CHAPTER -1

Introduction

1.1 Chapter Overview

In this chapter, aims at introducing the synopsis, increment data mining methods for GSM/CDMA network navigation analysis, as well as the Geographic’s information of play important role GSM/CDMA network navigation analysis, Further, the motivation and problem addressed by this work are presented.

1.2 Motivation and overview

In India, mobile phone has become a big part of the mobile user's life today. With over 1052.33 million (February 2016 ) [275] mobile user, mobile phone subscribers in India today and having the second largest subscriber base in the whole world. The development of digital switching and information technologies made modern cellular telephone systems feasible. The cooperative standards of cellular systems are valid for any PLMN (public land mobile network) [269][127]. The booming revolution in information technology sector has pushed the India’s telecom market significantly [11]. India has shown fantastics growth in past few years in terms of cellular device services [4]. Since past few years users prefer wireless mode of communication services to wire line(land line) services [164]. Cellphones are a immense very improvement over the telecommunications technology of the past, and now become an important asset in today’s busy life[12]. Cellphones have become the necessity in today’s competitive environment to meet the emerging global economy [145].

Cell phones device, also known as mobile phones, cellular device or wireless phones, are hand-held phones with built-in antennas. They can be carried out anywhere any time. Cell phones are actually two-way radios (Full duplex communication mode), much like the walkie-talkies of the past, when someone talk into cell phone receiver[4]. It registers voice and converts the sound waves into radio waves. These waves travel through the air & reaches to a receiver, which is usually found at a base station [181]. This base station will then send your call through
a telephone network to the actual destination. & vice versa There are a number of electronic personal devices that are labeled mobile devices on the market today [182]. Mobile phone devices include cell -phones, smart phones like the Apple iPhone and Blackberry, Samsung, Miromax, Nokia, LG, Korban ,Spice LAVA, HTC ,Niket , many more company working in this filed , personal digital assistants (PDAs), and digital audio players such as iPods and other MP3 type devices. Laptop computers, tablets and iPad products are not typically classified as a mobile device as they are not small enough to be considered handheld [77].

In today, the increasingly popular Smart-Phone comes with a storage capacity that is similar to a laptop while commonly utilized as a portable office, social network and entertainment center all rolled into a solitary, convenient device[63]. A smart-phone is a mobile device that provides advanced computing and offers the ability to run mobile applications with more internet connectivity options than a cellular phone [49]. Technical, hi-tech and storage capacity for cell phone devices has grown exponentially. Over the last ten year, capabilities and features of cell phone devices have turned them into data repositories that can store a large amount of both personal and organizational information [175].

Telecommunication is one of the first industries to adopt data mining technology and real time increment data mining (GSM /CDMA/ network analysis, on the call site measurement) [31]. Companies generate a tremendous amount of data. These data include call detail data, which describes the calls that traverse the telecommunication networks, network data customer data [202]. To handle this large amount of data and to discover useful information from this data the automatic or semi-automatic method should be used as it simplifies the work and the data mining fits for these criteria. Incremental pattern discovery is an online summarization process [155].

Cellphone move or movement of objects are becoming increasingly attractive to the data mining community or researcher due to continuous advances in technologies like GPS, cellphone technology ,laptop ,computers, and wireless communication devices [17]. In this research we use a compact representation of a cellphone trajectory and define a new similarity measure between trajectories[250]. We propose an incremental clustering algorithm for finding evolving groups of similar mobile objects in incremental CDRs data[61]. we focus on incrementally increase CDR
data and social network data, identifying receive signal strength movement, alpha beta & gamma regarding to tower network structures of the data as the patterns and monitor them over time. [294].

Network data knowledge discovers search for identify four major types of patterns: Associations, Predictions, Clusters and Sequential relationships [73]. These types of patterns have been manually extracted from data, increasing of cellular communication volume of data in modern times has created a need for more automatic approaches [58]. As datasets have grown in size and complexity, direct manual data analysis has increasingly been augmented with indirect, automatic data processing tools that use sophisticated methodologies, methods, and algorithms [75]. Data mining technology is must for telecommunication companies which describe the telecommunication users [132]. Competition in the cellphone telecommunications industry is attractive more and fiercer [276]. In order to improve mobile operator's competitiveness and customer value, several datamining technologies can be used. One of the most important datamining technologies is user clustering analysis [220].

Increment data mining approach in this research mainly describes the datamining process for fulfilling rapid emergency response in GSM/CDMA network. The major application for wireless communications has been speech[277]. Wave communication have been around for many decades, but the capacity of these systems has been very limited[192]. These wave communication networks consisted of only a few base stations (BSs) with which mobile units communicate, and each BS covered a large geographical area[270]. The number of simultaneous calls inside the area covered by one BS was restricted to the number of channels available for this BS[243][128].

