Identification of Geo location using Smartphone in absence of internet and mobile network.

A mini-project report submitted for

Bachelor of Engineering

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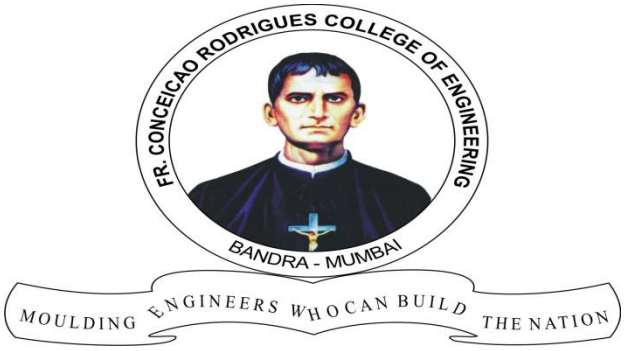

DEPARTMENT OF INFORMATION TECHNOLOGY

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Contents

Chapter 1

Abstract

The location technology has advanced with the rise of the internet era and due to this the protection of privacy has been declining over the years. This report aims to propose a system which will be able to identify the geolocation using a smartphone without internet and mobile network. Normally identifying geolocation needs A-GPS which uses internet service. But using internet leads to security and privacy leaks of the data consisted withing your smartphone. Geolocation can be identified without internet using Smartphone's power consumption data, Global System for Mobile Communications (GSM), GPS Radio. And Short Message Service (SMS), The main reason of departure from existing similar systems is that it is less secure as compared to the proposed system.

Chapter 2

Description

Our phones are always within reach and their location is mostly the same as our location. In effect, tracking the location of a phone is practically the same as tracking the location of its owner. Since users generally prefer that their location not be tracked by arbitrary 3rd parties, all mobile platforms consider the device's location as sensitive information and go to considerable lengths to protect it: applications need explicit user permission to access the phone's GPS and even reading coarse location data based on cellular and WiFi connectivity requires explicit user permission.

Now a days with the rapid increase of Smartphone's devices, there users are also increasing as it becomes a major source of information. It is apparently showing the interest of users in mobile applications that provide storage, analysis and visualization of the information. Most of smart phones equipped with computer processing ability are used to access network and use different applications developed to meet the user requirement via mobile communication network. In last 07 years, different android Mobile applications have been developed including top paid and free apps also some focus on GPS-Global Positioning System are developed.

A Stanford study suggests that location tracking can be done if we can get our hands on the smartphone's power consumption data. It is shown that despite there being Applications restricting access we can covertly learn the phone's location. They can do so using a seemingly benign sensor: the phone's power meter that measures the phone's power consumption over a period of time. This is based on the observation that the phone's location significantly affects the power consumed by the phone's cellular radio. The power consumption is affected both by the distance to the cellular base station to which the phone is currently attached (free-space path loss) and by obstacles, such as buildings and trees, between them (shadowing). The closer the phone is to the base station and the fewer obstacles between them the less power the phone consumes. The strength of the cellular signal is a major factor affecting the power used by the cellular radio. Moreover, the cellular radio is one of the most dominant power consumers on the phone.

Nevertheless, using machine learning, we can see that the phone's aggregate power consumption over time completely reveals the phone's location and movement. Intuitively, the reason why all this noise does not mislead the algorithms used is that the noise is not correlated with the phone's location. Therefore, a sufficiently long power measurement (several minutes) enables the learning algorithm to "see" through the noise. This refers to power consumption measurements as time-series and use methods for comparing time-series to obtain classification and pattern matching algorithms for power consumption profiles. we are able to use machine learning to identify the routes taken by the smartphone based on previously collected power consumption data

As technology progresses, and as it advances many of us think that these advances make us more intelligent and more in control over our lives. There is thus a need to develop applications to get control and determine the whereabouts. Identifying location of moving objects is one of these applications that had evolved over time. In this system the geolocation can be identified

by creating a software which makes use of GSM technology for retrieving the location on the smartphone.

In this paper Identifying geolocation of object moving over a wideopen area environment is designed and implemented. The proposed system is based on GPS and GSM system and avoids the use of the Internet. This is because of the truth that on wide areas the Internet availability cannot be ensured, whereas the GSM network coverage is.

