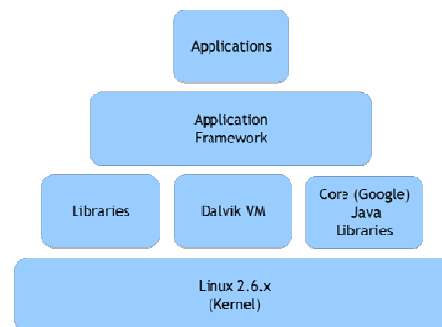

Fig. 2 Hierarchical View of the Android Framework [11]

C. Google Map API

Google Maps API is the application program interface based on Google Maps as shown in Fig. 3. The main idea of launching this project is to allow developers to embed and make use of Google Maps via their own websites. Due to the agreement term of uses, developers must apply and accept the initial term of using it. In addition, there are many functions which are supplied by Google Maps API such as GMap, GMap2, GPoint, GIcon, GLatLng, etc. The popular function used by developers is Gmap. In this function, users can call and view map objects on the page. The development kit provides users various functions which can be applied in their own project or some specific scenarios.
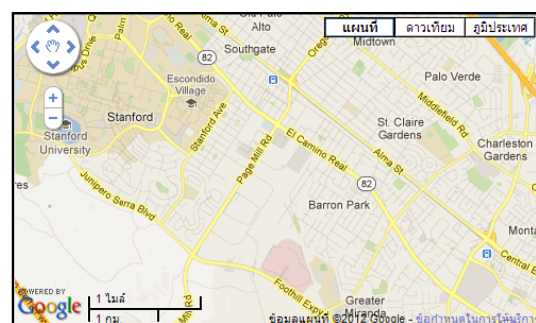

Fig. 3 Simple Google maps API example [12]

III. APPLICATION DESIGN AND IMPLEMENTATION

A. First Aid Instructions

The first aid application on Android device is an application for giving some useful instructions about preliminary taking care of patient before sending to the hospital. The application also provides hospitals searching function for finding the nearest hospitals. So, there are two types of service in this application. Those are sets of first aid instructions and hospital searching service for finding the appropriate hospitals to go to. In the giving first aid directions service, there are six sub-types which are muscles and bones injuries, skin injuries, respiratory disease, viscera injuries, injuries from toxic and other injuries. As shown in Fig. 4, the first six bullets are menus about giving directions from different injuries and the last H symbol on the bottom of this page is the sign of hospital searching service. The submenus of the muscles and bones injuries are also shown in the figure. The list of the diseases and injuries are given for user to select and view the intended items.

Fig. 4 Application main menu and muscles
and bones sub-menu

B. Hospital Searching Function

In case if the patient want to go to the hospital in the emergency situation, the application provides functions for searching and navigating to the nearest hospital or an appropriate hospital for user. The flowchart of this function is shown in Fig. 5. The searching function starts with getting the current location of user by using mobile GPS, and then the application will ask for a searching radius. After user provided the specific radius as an input, the program will return a set of results by pinning the position of each hospital within the given radius on the screen. User can choose any possible pins by touching the H symbol on the screen, and then the information of the selected hospital will be shown up. Next step, user can request the path to hospital by tapping on the provided button. The most suitable direction to the selected hospital will be appeared as a result.
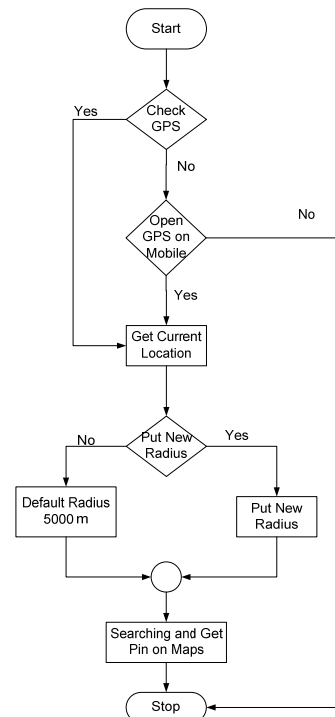

