Literature Survey and Competition Report

18.10.2011 – Team3

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Table of Contents

Introduction

After the examination of the Revised Project Proposal Report, “Location Tracking Application on Smartphones” topic is recommended by the instructors. After the discussions in the first Lab session with Instructor Mr. Reyhan and Teaching Assistant Mr. Yöntem on the topic, it has been reviewed. Our new topic title is “Secure Messaging and Location Tracking”. In this new project topic, providing secure communication to the users is the main target.

In the first part of this report, new topic is explained. Further chapters are Literature Survey and Competition.

Literature Survey title further includes four subheadings:

- Connection between the Mobile Phones
- GPS Technology
- Google Map Integration
- Cryptography

Although new project topic may seem to be a simplified version, it is actually more compact and consistent. It promotes users’ security concerns. It has balanced hardware and software parts. It is also open to be developed by adding new features.

HHK MELIH BURAYA BIRSEYLER SALLAYIN BIRAZ DAHA BIRAZ DA HEDEF KITLEDEN BAHSEDEBILIRSINIZ

Project Proposal: "Secure Messaging and Location Tracking"

Short explanation of the project

This project can be called as a messenger program being run on smart phones (Android operating systems) and having the feature of enabling users to see the positions of each other on a map. All the information shared within the group is encrypted.

HHK – MELIH YINE BURAYA HEDEF KITLE ILE ILGILI KIME ULASILABILECEGI ILE ILGIL BIR SEYLER YAZILMASI GEREKIYOR

Hardware Related Features:

- In this project, a cryptographic device which encodes the data sent from the mobile device will be designed. This device should be designed small enough that it could be placed into or as a part of a Bluetooth headphone. This hardware component should be portable and should not discomfort the user.
- The cryptographic method has not decided yet. There are many different algorithms, protocols and hardware designs on this purpose. Main methods are discussed under Literature Survey subject.
- The connection between the cryptographic device and mobile phone is done through Bluetooth technology. Bluetooth technology is chosen due to two important reasons: Increasing portability and being a standard protocol which is supported by the vast majority of the smart phones.

Software Related Features:

- A user interface which displays the locations of the other users on a map is designed. The location information is read from the integrated GPS chip inside the smart phone. Obtained coordinates are interpreted and users are demonstrated on the map with symbols.
- This user interface also enables the user to send and receive encrypted messages via this application. Together with the location information, the plaintext is sent to the cryptographic device via Bluetooth. Encrypted information is transmitted to the other users via a HTTP Server application.
- The received and transmitted messages are stored during the session. Last few locations of the users are also stored internally in the program in case of a GPS or Internet connection loss. In such unexpected emergency cases, other users who still

have the connection can reach the last location of the user who has lost his connection.

Further Developments:

The features which are stated below can be perceived as the optional parts of the project. According to the development process of the device and application, this part will be updated.

- In current configuration, the shared data within the mobile phones network is not stored. A database can be added to the network which saves all location and message history of the users. Users can be categorized according to their authority to reach this database.
- The main function of this project is essentially the transmission and reception of data in a secured way. In the future, application can provide the user to attach documents such as images and short sound records. As a further point, an encrypted real voice communication may be added to the project. The ideal case would be that the voice to be transmitted can be encrypted without being sent to the mobile phone in the Bluetooth headphone.
- In current configuration, messaging and location tracking fails when the users cannot reach Internet connection. In order to overcome this difficulty, a separate GPS device can be developed. Together with the development of digital communication radio, users can still continue to use the application. In this version, the usage of smart phone is limited to the role of providing user interface.

Literature Survey

Connection between Mobile Phones

There will be one main application to send the information of the locations to the HTTP server. Inside this main application there will be a small application that directly sends the messages from the sender IP to the receiver IPs as peer-to-peer TCP connection.

The location information -latitude, longitude, etc.- will be read from the GPS device. These data will be converted into the scalar values that represent the values for the latitude and longitude. These acquired data will be passed to the Java-based HTTP Server application. This application will send to these data to the server to inform other users about the location of one of user in map. The Java-based HTTP Server application will be integrated with another application that gets the data from the server and notifies the users about last changes as a real-time source. This real-time GPS based data will be used in the application that shows the map by means of the free GoogleMAP API. After each notification, all users that use our framework in a shared network will be informed about the real-time location of all users. The latitude and longitude information of users will be located on the map which is implemented by using googleMap API.