Chapter: 3

Literature Survey

Literature Survey Paper [1]:

PowerSpy shows that applications with access to a smartphone's power monitor can gain information about the location of a mobile device – without accessing the GPS or any other coarse location indicators. Our approach enables known route identification, real-time tracking, and identification of a new route by only analysing the phone's power consumption. We evaluated PowerSpy on real-world data collected from popular smartphones that have a significant mobile market share, and demonstrated their effectiveness. We believe that with more data, our approach can be made more accurate and reveal more information about the phone's location.
The experiment was done in real time using real information for machine learning and real time identification of geolocation was done.

Literature Survey Paper [2]:

In this paper, a tracking system for vehicle motion tracking over wide geographical areas, is designed and implemented. The system is based on the widely available GPS and GSM technologies, rather than the Internet. This is because the Internet service in Iraq is not available widely and it may encounter sudden cuts due to security and governmental related issues. The system consists of a central server and many moving units equipped with smart phones. When a position request SMS is broadcasted to the moving units, they will respond by sending their GPS coordinates (longitude and latitude) to the server. These coordinates are obtained from the free GPS service, therefore they may not be exact. Other sources of inaccuracy are the weather conditions, surrounding obstacles and satellite signal strength. The accuracy of the coordinates obtained by the implemented system is measured over different regions and conditions. A maximum uncertainty of about 16 m is recorded. However, this level of accuracy is fairly acceptable for the implemented system which is designed to track objects moving over wide geographical areas.

Literature Survey Paper [3]:

Smartphone's application changed the way of lives more than nothing especially android mobile applications. In more than 190 countries around the globe millions of Android mobile devices are founded and these numbers are growing day by day. The main reason is the powerful mobile platform which helps the user to create different useful application from games to medical field (developer. Android, 2015). To conclude, this work aims to develop an android application for GPS enable smart phones which provide the current location address to the user and also update periodically to the online web server as far the user is connected otherwise the last updated location address will be store. In case of any emergency the user need one click and alert messages will be automatically transfer to local police station or close relative to inform about emergency and provide the user cur-rent location address. These

contact numbers are also editable so the user can add or delete as many contact number as per user requirement.
As a future work, this application can be developed for different platform like windows, java and iOS.

Literature Survey Paper [4]:

The rapid adoption of smartphones has changed with way we communicate. Smartphones perform far more functions than that of their earlier counterparts and are similar to a desktop computer. The types of data contained within mobile devices is constantly evolving and includes, call history, sms, mms, calendar, email, photos and internet browser history (M2 Presswire, 2012). The introduction of Global Positioning Systems (GPS) into smartphones has further contributed to the range of services available. GPS allows for satellite navigation, geo-location based social networking, personal sports performance tracking, and geo-location targeted advertising. GPS also allows for a smartphone to be located when lost or stolen. Smartphones contain a wealth of valuable information, and with the introduction of GPS into these devices, geo-location data may have significant forensic value in legal proceedings.
As such this analysis will seek to identify how GPS and location based services are used within smartphones and identify any digital artefacts' that are contained within in smartphones. In order to achieve this an attempt will be made to recover geolocation data in a forensically sound manner from an Apple iPhone 4s (iOS) and a Huawei Ascend G526 (Android platform). A comparative analysis will be undertaken to see any variations in geolocation data that is recorded between the two devices.

Chapter: 4

Gaps in Existing Systems

Geolocation is a technology that uses data acquired from an individual's computer or mobile device to identify or describe the user's actual physical location. Two types of data can be collected active user/device-based information and passive server-based lookup/data correlation and then cross-referenced against each other to create the most accurate result.

Mobile geolocation services are pervasive in the "always connected" world. They have introduced innovative, profitable and functional services and applications. With location technology, a user's experience can be uniquely personalized, which appeals to marketers, retailers, government entities, law enforcement, lawyers and, unfortunately, criminals. Despite their many benefits, these services do increase risk to the user, the service providers and those who utilize the data collected by the service providers.

