

DATA MINING METHOD USE IN CRIME INVESTIGATION NETWORK CDR ANALYSIS

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Abstract— In this research paper it is based on the GSM/CDMA network analysis along with data mining. This research based on conceptual modelling for GSM/CDMA network analysis methods models, and graph transformation techniques to support sound methodological principals, for formal analysis and fine-tuning. With conceptual model and real level of modelling and simulation, the approach could sound support application development and the research of GSM/CDMA network. GSM/CDMA network data-analysis methods for the processing of the available measurement information is studied in order to provide more efficient methods for performance optimization, CDRs Play vital role of the crime investigation and his is important of the metadata analysis the uses of measurement prediction, information in selection of most useful optimization action have been studied. This research work is the improvement of a new CDR network determination method for the localization of a mobile receiver in a cellular communications environment.

Keywords— GSM/CDMA, Network, Navigation, Modelling, Simulation.

I. INTRODUCTION

In India, mobile phone has become a big part of the mobile user's life today. With over 1052.33 million (February 2016) [1] mobile user, mobile phone subscribers in India today and having the second largest subscriber base in the whole world. The cooperative standards of cellular systems are valid for any PLMN (public land mobile network) (Tarmo Anttalainen 2003) [2][3]. The booming revolution in information technology sector has pushed the India's telecom market significantly (AA Deoskar 2011) [4]. India has shown fantastic growth in past few years in terms of cellular device services [5]. Since past few years users prefer wireless mode of communication services to wire line(land line) services (M PALANI 2014)[6]. Cellphones are a immense very improvement over the telecommunications technology of the past, and now become an important asset in today's busy life Cellphones have become the necessity in today's competitive environment to meet the emerging global economy (J Chan Cell) [7]. There are a number of electronic personal devices that are labelled mobile devices on the market today [8]. Mobile phone devices include cell -phones, smart phones, 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 [9].

II. PREVIOUS WORK

In this work research information about CDR data mining and network navigation use in crime investigation, location technologies is hardly ever found in any books researcher study to find the work of CDRs used in crime investigation is a novel work, it is a secrete work hidden some parameter of

research, few researcher his work focused on network location estimation these researcher not focused on crime investigation used in CDR, this literature review researcher examine AOA, TDOA CellID etc compare algorithms(L. Xiong)[10] , All researcher discus cellphone users' behaviours and location estimation group clustering or network clustering but our focussed to CDR base distance ,suspect behaviours in BTS, Increment data mining methods to fulfil researcher objective research[11].

II. NETWORK CALL DETAIL RECORD

Network communication navigation analysis is the term of the position of a cellphone device in the network is derived by correlating the location of cellphone, cell phone tower with call detail records belonging to a cell phone (Hardware device) suspected of being present during a crime sport CDRs, cell tower (BTS) and Cell ID antenna information is obtained. This information store in CDR and format of the CDR depend on TSP (Telecom service provider. Table no.1 shows the general view of the CDR format.

Table-1 Call detail record format

Call Party A	Call Party B	Time	Duration	IMEI No	Type
9893107037	9669900744	14:23:25	06:23	*****	IN
9893107037	9755002059	14:05:12	05:45	*****	IN
9893107037	9826841318	14:18:14	04:18	*****	OUT
9893107037	9893233386	14:12:09	02:14	*****	IN
9893107037	9669900744	13:33:01	02:02	*****	IN

In the table no.2 show short descriptions of CDRs field parameters, it helps to guide GSM/CDMA navigation analysis, each parameters play important roll identification of geo position, that place made or received call.

Table 2 Short description of CDRs formats

Sr.No.	Parameter	Description
1	Calling	calling no is who number is that this made to call another number
2	Called no.	This the number of receiver
3.	Date	Date
4	Time, Duration(s)	Called and Received duration
5	Cell1	Called Party
6	Cell2	Received Party
7	IMEI	International mobile equipment Identity number
8	IMSI no	International mobile subscriber Identity number
9	Type	Incoming /Outgoing
10	SMSC	Massaging center
11	Roin NM	N/W

III. METHODOLOGY

The proposed research methods CDRSS work proposed consists of two distinct steps. **First step-** A CDRs analysis methods using particular time period BTS or cell ID CDRs analysis for the location of the suspect navigation, distance estimate and behaviours analysis. **Second step-**Increment Network CDR data mining Analysis and navigation, the accuracy of the first step via the utilization of an advanced Cell-ID MS signal strength propagation model. Now BTS (Cell ID) denoted by CT

CT_i [Where CT is Cell Tower $i=\alpha,\beta,\gamma$]

CEID provide the direction of the Cell ID where the suspect (α, β, γ) region. In order to extract meaningful information from these large stores of data and extract the classified data for the interpretations, need to first order to uniform different CDR data to process to analysis

MCDR Algorithms -1

- Step1: Collection of CDR data {? alpha,beta,gama}
- Step2: Identify the parameter to CDR process according (Time, Period or Duration, Type).
- Step3: Data normalization and merge because different telecom service provider CDR format is different and this step all CDR data gather and mage to one file format to CDR analysis and navigation process.
- Step4: Format CDR Sorting to the Parameter
- Step5: Applies the operation to CDR analysis and navigation Method
- Step6: CDR data Visualization
- Step7: GIS MAP
- Step8: Report

