AALTm: An Android Application to Locate and Track Mobile Phones

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Abstract⸺

The introduction of Android Mobile phones has bought a new revolution in the mobile phone market and almost everyone might have experienced misplacing or losing their mobile phones. Hence it is necessary to develop an application in all smart phones to prevent the mobile phone theft. **This paper describes a tracking application called AALTm (An Android Application to Locate and Track Mobile phones) which is embedded with a lot of features such as location tracking, SIM card detection, call monitoring, profile changing, sending the images to the predefined email address and deleting the project specific incoming and outgoing messages. These features are quite different from the existing tracker applications which would be helpful in tracing the lost mobile.**

Keywords⸺ **Mobile computing, Smart phones, SMS, GPS, GSM cell, GPRS.**

I. INTRODUCTION

Today Mobile phones are becoming more techno logically advanced and offer more features. Specially, Smart phones are having more advanced computing capability than a feature phone. Smart phones can run applications and can access the internet directly unlike cell phones rely on a carrier to get that. The reason Smart phones can run applications because these phones have CPU, memory and all other stuff that allows PCs to do the same thing.

The mobile operating systems (OS) used by modern smart phones include Android, BlackBerry, iOS and Symbian , which are the world's best mobile operating systems. There are many differences between their features and performance. In Android 2.3 various changes have been made in the user interface. There are changes in settings and menus which make it easier for the users to navigate and control the features of system and device.

This application uses Android OS which demonstrates a system that uses a regular mobile phone equipped with a GPS receptor and connected to a global system for mobile (GSM) network that takes advantage of these technologies in behalf of the user safety. AALTm is a useful mobile application that combines several features which aims at the user's security.

A mobile location estimation and tracking technique for wireless communication systems has been summarized in [2]. The location estimation is based on the differences of Downlink signal attenuations. A mobile tracking technique via piecewise linear optimization using a simple genetic algorithm is applied to improve the locations estimation.

With the inclusion of built-in GPS and 802.11 supports in the mobile phone hardware, the mobility information are easily captured and routed to a remote system via opportunistic connections over Internet. In this, a Web based mobility analysis system [3] which collects location data from mobile phone users via opportunistic Internet.

A method to track a mobile device by monitoring the signal powers of the mobile transmitter measured at several base stations has been presented in [5].The signal power measurements at several base stations with the power maps (non-linear function of the position of a mobile) were compared to get the likelihood at each position. This method is mainly focused on mobile devices that are mounted in vehicles.

The two techniques to locate and track cellular phones using digital cellular mobile telephony networks have been presented in [6]. One is based on time of arrival methods with a minimum of three base stations required, while the other technique uses angle of arrival methods that require only two base-stations. Both methods were examined for a multipath fading environment.

There are already several applications in the market that offer tracking systems and anti theft applications like mGuard, detect non-authorized SIM cards. Unlike this application, the AALTm is able to enable the GPS when a non-authorized SIM card is detected in the device by comparing the Integrated Circuit Chip Card Identification (ICC ID). The ICC ID number is unique for each SIM card. Tracking applications such as, Mobile Tracking System [9], AccuTracking [10], and PhoneBak (also anti theft application), are already rooted in the mobile phone market.

Most of the above-mentioned systems, provide dedicate solutions using tracking methods to monitor a mobile device. But by just enabling the mobile phones with GPS system and retrieving the information about the new SIM would be insufficient to track the Smartphone. Hence came the idea of developing AALTm: An Android Application to Locate and Track Mobile phones, an efficient and unique application with few more features which help in controlling the lost android Smart phone. This application uses GPS or global system for mobile (GSM) network to track a mobile device.

AALTm is filled on with features like changing Profile, call monitoring, SIM card detection, location fetching through GPS and transfer of images to email address. All these features work on the SMS basis. So, incoming SMS format plays an important role. The android application running in the Smart phone monitors all the incoming messages. If the SMS is received in a predefined format it reads the SMS and performs the expected task.