The GSM (Global System for Mobile Communications),) & CDMA (Code Division Multiple Access) technologies[101][102]. Data mining techniques seek to find new information about a domain through a combination of existing domain knowledge[286]. These techniques can either be manually performed by an expert, or automated using software algorithms (CDR)[130][249]. Modern mobile networks including GSM/GPRS networks over faster and more versatile communication services for the network subscribers. As a result, it becomes more
and more challenging for the mobile network operators to enhance the usage of available radio resources in order to meet the expectations of the customers[206].

Mobile networks collect vast amounts of measurement information that can be used to monitor and analyze the network performance as well as the quality of service[2]. In this research, the application of various data-analysis methods for the processing of the available measurement information is studied in order to provide more efficient methods for performance optimization [138].

Recent technological advances in cell phones and the incremental development of smartphones have led to increased user and dependence on the cell phone. The bang of its use has led to troubles such as fraud, criminal use and identity theft which have led to the need for mobile phone cellular network GSM/CDMA analysis. Mobile phone analysis, what it means, who advantage s of it research [211].The use of advanced technology is the use of scientific techniques and values to provide evidence to legal or related investigations within this field. These involve the use of specialized scientific apparatus, special technique and algorithms. Cellular device phone scientific examination is the science of recovering digital facts and figure from a cell phone under sound conditions using conventional process. Digital scientific has grown rapidly due in part to the increase in cell phone devices [50].

Scientific examiners commonly initiate with cell phone numbers dialed, answered, received call or missed call, stored cell phone numbers of people whom the cell phone user may know and text messages sent MMS send, received or deleted, Wap service use[29]. Cell phone capabilities boost in performance, storage ability and multimedia functionality turning cell phones into data reservoirs that can hold a broad range of personal information from an analytical viewpoint[45], digital facts recovered from a cell phone can provide a wealth of information about the user, and each technical advance in capabilities offers greater opportunity for recovery of additional information[91]. Cell phone examination is a challenge as there is yet no de facto cell phone different operating system (Android, iOS )[253]. They are a means of communication that is not traceable, because there is no signed contract with the network provider for the authorities to trace [186]. Cellular device applications and feature are being
developed in a rapid pace. MS office application such as word processors, spreadsheets, and database, scientific GPS bas map, road map, Bluetooth operating application; based applications have already been ported to cell phone devices [93].

The cell phone’s capability to store, view, send and print electronic documents transformed these devices into mobile offices[117]. The capacity to send and receive Short Message Service (SMS) messages also transformed mobiles into a message centre[158]. SMS was further upgraded to Enhanced Messaging Service (EMS) and saying some added features while the latest upgrade to Multimedia Messaging Service (MMS) added support for multimedia objects and faultless combination with email gateways that enabled users to send content rich emails using the MMS service[252]. In addition, technologies such as ‘drive email’ and always on connections added handiness and powerful communications capabilities to mobile devices[184]. Drive email provided users with instant email notification and download capability, where when a new email arrives; it is instantly and actively transferred by the mail server to the email client, in this case, the mobile phone[183]. This in turn made the mobile phone an email storage and transfer tool [225].

The number of cell phone network subscriber’s increment constantly. At the same time, more efficient network technologies (2G, 3G, and 4G and Future technology 5G) are developed in order to provide faster and more advanced data communication services for the subscribers. As a result, the current and new network technologies operate in parallel, making cost-effective network management more and more challenging. The network operator should be able to manage the radio resources to meet the current as well as the future demand without expensive investments to infrastructure [14].

Mobile phone communication data analysis has been often used as a background application to motivate many technical problems in data mining research, such as mining frequent patterns and clusters on data streams[266], Cell phone social network analysis, collaborative altering and recommendation[228]. However, very few data mining researchers have a chance to see a working data mining system on real mobile communication data[44]. The lack of this experience prevents those researchers from deeply understanding the business
application scenarios in mobile communication as well as the successes and the limitations of the existing techniques [190] [3].

1.3 Need of the study and Problem statement

Cellular device base crime, in such an area of technical advancement is like a rebuke to Science. World is going towards a high-tech globalization and mobile phone plays a prominent role in, saving the time by providing communication[51]. As the business operations and our daily activities are getting more robust and smarter [108]. India including the world does not have such a good GSM/CDMA CDR data base navigation system that can help one to navigate suspects. Mobiles phones are one of the few most valuable properties of any one that can have in terms of economic value, so ever been an area that needs constant improvement [169]. If any person hold a cell phone device that mean, person hold geo information this information retrieve through network CDR data, but some time emergency situation need to geographic movement information real time. Today the demand for cell phone device and network CDRs data scientific stems from mobile phones being employed for such functions as to store and transmit both personal and corporate information [176].