The potential benefits have led many individuals and enterprises to adopt this technology, resulting in more data and personal privacy risk in the virtual network and an exponential increase in the inherent vulnerability for geolocation data across the information life cycle. When someone utilizes an app and its services, there may be multiple data controllers: the service provider, wireless access points and/or developers. Multiple data controllers force users to accede control of the systems that determine and store their location and other personal information. Consequently, users usually cannot identify the source and ownership of data collection. This raises several concerns for users such as how their location data are being used, with whom the data will be shared, whether there will be onward transfer of the data, and the timeline for data retention and destruction. As the use of location-aware apps and geomarketing becomes increasingly pervasive, concerns continue to exist around online privacy—specifically, business practices around the collection and use of the PII.

As the user group grows, continually utilizing new features and creative apps on their mobile devices, the prospect of criminal attacks becomes even more worrisome. Each user's personal information, including race, gender, occupation and financial history, has significant financial value. Therefore, location information is of particularly high value. Information from a GPS and geolocation tags, in combination with other personal information, can be utilized by criminals to identify an individual's present or future location, thus facilitating the ability to cause harm to individuals and/or their property, ranging from burglary and theft to stalking, kidnapping and domestic violence. And the risk of identity theft increases with each collection of PII, especially when the information is not maintained for the purpose of specifically identifying an individual. Technology that can match PII with a user's location presents an additional layer of privacy

concern. In this climate, companies need to think carefully about their geomarketing practices and examine whether their current privacy policies accurately reflect the collection and use of geolocation data.

Criminal activity can take various forms. Physical crime, while more visceral, is likely less prevalent than cybercrime. Major corporations usually store positional data on remote servers. Through IP geolocation data, a user's physical location and computer can be

identified. Using GPS on a computer or mobile device and geolocation tags on pictures and video also reveals personal information such as home, work and school addresses and a daily itinerary. A cybercriminal then can mine personal information (e.g., credit card numbers and government identification numbers) by utilizing social engineering, malware, key loggers and persistent threat mechanisms to steal a user's identity.

Chapter: 5

Proposed System

5.1 Objective:

The objective of our proposed solution is to make an efficient system which can accurately predict the geolocation by collecting power usage data from smartphone devices along different routes taken. various measurements are needed like signal strength, voltage, current, GPS coordinates, temperature, state of discharge (battery level) and cell identifier for the system to work accurately.

5.2 Technology stack:

A. Data Collection

These experiments requires collecting real power consumption data from smartphone devices along different routes. This can be done by developing an android application that collects various measurements including signal strength, voltage, current, GPS coordinates, temperature, state of discharge (battery level) and cell identifier.

B. Assumptions and Limitations

Exploring the limits of our process, i.e. establishing the minimal necessary conditions for it to work, is beyond our resources. For this reason, we state the assumptions on which we rely in our methods. We assume there is enough variability in power consumption along a route to exhibit unique features. Lack of variability may be due to high density of cellular antennas that flatten the signal strength profile. We also assume that enough communication is occurring for the signal strength to have an effect on power consumption. This is a reasonable assumption, since background synchronization of data happens frequently in smartphone devices. Moreover, the driver might be using navigation software or streaming music. However, at this stage, it is difficult to determine how inconsistent phone usage across different rides will affect our process.

C. Real-time mobile device tracking

The evaluation simulates the conditions of real-time tracking by serially feeding samples to the algorithm as if they are received from an application installed on the device. We calculate the estimation error, i.e. the distance between the estimated coordinate and the true location of the mobile device at each step of the simulation. We are interested in the convergence time, i.e. the number of samples it takes until the location estimate is close enough to the true location, as well as in the distribution of the estimation errors given by a histogram of the absolute values of the distances.

D. State of Discharge (SOD)

The time derivative of the State-of-Discharge (the battery level) is basically a very coarse indicator of power consumption. While it seemed to be too inaccurate for our purpose, there is a chance that extracting better features from it or having few possible routes may render distinguishing routes based on SOD profiles feasible. Putting it to the test is even more interesting given the HTML 5 Battery API that enables obtaining certain battery statistics from a web-page via JavaScript. Our findings demonstrate how future increases in the sampling resolution of the battery stats may turn this API even more dangerous, allowing web-based attacks.

E. Collecting a massive dataset

Collecting a massive dataset of power profiles associated with GPS coordinates is a feasible task given vendors' capability to legally collect analytics about users' use of their smartphones. Obtaining such big dataset will enable us to better understand how well our approach can scale and whether it can be used with much less prior knowledge about the users.

Chapter: 6

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