Organization

The paper is organized in the following sections. Section II describes the application development including its Requirements, features and the technologies employed. Section III describes the application functionality along with experimental evaluation and results. Finally, section IV presents the conclusions and some possible future work.

II. APPLICATION DEVELOPMENT

The Application development includes the requirements of the AALTm, the application features and the technologies required for its development.

A System Requirements

AALTm is directed to two user profiles, the client and the server to be tracked. The server side requires any android based Smart phone starting from version Android 2.2 having AALTm installed in it with GPRS and GPS enabled. The client side requires any other OS based mobile phones for sending and receiving SMS.

If there is any error in sending the message from the operator, there won't be any message sends to the operator by the application, instead no action takes place at the server side. The figure 1 shows AALTm requirements.
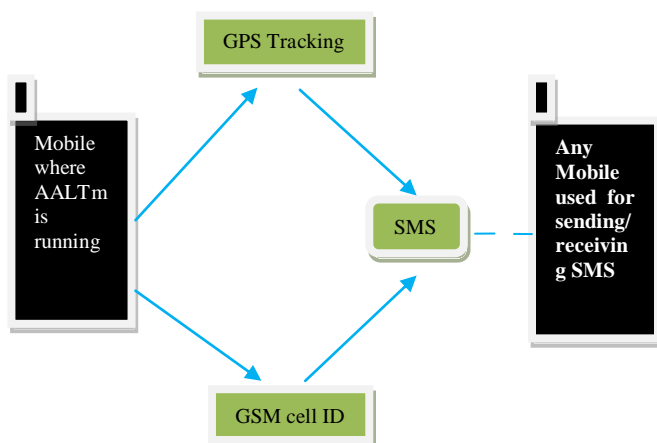

Fig 1: AALTm requirements

The SIM card detection feature allows only authorized SIM cards in the device. If there is an unauthorized SIM card in the device the application will send a warning notification via SMS to a predefined emergency number with the current GSM cell id and also the phone number of the unauthorized SIM card.

The camera feature requires the front or back camera and internet connection in the android smart phone.

For the user's safety, the application will allow the sending of distress calls via SMS to a predefined emergency number. The application fetches the location through GPS and the GPS values along with address is send to the predefined number. To activate this feature the android Smart phone where AALTm is installed must be GPS enabled.

B. Application Features

Each SIM card is identified by its Integrated Circuit Card ID (ICC-ID). ICC-IDs are stored in the SIM cards and are also engraved or printed on the SIM card body during a process called personalization. When started, the application compares the ICC ID of the current SIM card and the predefined ICC ID to detect unauthorized SIM card in the device.

Immediately after the SIM replacement we will get notification about the IMEI/IMSI number and details of new SIM inserted .The user is expected to hardcode a mobile number in the application which enables the application to send notification to that number.

The call monitoring feature provides all call registry details like incoming, outgoing calls which are made from the lost android mobile. It records the numbers and names which are known to address book and sends in the form of an SMS to the predefined number. Thus, we will get more information about whom the cell phone thief has close acquaintance; we can call them in turn to know more about the theft.

If the GPS data shows the mobile phone very much close to us but, we are unable to trace it as it is in silent mode or if the person who flicked the mobile phone is still around and has put it in silent mode. Then the profile management feature in the application convert the profile of the phone from general to silent and silent to general as per our requirement by just sending an SMS.

We can activate the front / back camera of our mobile phone by just sending an SMS in a predefined format. Upon receiving the SMS the application activates the camera, captures three images (service that runs in background), automatically composes a mail to our email ID, attaches the three snapshots taken, and sends it automatically as a mail to our email account. We can check our mail; view the attached pictures to check out whether we can extract more info about who, how, where etc. Here we assume the new SIM card inserted to our lost cell is GPRS enabled too.

We retrieve the location string by sending one SMS to the lost Smart phone in a particular format. We can retrieve the location in two ways. One is single value, which fetch the GPS value and sends only once. The other is continuous

fetching, where various values of location can be obtained and send every 1min or for every 5mtrs displacement.