Fig. 5 Hospital Searching function process

The pseudo code of the proposed searching algorithm is given below;

```
Function Hospital Finder at coordinate (lat,long)
Start :

// Variable Declaration
lat = new GeoPoint(int)(loc.getLatitude)
long= new GeoPoint(int)(loc.getLongitude)
Type = hospital
Language = en
RadiusSearch = rad

//Connect to Google API with Feed
SetFeed = (lat,long,hospital,rad,en)
JSONObj = GetLocationGoogleAPI (SetFeed)

//Convert JSON Object Result to String Type
MapDetail[] = ConvertToString(JSONObj)

//Use Detail from Previous Conversion to Plot Map
For i:1 to n
Start :
        (tempLat,tempLong) = GetLocation(i)
        Show(HospitalName(i))
        PinHospital(tempLat,tempLong)
End For

//Show Path to Selected Hospital
UserHospital = onTouchScreen(PinPoint(i))
ShowPath(UserHospital)

End Function
```
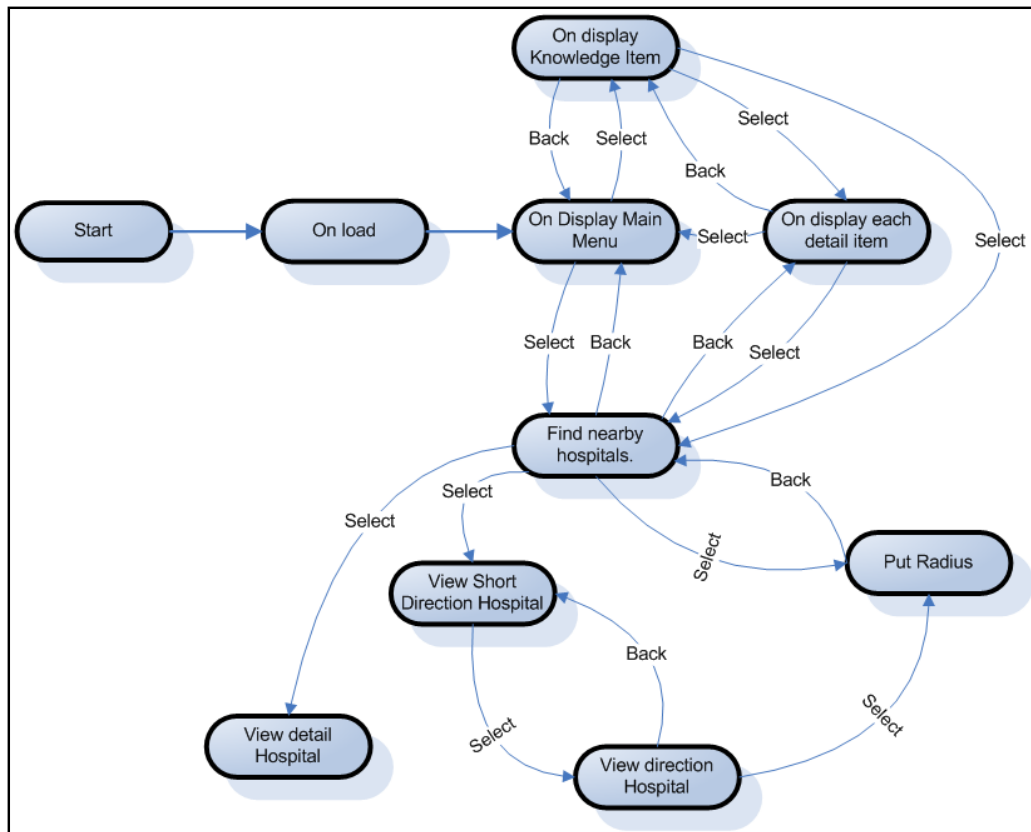
Fig. 6 States of application life cycle

C. States of Application Life Cycle

As shown in Fig. 6, the states of application life cycle are given. The state diagram shows how the program starts and ends. User begins the first aid application on main screen at the first place. Then, the knowledge items are shown. User can choose an intended topic on this screen. After the main symptom type selected, the sub-menus are then suddenly illustrated up on the next screen. In this screen, user can find the names of disease or injury types. Upon the selection on any single of them, the related instructions of first aid will be shown up in the final screen. The process will be ended at this screen with nothing to be done further as shown in the top of Fig. 6. User sometimes might need to find the nearby hospital in the emergency event. The application also provides searching hospital page. User can activate this page by using default searching radius or defining their area. The default radius is set to 5000 meters by default but can be readjusted by assigning new value into the box. After the radius defined, the results will be returned by application to user. User can choose any hospital on the screen by tapping the H icon. Then, the hospital information will be shown as a result. Also, user can request the navigation to the selected hospital by tapping the request button as shown in the bottom of Fig. 6.