Use of cell phones device in online transactions ‘wireless application protocol (WAP) enabled’ the use of cellular device in online transactions. Technologies such as digital wallets (E-Wallet) added convenience to online transactions using a cellphone [221]. Further enhancements in connectivity and security of mobile devices and networks enabled cell phones to be used securely to conduct transactions such as, online shopping, stock trading, e-ticket, real time transaction, mobile banking and hotel reservations and checking and flight reservations, rail reservation, technical education seat allotments, and confirmation[99].

Data collected from mobile electronics such as cell phones has the potential to aid research in a wide variety of fields from predicting GSM/CDMA network CDR traffic patterns to studying air quality[213]. But how can researchers balance personal privacy and the desire to take full advantage of real-time data analysis technologies in this segment, we'll talk about the potential benefits offered by such data collection and about the risks to privacy, that the time of need research in this area call detail records is the evidence of Geo information, the most
important thought to remember is that a cell phone always holed geo information to be shadow [185]. This geo information is private and sensitive but some time need to identify this geo information some cause based or some legal cause based, what the call detail record contains, call detail records supply the information for each call attempt data filed[111].

The research topic” Increment, data mining methods for mobile GSM/CDMA network navigation analysis “Increment meant online real time GSM/CDMA geographic data, that data increase every time because geographic movement uncertain, unpredicted but these data is increase every minutes and geo movement NEWS ( North, East, West, South,) change the direction ,Cell ID (Base Station, Tower ) 360 degree radius movement , these data identify more difficult ,data mining method help to CDR knowledge discover, predict pattern analysis, data base navigation, Cell ID base navigation, CDR relationship, CDR analysis[84]. In this research identify increment data and apply data mining methods, GSM/CDMA navigation to sound concrete solution[271]. Law enforcement and forensics investigators have struggled to effectively manage digital evidence obtained from mobile devices. Cell phone device navigation is the process offline and online recovering information data from a mobile device under the sound conditions and utilizing acceptable methods [240]. The following region to need research in this area:-

1.3.1 Clone of identity GSM/CDMA networks

On the GSM /CDMA network, an identity is based on two numbers, first is the IMEI number, which is bound to a specific phone. This number can usually be found by pressing “*#06#” on the phone, but it is also located under the battery, and it also appears on the bill when purchasing the phone. In case a cell phone is stolen, you can contact your network provider, and have that exact phone blocked on all networks. Second is the other number is the IMSI number this number is tied to the SIM card, which again is tied to the individual owner of that SIM card. Both the IMEI and the IMSI number are used to identify the phone, when it connects to a signal transmitter [16].

The application simply has to call the Telephony Manager library, and then use the getSubscriberId()function to get the IMSI number[1]. In theory the app could then silently
transmit these numbers to a remote server, and a criminal would be able to alter these on to another phone[112]. It is in fact illegal to alter the IMEI number this is because the only apparent reason to alter the IMEI number is if the phone was stolen and blacklisted. But organized criminals like terrorists may be interested in obtaining IMEI and corresponding IMSI numbers to hide their identity and to make it harder for the authorities to trace them [258]. There is no authentic way to control the phone by the IMEI number, it is only possible to copy the cell phones identity and then abuse the original owner’s cell phone payment bill. The only control that is possible, comes from the phone operators, they can block the access to the GSM/CDMA network making the phone unusable [227].

(i) Fake IMEI

The cell phones coming out of China have been known to have fake IMEI nuber or nil zero IMEI numbers, this fake a threat because it makes it complex for authorities to tracing the calls[217]. With fake IMEI numbers there is no exact number for how many cell phones with the same IMEI, and when authorities try to trace the IMEI it will locate more than one mobile making it nearly impossible to implement which phone made the call(MD Bhawan) [170]. This fakes a threat as this obtained by many terrorist groups as it makes them nearly invisible to the authorities.

(ii) IMEI number cloning

There are various different ways to mistreatment the IMEI number. Suspect person can clone the cell phone by IMEI and the IMSI numbers, these are used make an ‘Copied’ cell phone, this will look like the cell phone that has been hackneyed[214], though it does not have to be the same mobile model are have the same operator SIM card. Now the criminal who hacked the cell phone can make expensive calls to any kind of fake company created by the criminal. Now expensive calls cost the offended loads of money on the phone bill, and is hard to prove how and when the offended did not make the calls [233].

1.4 Increment data and real-time data mining

Knowledge detection as a field covers techniques for finding and significant new information about a area or data field, using gathered area data or existing field knowledge. The
field partially originated from studies into how to use large volumes of information to derive new and meaningful information [53]. The word uses this thesis “Increment “that meaning real time data increment GSM/CDMA network , data create increment order (like peak hours) , this data 2G,3G ,future data 4G, focus this research identify that increment data. In this thesis, we study’s GSM/CDMA networks increment and real-time data mining dealing with multi BS datasets for emergency response systems in GSM/CDMA networks(S BOLOHAN)[238]. The tasks of real-time data mining are to determine the permitted range of values of some parameters (e.g. Cell-ID, IMEI, Call party BS), to detect abnormal events (e.g. Crime investigation) [230].

