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Research Paper

ANDROID PHONE SECURITY USING WI-FI POSITIONING SYSTEM

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Android is an open source full stack platform for developing applications for android based mobile phones. The wide spread usage of Android requires some areas for potential researchers. Mobility management, location awareness and security are among them. Vulnerability of theft exists as these phones are portable devices. This has opened new opportunities in the field of security of android based mobile phones. A cost effective technique is needed to protect phones using existing resources. Location based services is one of such technique that can provide the protection for smart phones with minimal cost investment. The currently available technique for providing location is GPS, but GPS does not work well at indoor locations for providing locations, so WI-FI signal strength can be used to find the indoor location. This viewpoint can be thus used as a medium to track the phone. An application is developed that can be used for securing android based smartphones in a particular area. It is an effective security application that uses WI-FI signal strength as a parameter to inform location changes. It uses SMS service to inform about the stolen device. The application is suitable for identifying position in indoor locations so that mobile phone can become theft free.

Keywords: Smart phone security, Indoor location based services, WI-FI signal strength, Algorithm

INTRODUCTION

The advancement in the field of mobile technology, wireless communication and handheld devices led to popularity of mobile applications. There are several mobile platforms and technologies available nowadays. Symbian, Windows, Android are among them. Each of them has their own characteristics and features. Symbian offers a high-level of integration with communication and Personal Information Management (PIM) functionality (Laoudias *et al.*, 2012). Windows based on the Windows CE kernel operates and seems similar to desktop versions of Microsoft Windows (Papliatseyeu *et al.*, 2009). Android developed by Google Inc. is

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an open and free software stack that includes an operating system, middleware and also key applications for use on mobile devices, including Smartphone. It is an Open Handset Alliance Project. Android has gained popularity in recent years due to its features. Android includes API's for Location Based Services (LBS), GSM and 3G EDGE networks for telephony, IPC message passing, background processes and applications. There is no charge for licensing, distribution and release approval as well.

Security for Android mobile phone is an important issue these days. A lot of research work is going on for security of these phones. Since, Android phone is a small handheld moveable device therefore use of positioning system is one of the ways to incorporate security in it (Laoudias *et al.*, 2012).

Security using positioning system can be provided for indoor as well as outdoor locations. Some technologies are already available that can deliver high level of positioning accuracy for security. As far as security is concerned, cost is major issue. They require equipment such as antennas and transmitters. This necessitate expensive infrastructure. It is also time consuming and non-flexible (Mahajan *et al.*, 2012). Thus a cost effective technique is needed to protect phones using existing resources.

It leads to requirement of a security technique that uses existing resource for positioning of indoor location. One of the solutions is use of WI-FI positioning system. WI-FI signals are used for getting location in WI-FI positioning system. The locations are assigned against particular signal strength received from WI-FI (Shin *et al.*, 2010).

There are certain issues with android phones that are required to be overcome in providing security using WI-FI positioning system. The issues are related to power consumption of battery and starting the application remotely. These two issues are very much related to each other, i.e., if one application can start remotely then there is no need to run it all the time and due to this power consumption is also reduced.

The proposed work has chosen security aspect of mobile devices as a major concern. It proposes an algorithm for providing location and security using WI-FI signal strength. SMS service is used to communicate about the stolen device.

RELATED WORK

A lot of research work is available on positioning systems. The available work explains about the various methods that can be used to implement positioning system. Indoor WI-FI positioning system for android based smart phone (Shin *et al.*, 2012) proposed the applications that include position related jobs, general survey regarding signal strength patterns, decision based on signal strength information for indoor location.

A system based on Location Based Service (Laoudias *et al.*, 2012) locates the position of a user. It relies on ubiquitous WLANs and exploits Received Signal Strength (RSS) values from neighbouring Access Points (AP) that are constantly monitored by the mobile devices under normal operation. An Analysis of Wi-Fi Based Indoor Positioning Accuracy (Papliatseyeu *et al.*, 2009) suggests examining several aspects of location fingerprinting based indoor positioning that

affect positioning accuracy. A similar work on an indoor localization application (Martin *et al.*, 2010) presented a precise Indoor localization using smart phone leveraging their sensing capabilities. It implemented the approach for the statistical processing of radio signal strengths, to justify its performance better than other deterministic techniques.