The transmission of the messages which is another feature of our framework is planned to be transmitted directly between the massage sender and the users that the sender wants to send message. Firstly, the IP of the receiver will be requested and then the message will be transmitted by using the IP of the desired receiver. If the users wants to share their messages globally on their network, then this option will be provided by the main application that sends the latitude and longitude data. Within the Java-based HTTP Server application the type of data will be checked and after that it will be decided that what kind of data will be passed to the other users will be decided.

Our framework also includes a smart function that controls the magnitude of the location change of users (by checking last two GPS based latitude and longitude data) to decide whether the last data is worth to be transmitted to other users. If the change in location is less than the minimal requirement position change, then this location information will not notify other users. Thanks to this function, the unnecessary usage of memory and great number of connection establishments will be prevented.

For further development, we can also hold several data points in our server database to draw a path by using continuous stream of real-time latitude and longitude information. The time when the location coordinates are recorded can also be given with the latitude and longitude information at that time.

References:
http://www.jonathansblog.net/iphone-3g-instamapper-gps-tracking-google-maps-satnav

http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6003963&tag=1

http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4641358&tag=1

http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4068791&tag=1

Gps Technology

GPS made its way into the phones through Motorola and RIM (BlackBerry manufacturer), which were the two companies that first manufactured GPS-enabled phones. Initially, Motorola"iDEN" phones were commonly used for employee tracking on the business-oriented Nextel network. Then GPS enabled Blackberry phones were used by corporate and government VIPs and it began to penetrate the consumer market stimulated by the demand for phones with advanced messaging capability. Today, a variety of GPS-enabled smart phones and tracking services are available on the market.

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. Athough, it was initially intended only for military applications, in the 1980s, the system was made available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day and there are no subscription fees or setup charges to use GPS.

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the device’s integrated map.

Getting Location Coordinates From A Smart Phone

To get the instant coordinates of a current location, we are going to use the integrated GPS of the smart phones. To fetch the instant coordinates of the smart phone, we are going to include a location listener method in our program where we will get the coordinates each time the GPS senses a location change. For different platforms, there are different pre-defined classes to be used to get the coordinates. For example, for the Android platform, in which we are planning to develop our program initially, the LocationManager, LocationListerner and Location classes will be imported and used for that purpose. Following is a part of code that shows how to get the instant coordinate values on a Android device:

```
LocationManager MyLocManager =
(LocationManager)getSystemService(Context.LOCATION_SERVICE);

LocationListener mlocListener = new MyLocationListener();

MyLocManager.requestLocationUpdates(LocationManager.GPS_PROVIDER, 0, 0,
MyLocListener);

public class MyLocationListener implements LocationListener

{

public void onLocChange(Location MyLoc)

{

loc.getLatitude();

loc.getLongitude();

String Text = “My current location is: “ +

“Latitud = “ + loc.getLatitude() +

“Longitud = “ + loc.getLongitude();

}

}
```

Reference:

http://www8.garmin.com/aboutGPS/

http://www.travelbygps.com/articles/tracking.php

http://www.firstdroid.com/2010/04/29/android-development-using-gps-to-get-current-location-2/

Google Map Integration

To develop application Java ME platform will be used. Java ME is a development tool which enables to develop programs for different mobile phones. As a background map Google Maps will be used. Google Maps API for Java ME is available on the internet. It can be reached from following link:
http://www.developer.nokia.com/Community/Wiki/Google_Maps_API_in_Java_ME

Java ME program together with Google Maps API and GPS device will be used and manipulated to serve purposes of the system. The coordinates of users will be taken from GPS and interpreted. After getting latitude and longtitude values, location of users are represented on map by symbols. User will be able to zoom in and out of map. In addition he will be able to look around using directions which might be set differently for different mobile phones such as using fingers for smart phones and number for other phones.

Last few locations of users will be kept in all users' databases in order to guess other people's location in emergency situations.