The motivation is to reduce various existing problems in traditional emergency response simple management etc. we review real-time data mining in GSM/CDMA network and case study used for emergency response. Cellular network or mobile phone forensics is an ever-evolving field filled with challenges and opportunities when analyzing a mobile device for forensic evidence in support of a criminal investigation[65].

1.5 Objectives of the research

Cell phone networks GSM/CDMA have been always an major interested area of research, locations navigation, CDR data , is an important issues under which so much research work is going on these area ,some of the related research work carried out the navigation.GSM/CDMA network big area of research. Many location tracking and positioning algorithms have been developed over the ten years to tackle the problem of determining location [20]. Since each was implemented to perform a different aim, they vary broadly in many parameters with accuracy, cost, and cell mast size, configurability, security, and reliability, analysis application. This research study area is multidisciplinary and few researches interested in this area.GSM/CDMA network localization, traffic analysis, or otherwise stated the determination of the geographical position of the cell phone mobile receiver or callers, have attracted great interest over the last ten years.

The absence of innate mechanism for localization initially challenged many researchers. However, the complicated propagation phenomena, which increase the degree of difficulty, intensified that challenge. Various methods have been proposed last ten year for the solution of
the problem. Some of them methods have been standardized, while others have not, these methods differ in many ways. Just to mention a few, these include the parameters they are based on (e.g., time of propagation, received signal power measurements), where measurements and the location calculations take place, the need for handset and or network modifications, the accuracy achieved, etc. This is research focus on Madhya Pradesh, India crime investigation or crime analysis use cell phone technology GSM/CDMA.

In this research describe different type of cellular GSM/CDMA network increment parameter of the CDRs data, CDR data-analysis methods; GSM/CDMA network social parameter data. In the crime investigation CDR (Call Detail Record), Tower analysis (Base Station) play important role. If we don’t know suspected person then tower analysis is important. To collect tower details Base station (BS), call detail report (CDR) is useful. Cell track is one of the innovations in tracking active cell IDs at the crime location. For investigation of crime where in no clue or data is found call track plays a vital role in drilling investigation. It provides active cell ids, hardware detail (IMEI) of any given location and helps officers in reaching the criminals[218].

In this research we use a compact representation of a mobile trajectory and define a new similarity measure between trajectories[239]. Suspect network CDR Increment data is group of naksalied, group of illiage mining, group of docket ,Group of bikesr , group of smugglers etc[121]. We had designed new incremental algorithm by maintaining infrequent mobility patterns, which avoids unnecessary scan of full database[146]. Incremental data mining algorithm taken lesser time to compute new mobility patterns. The discovered location patterns can be used to provide various location based services to the mobile user by the application server in mobile computing environment [109].

We choose to classify these according to the parameters they are based on. In particular, we split them into methods relying on time of propagation measurements, received signal power measurements, and angle of arrival measurements and the alarming situation of cellular GSM/CDMA identification and its security concern focuses an important branch of crime in terms of illegal cellular use & cellular robbery. This research captures an innovative data analysis on the CDR (Call Detail Record) increment data, find the methodology GSM/CDMA CDRs analysis:-
1.5.1 Main Objective

(i) To find the increment parameter in GSM/CDMA impact of the CDR base navigation service parameters on investigation satisfaction. First, we propose an algorithm to capture the suspect CDRs. unsupervised data mining on suspect GSM/CDMA network analysis and navigation, correlation in social network with the suspect, frequent user moving patterns from a set of log data in a cellphone environment. The algorithm proposed is enhanced with the incremental mining capability and is able to discover new moving suspect knowledge, correlations of other person efficiently with valuables information of the suspect. We propose an incremental clustering algorithm for finding evolving groups of similar mobile objects in network data.

(ii) To find a CDRs analysis algorithms for the investigation satisfaction, we propose a algorithms to CDR data analysis and navigation of multi BTS(CellID) suspect moving patterns and the properties of data objects, allocation schemes that can utilize the knowledge of suspect moving patterns for proper other analysis applicable of individual or groups of suspect, which explore different levels of mining results, are devised: one utilizes the set level of moving patterns and the other utilizes the path level of moving patterns.

(iii) Call Detail Analysis with meaning full data visualization.

1.5.2 Sub Objectives

(i) To find out the CDRs parameter investigation on data mining process

(ii) To find out the association of call party and called party suspect relationship satisfaction.