The application automatically deletes the incoming and outgoing messages from the Smart phone where AALTm is installed such that the new owner of the cell is clueless about it all.

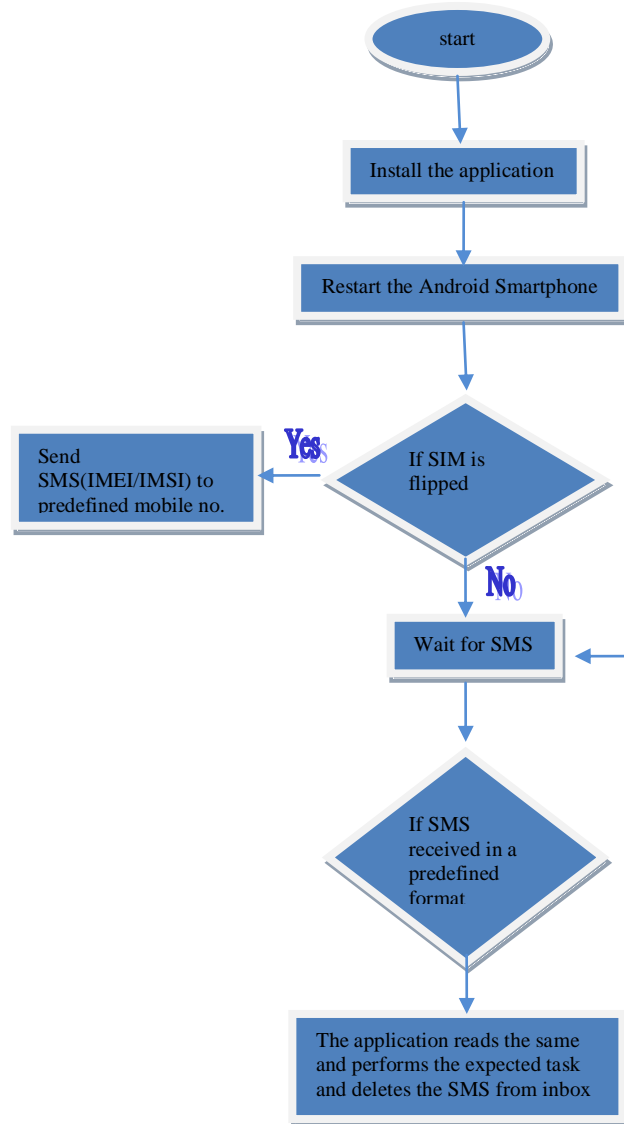The data flow diagram of AALTm application is shown in figure 2.

Fig 2   AALTm dataflow diagram

Algorithm:-

Step 1. Start of process.

Step 2. Install the application. After installing the application on the Smart phone, it will be set to start running in background every time the device operating system restarts.

Step 3. Restart the Android Smart phone.

Step 4.If the SIM is flipped the application sends SMS regarding the details of new SIM to the predefined mobile no.

Step 5.The application auto starts every time the mobile boots up. Then it goes to running mode and will start the main service which continuously listens for the incoming SMS messages.

Step 6. Whenever it gets a new SMS, it checks the content of the message and if the message is in a particular pre-defined format, application reads the same, performs the expected task and replies back to the previously number.

The application installed will be running in the background & won't be shown in the task manager as well. Once the mobile phone is lost, this application enables the user to track a mobile device and to receive notification via SMS to a predefined number.

C. Technologies

The AALTm is developed in Java programming language using the Android software development kit.

The development tool chosen for this application was the Eclipse SDK.

III.EVALUATION AND RESULTS

The role of the user in this application is to send SMS to the lost Android Smart phone having AALTm installed in it.

The syntax of SMSs that can be sent by the user and its functionalities are as follows.

1. If the SIM is flipped, the hardcoded numbers receives the SMS containing the IMEI/IMSI number of the lost cell and details of new SIM inserted.