Wi-Fi Localization using RSSI in Indoor Environment via a Smartphone (Shin *et al.*, 2012) is also suggested in past. It suggested the use of Wi-Fi network to localize a mobile user in an indoor environment. Their system used the inverse relationship between Distance and RSSI and showed the improvement in finding the correct match for the fingerprinting by incorporating database correlation algorithms such as K nearest neighbours and probabilistic algorithms.

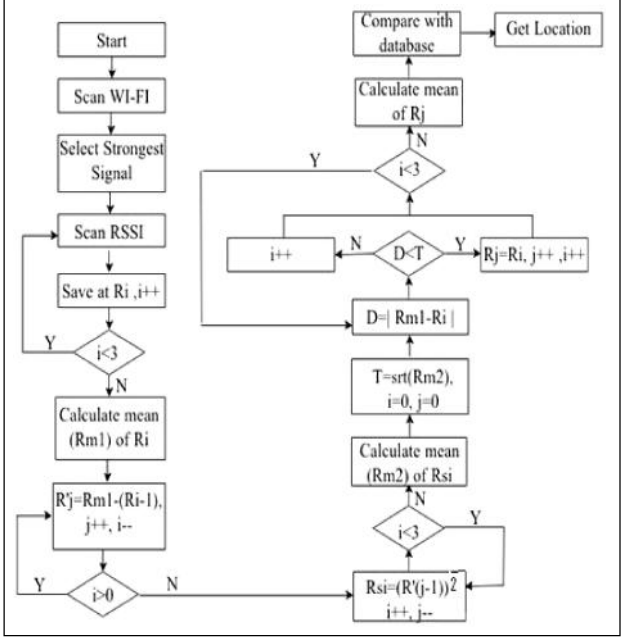
PROPOSED ALGORITHM

The RSS (received signal strength) from WI-FI access point is measured three times and stored in the proposed algorithm (Figure 1). The abbreviations of symbol used are given in Table 1. The threshold value is calculated according to signal strength and signals from previously stored signals, are selected to provide input.

Table 1: List of Abbreviations

Ss	Strongest Signal Received
i, j	No. of iteration
R	Training value of RSS
R'j	Mean Difference
D	Difference of Threshold
T	Threshold
Rsi	Square of mean Difference

Figure 1: Proposed Algorithm



Proposed Algorithm

- Scan the signal from access point three times.
- Store the signal (Ri) and calculate mean of signal (Rm).
- Calculate difference between scanned signals and mean.
- Store difference at R'j.
- Calculate square of difference, R'j * R'j.
- Store at Rsi.
- Calculate mean of Rsi and store at Rm2.
- Find square root of Rm2 and call it Threshold.
- Select the signal whose mean difference with Rm is less than threshold.
- Again calculate the mean and call it rms (root mean square) value.
- Fetch the location from database according to this rms value.

EXPERIMENTAL SETUP AND ENVIRONMENTAL ENVIRONMENT

The experiment was carried out with an android phone and a WI-FI access point (Figure 2) in a floor of MTech lab which locates in School of Computer Science, DAVV Indore. Three points are selected for location and *rms* values for each selected points are stored in database. Database hence contains the location and corresponding value of *rms* to each location.

Figure 2: Selected Space for Implementation

IMPLEMENTATION

The implemented application is installed in an android device (ICS: Ice cream Sandwich). Application is started by sending an SMS to android device. The application on receiving SMS extracts the SMS contents and compares its value with the previously stored special code. The application starts scanning WI-FI signal, if the code matches.

The execution of the application generates an interface for (Figure 3) scanning the signal. It shows “get get” message as well. Here the first “get” is the stored code for starting application and the second “get” is the code sent through SMS to start application.

Figure 4a shows scanning of signal for the first time from access point (Davv-8023). The signal strength of –77 is calculated for this experiment. Figure 4b shows scanning of signal for the second time from the same access point (Davv-8023). Signal strength value of –71 is measured in the second time. Figure 4c shows scanning of signal third time from the same access point (Davv-8023) and signal strength calculated is –78.

