CDR and TD analysis using Data Mining

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ABSTRACT

Cell phones acts as an basic entity in any of the crime scenes. With the help of approriate tools finding the possible suspect/criminal can be an easy task. CDR (Call detail record) and TD (Tower Dump) can play an important role in finding the possible suspect. Here the call records of the area are been checked with the help of TD located at that specific area(where crime has occured),which uploads the data on to the database. The frequent caller is been identified by using APRIORI and K-Means Algorithms. A GUI is been developed,where the records are been obtained,if the suspect changes the SIM or Mobile Phone,with the help of specific tools,the data about the changed sim or mobile can also be obtained. Finally the output from the above process will help the police to find out possible suspect easily.

Keyword: -*CDR; TD, Apriori, K-means, and GUI; SIM.*

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1. Introduction

Crimes are on verge. For crime activities criminals make use of cell phones for communication. Keeping this in mind, police take resort to analyzing of these cell phone records for finding clues in crimes when no situational witnesses are found.

Tower dump of the crime site is recorded and analysis of this tower dump data of this data is done for extracting suspicious numbers based on some significant and suspicious traits. After obtaining these numbers the police record the Call Detail Record for these numbers and thereon continue with the analysis for finding out suspicious relevancies in the data. This analysis on both Tower Dump and Call Detail Record Data is done in a manual manner. Where every numbers is found and analyzed for its occurrence in the data and then such numbers whose occurrence seems suspicious are found. Our paper aims at performing this analysis in an efficient way and providing results to the user.

The CDR and Tower Dump data being vast, it is quite difficult to sort and analyze manually. Also the policemen who are the ones to accomplish this task are not trained computer users. Hence an application which is very easy to operate but efficient to function is needed to help them analyze the records according to their perspective.

2. Related studies

In an existing system Criminal network investigation involves a number of complex knowledge management tasks and both humans and software tools play a central role in performing such tasks. A crime investigation is an official effort to uncover information about a crime. In recent years the number of crime cases has been on a rise. The traditional and age-old system of intelligence and criminal record maintenance has failed to live up to the

requirements of the existing crime scenario. This age-old system is also time consuming as Police or other Crime department officers have to manually analyze these big databases of hundreds and thousands entries and come to a firm conclusion. There are existing system that analyse the CDR for billing purposes. But these systems haven"t built by incorporating the perspective of the police, and hence cannot be used for analysis crimes.

In our Proposed system helps in obtaining the suspects number by providing the enhanced functionalities of the Tower dump and CDR. The advantage of this system is that it reduces the time require in analyzing the CDR"s and Tower dump.We propose a swift response system which can identify the most probable local suspects involved in a crime case, by analyzing the relevant case histories. We have looked into the mobile call detail record of the suspects and the victims to understand their presence in the crime scenario. Records of cell tower and crime scene have been analyzed to track the real perpetrators. With the knowledge of suspect's journey to crime about the movements of people in the crime scene, we are able to model the system and to understand the probable suspects involved in the crime. Prediction techniques are used to filter and identify the different types of people present at the crime scene. To solve the case at a rapid pace, we have mapped the current location of the probable suspects using mobile GIS. We are also evaluating Tower dump database of the particular area in which crime scene occurred. And from tower dump database we can identify the suspects. We have also evaluated the methods used in this system in comparison with traditional methods.

3. Data mining

In simple words we can say that Data mining is the practice of examining large pre-existing databases in order to generate new information.