(a) Target Number Analysis

The TNA (IMSI) is predefine identified number, it is knowledge to discover all things regarding to about the suspect's information, behaviours, relationship, address, Long duration time called and received, Short duration time called and received, Maximum & Minimum BTS location, Suspect Cell ID information and correlation of crime scene & social activity. Figure 1 show model of Target Number analysis

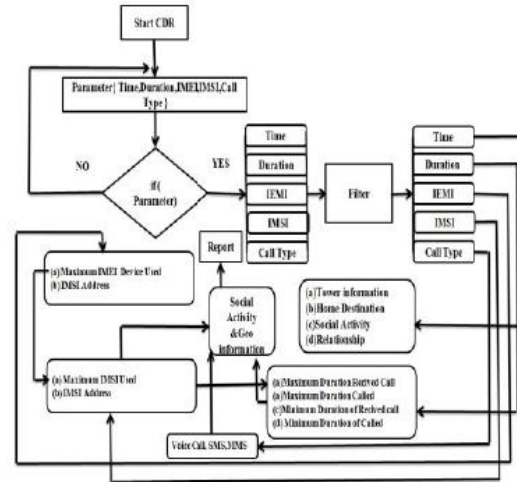


Figure 1 TNA CDR Analysis

(b) Tower and Cell ID Analysis

BTS CDR data is collection of identify geographic area with time period large amount of data. For example the telecommunications service provider a data of MP state, Airtel, BSNL, Reliance, Tata Docomo, Vodafone, Idea network, and identify geographic area all company network are available. The particular time network different BTS cell ID CDR data cannot to be easily processes to data mining because various telecom service providers CDR formats is different. In that condition MCDR algorithm apply and clustering data, different parameters. According the equation (1) alfa beta gama. Figure 2 show the BTS cell ID analysis and navigation model this is need to analysis is following point of view.

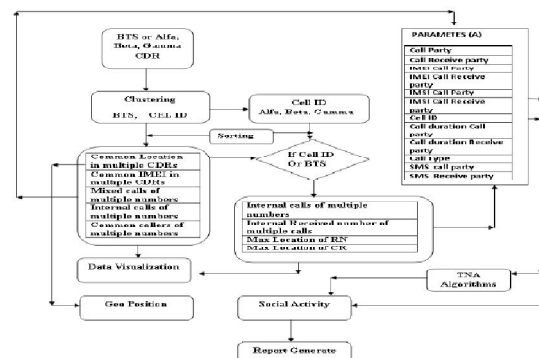


Figure 2 Towers and Cell ID Analysis

- (i) Common Location in multiple CDRs,
- (ii) Common IMEI in multiple,
- (iii) CDRs Mixed calls of multiple numbers,
- (iv) Internal calls of multiple numbers,
- (v) Common callers of multiple numbers
- (vi) All CDRs parameters
- (vii) MaxDRN Maximum duration received & call number
- (viii) MinDRN Minimum duration of Received & call number
- (ix) GPR Geo Position of Received & Call Number

(x) Social activity

SECOND STEP

GSM/CDMA network cell identification (Cell-ID) navigation analysis, where the cell, which is cell phone is registered. This information is available in the network and at the cell phone. Cell-ID is then converted to a geographic position using knowledge of the operator's network, such as coverage database at the serving mobile location centre (SMLC). **CDR_{SMLC}** (Where CDR SMLC serving mobile location center), **Cell size power density CS_{MS}** (Where Cell Size Mobile Station (Cellphone)), Cell size Power density P_d at a distance R is given by $P_d = (P_t \times G_t / 3.1428 \times R^2)$ watt/m² (where, P_t = Transmitter power in Watts, G_t = Gain of transmitting antenna, R = Distance from the antenna in meters). To measure the power at a distance R , an antenna is used to receive the power and a power meter is used to measure received power. Power Received P_r by an antenna at a distance R is given by: $P_r = P_t \times G_t \times G_r \times (\lambda / 4 \times 3.142 \times R^2)$ λ , Electromagnetic waves travel at the speed of light (299,792,458 meters per second), **CS_{MS}** Cell size Power density P_d at a distance R , $\text{Max } P_d = \text{ERSS} - \text{RSS} = \text{Max } P_d - \text{Max } P_r * \text{ERSS}$ (Where ERSS calculate ASU port Experiment base).