Figure 3: Starting WI-FI Scan

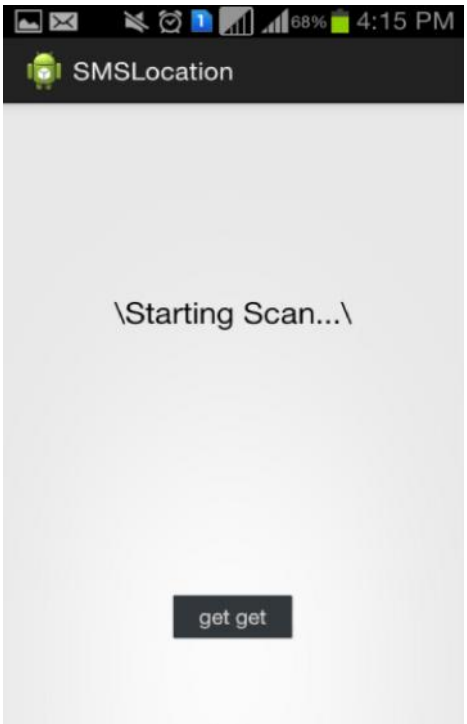


Figure 4: Screenshots of Three Scans of WI-FI Signal

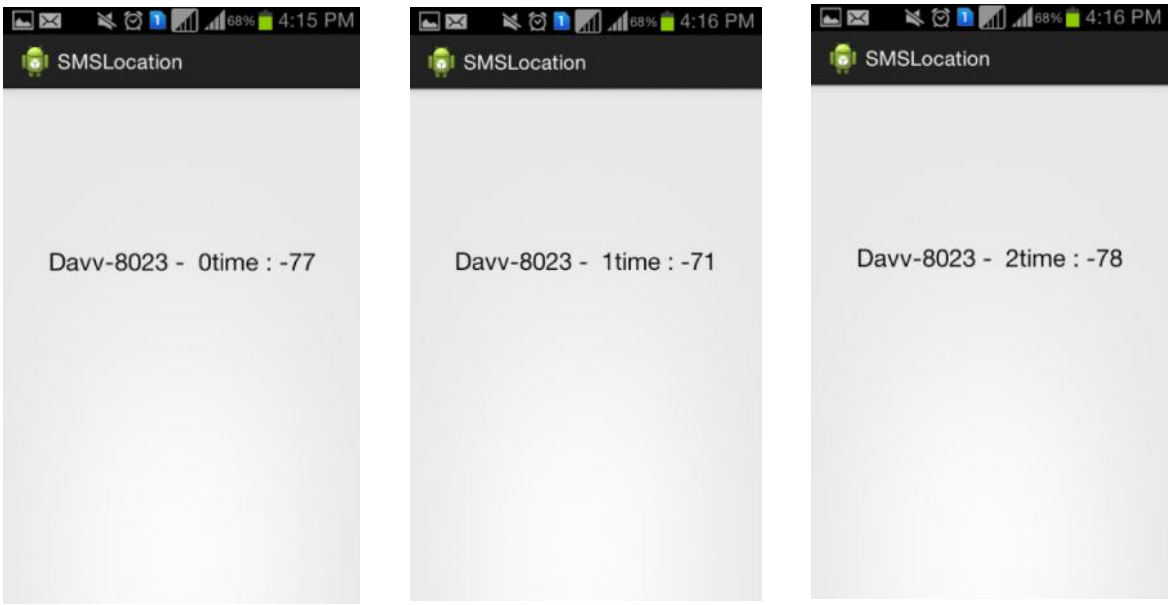


Figure 5 shows the message received. The message shows the current location of the device.

Figure 5: Message Inbox Showing Location Information as SMS

CONCLUSION

Indoor LBS on smart phones have had great success in the commercial buildings such as mall providing useful functionalities such as finding nearby point-of-interest. Next-generation Indoor LBS promise to deliver even more interactive services to users and create a huge knowledge-base of location-tagged information. The major technological reasons for this advancement are better WI-FI signal strength and better signal access through mobiles.

The presented work describes an active service that supports context aware computing by providing clients with information about location object and securing the object. It provides an indoor WI-FI positioning system for Android smart phones. Positioning using WI-FI signals is easy to implement and requires lower cost than other localization systems. The system installs Access Points dedicated for localization at specific locations to improve

positioning accuracy. We proposed a new algorithm to find the location of the smart phone and to secure smart phones. It acquires a proper scan time and threshold thereby yielding a low error rate. The presented system can be used in school, college and mall etc. to secure the mobile device.

The existing solution for indoor localization needs a complex hardware implementation. In future it can be reduced by introducing the sensing capabilities in order to deliver accuracy. The localization application can also make use of hardware embedded within the phone and can be integrated both online and offline phases of RSS indication fingerprinting within the same device.

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