D. Graphical User Interface Design

We design GUI in only Thai language. The examples of the application GUI are shown in Fig. 7 (a)-(h). The main application page is shown in Fig. 4 already. Next, Fig. 7 (a) shows an example of first aid instructions for ear injury. The step-by-step instructions are given for user. User can tap or touch the screen to slide it down for more information. User can go back to previous stage by tapping on the left arrow symbol on the top of this page. Fig. 7 (b)-(h) illustrate the example of hospital searching. Fig 7 (b) shows default search with 5000 meters default radius. If the new radius is not assigned, the application will set the first radius at 5 kilometers by default. In contrary, if user want to define their radius, there is a pop-up dialog prompted for the radius input appeared on the screen as show in Fig 7 (c). User can input any valid number in this box, suppose that we input 10 kilometer for searching radius. If the application can find more hospital in defined area, the outputs will change from Fig. 7 (b)-(d) as a result. Moreover, Fig 7 (e) shows how user can toggle the view mode to the satellite mode by tapping the satellite button on the screen and can do the same way to toggle it back.
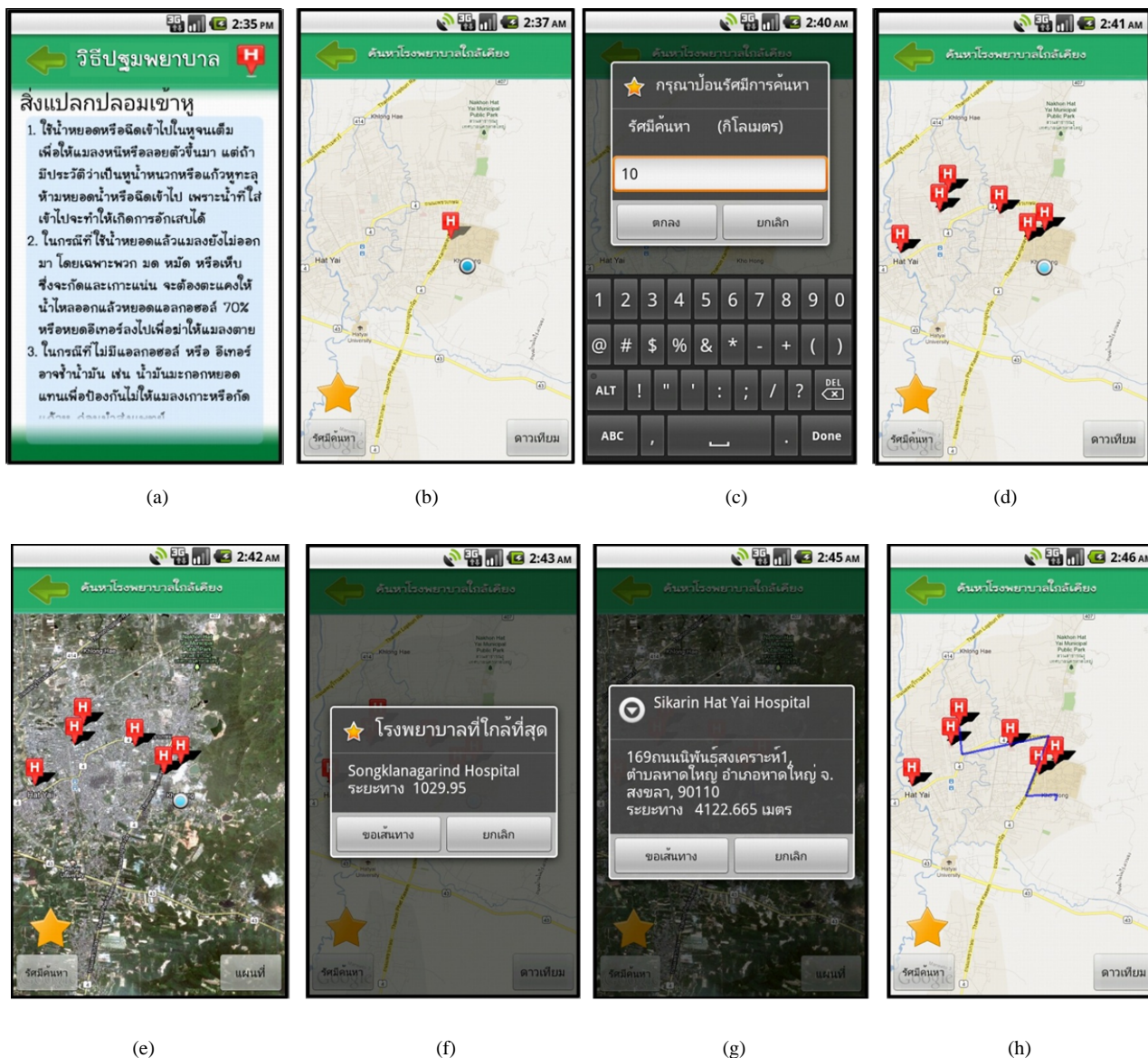
| (a) | (b) | (c) | (d) |

| (e) | (f) | (g) | (h) |

Fig. 7 Examples of graphical user interface design

IV. FUTURE WORK

In addition, after user submitted a searching radius, the nearest hospital will be returned as a pop-up box as shown in Fig. 7 (f). In this example, Songklanagarind Hospital is the nearest place. User can request the direction to the hospital by tapping the button or tapping cancel to choose new hospital. Fig. 7 (g)-(h) show the case if user does not choose the nearest hospital. User can choose any hospital that appears on the screen and requests for the direction. For example, user chooses Sikarin Hat Yai Hospital and requests for a direction to get there. The screen will change from Fig. 7 (g)-(h) by showing up the blue line on the map to represent the direction to the selected hospital. In this point, user can use this navigation line to get to the hospital.

V. CONCLUSION

In this paper, a First Aid Application is developed to give some instructions for preliminary aiding of patient in Android Smartphone. Also, the navigation function using Google Maps API is presented in this paper for searching a suitable path to the selected hospital. Therefore, in the emergency case, this function can be activated and navigate patient from the current location to the hospital in the time. Moreover, patient can define their own radius for searching hospital within the interested area.

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