IV. SIMULATION AND EXPERIMENTAL RESULT

The BTS CDR is collection of different Cell ID incoming and outgoing cells IMEI, IMSI number data. TA analysis finds the correlation between one or more BTS tower. Internal calling between towers or Cell ID, Calls under tower, Relation of calls party between different towers. table-3 show the detail of CDRs

Table3: Short Detail TA CDRs

Sr. No	No. Of CDR file	Tower Location	Sat e	Data (alpha, beta, gama)	Total
1	Airtel	RS II.abd	MP	251,386,397	1034
2	Vodafone	RS H.bad	MP	477,4763,3258	8498
3	Tata	RS II.bad	MP	553,1769,1469	3791
4	Reliance	RS II.bad	MP	4111	4111
5	BSNL	RS H.bad	MP	443,159,118	720
6	Idea	RS H.bad	MP	222,61,35	318
Total					10972

- (a) Suspect cellID and cellphone analysis
- (b) MCDR Clustering
- (c) Suspect duration base analysis
- (d) Suspect time period analysis
- (e) Clustering suspect and Suspect friend analysis
- (f) Suspect cellID and friend analysis

Consider cluster the pattern of usage in Figure 3 (a) & (b) and (e) & (f) shows time usage primarily on indentify parameter p in the hours. One possible explanation of this is that cluster of suspect are calling as they travel period to and after, the work

of crime. To investigate this hypothesis, we attempt to identify the calls made by suspect (figure 5.1) use activity cellphone device in criminal where there the phone is in transit. Figure (c&d) is visualize Vodafone cdr and analysis of time.

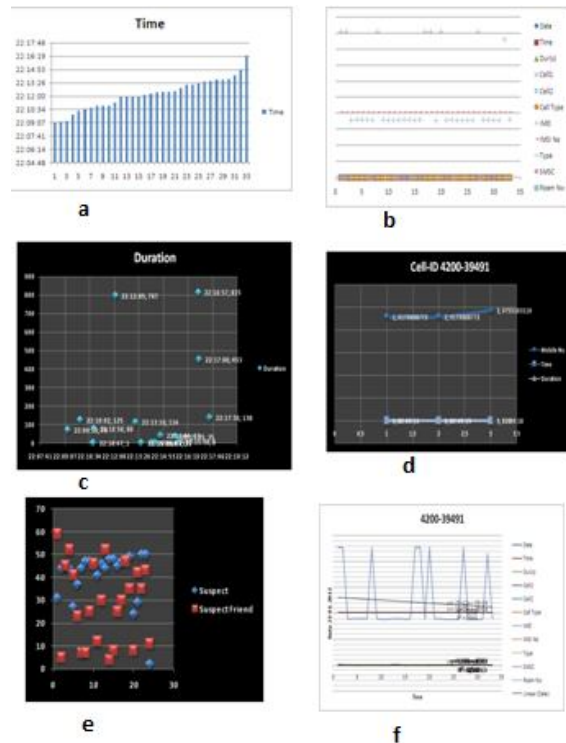


Figure 3 CDR data analysis

CDRs CellID up to 18 different antennas involved in a voice call. seem to suspect involve of differed cell ID, match data (according the figure5.1 (e) and analysis (f & f) than (h) clustering suspect and suspect friends data Since we know that even a stationary call can be carried on 5 different cell towers (a tower is a fixed location that typically houses multiple antennas), we use a conservative rule: if a call encounters at least 3 unique towers.

CONCLUSION

In this research work is novel contribution of the research work, present research guide the research how to made CDR data analysis research framework, this is research work to guide and indication the new field of the future research. First of all, the previous research approach is only logical experiment in the BTS or network location estimation, that is could not support to CDR data analyst where the data to be transferred for analysis are the pre-aggregated call profiles instead of the raw GSM/CDMA data. This research work brings out comparison of various technological options for selection of GSM/CDMA network navigation methods and their application. This research used graph transformation methods for the simulation. This helps the build to advance GSM/CDMA CDRs analysis navigation, the selection

of appropriate technology. Researcher is providing an innovative CDR base suspect navigation in particular BTS analysis. Previous researcher discussed many methods for cellphone navigation, few methods use to logical location or forecasting of the cellphone user position in particular BTS or tower. CDR data mining methods fine tune for the suspect network navigation. Different CDR data mining algorithms support to various scientific view of the suspect network navigation analysis. This increment data the navigation accuracy level increase, CDR is a primary information of suspect geo movement of particular BTS or CellID, researcher algorithms single number or multiple number algorithms is to help and navigate suspect behavior, geo movement, calling pattern, correlation of suspect, previous research discuss only location calculation different point of view they are no mention to CDR base suspect location navigate, researcher fulfilled the object of GSM/CDMA network navigation and analysis.

FUTURE SCOPES

Cellphone digital data and network data (like CDR) such, investigation is a reactive field, and as such future trends in cell phone network CDR analysis are largely dependent on trends in the cellphone industry. Cellphones are becoming much more capable and CDR data it can more incremental growth with WAP application cellphones with greater functionality are the expanding market. The term smart phone is ceasing to be relevant as it becomes the standard. For network investigation and analysts, this is positive for two reasons, cellphone will have greater capability and hence will contain more potential evidence, and the industry is stabilizing to a smaller number of core operating system platforms. The primary scopes of the present research are as follows:

- (i) Criminal suspect monitoring and nature prediction
- (ii) Advance Police Control System
- (iii) Prevention of misuse of cell phone
- (iv) Miscellaneous Applications after implementation.

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