2. If SMS is of the format TRACK-calls-phone number, the operator receives the SMS containing all call registry details like incoming and outgoing calls.

3. If SMS is of the format TRACK-profile-general@phone number the operator receives the SMS containing the profile changing information from silent to general mode.

4. If SMS is of the format TRACK-profile-silent@phone number the operator receives the SMS containing the profile changing information from general to silent mode.

5. If SMS is of the format TRACK-singlelocation-phone number the operator receives the GPS value of the lost cell in the form of SMS. This value is sent only once.

6. If SMS is of the format TRACK-continuouslocation-phone number the operator receives the update of GPS value of the lost cell every 2 minutes once/for every 5meters displacement.

7. If SMS is of the format TRACK-images-phone number the operator receives the images through predefined email-id.

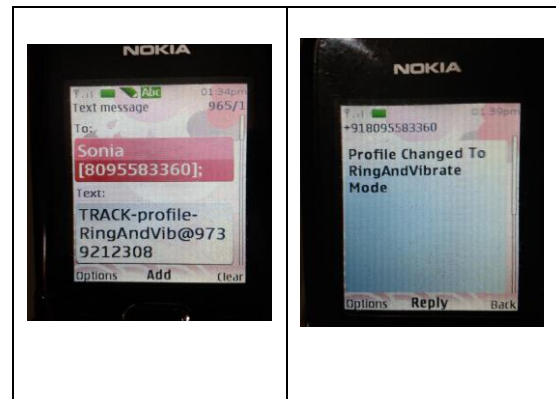Fig 3: Snapshot of the message received after the SIM change observed in the lost android Smart phone.

Sender	Receiver

Fig 4: Sender-message sent to obtain the GPS value/address from the lost Smart phone. Receiver- GPS value/address sent by the lost Android Smart phone.
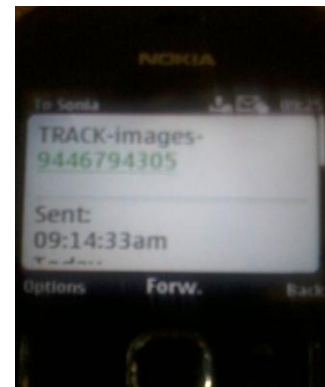
Sender	Receiver

Fig 5: Sender-message sent to track the incoming and outgoing call from the lost Smart phone. Receiver- message received after there was an outgoing call observed in the lost Smart phone.

Sender	Receiver

Fig 6: Sender- message sent to change the profile from silent to Ring and Vibrate mode. Receiver-message received after the profile was changed from silent to ring and vibrate mode.

Fig 7: message sent to transfer the images to the email address.

checkstudent08@gmail.com

to me

Adndroid programe with Attachment
3 attachments — Download all attachments   View all images

/sdcard/image1.jpg
2K   View   Download
/sdcard/image2.jpg
2K   View   Download
/sdcard/image3.jpg
2K   View   Download

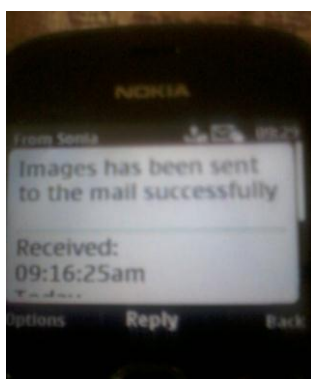Fig 8: message received to the predefined email address.

Fig 9: message received after sending the snapshots to the predefined email address.

IV   CONCLUSION

The AALTm -An Android Application to Locate and Track Mobile phones is a unique & efficient application which has a variety of features that enhances the existing mobile tracking system. AALTm stands different from the existing system as it is not only the GPS value it makes use of but it works on GSM/text messaging services which make it a simple and unique one.

This application doesn't work if the phone is switched off. For future work, it is proposed to implement some algorithm where the phone itself identifies that it is being lost. Whenever, the phone is off for more than 48 hours it should make it switch on automatically.

ACKNOWLEDGMENT

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