The process of using data mining methods (algorithms) to extract (identify) what is deemed knowledge according to the specifications of measures and thresholds, using a database along with any necessary preprocessing or transformations. To be simply stated data mining is the process of retrieving knowledge from the database[2].
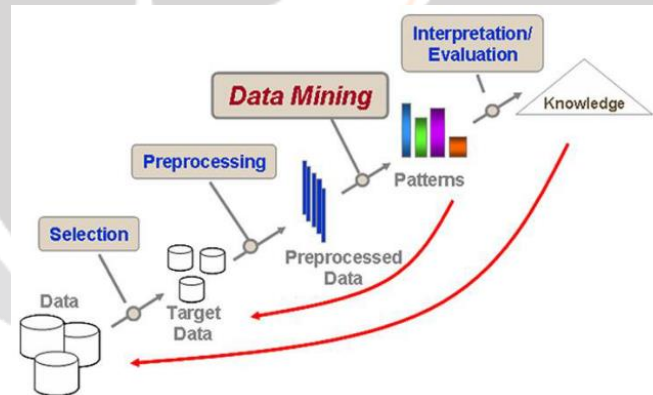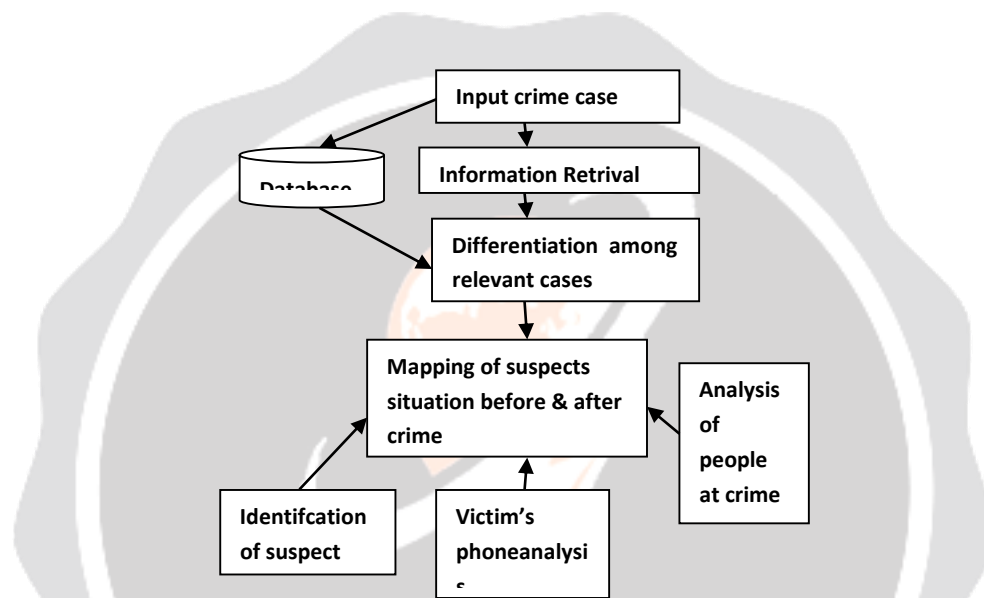

Fig. 1 Data mining process

3.1 Clustering

Clustering is a process of partitioning a set of data (or objects) into a set of meaningful sub-classes, called clusters. Help users understand the natural grouping or structure in a data set. Used either as a stand-alone tool to get insight into datadistribution or as a preprocessing step for other algorithms.

3.2 Frequent pattern Analysis

A Frequent pattern is a pattern (a set of items, subsequences, subgraphs, etc.) that occurs frequently in a data set and further we analyse these frequent patterns to acheieve possible outcome.

4. Proposed system and methodology

We propose a swift response system which can identify the most probable local suspects involved in a crime case, by analyzing the relevant case histories. We have looked into the mobile call detail record of the suspects and the victims to understand their presence in the crime scenario. Records of cell tower and crime scene have been analyzed to track the real perpetrators. With the knowledge of suspect's journey to crime about the movements of people in the crime scene, we are able to model the system and to understand the probable suspects involved in the crime. Prediction techniques are used to filter and identify the different types of people present at the crime scene. To solve the case at a rapid pace, we have mapped the current location of the probable suspects using mobile GIS. We are also evaluating Tower dump database of the particular area in which crime scene occurred. And from tower dump database we can identify the suspects. We have also evaluated the methods used in this system in comparison with traditional methods.

Fig, 2 System block diagram

4.1 Input crime case

Whenever some crime happens in a perticular area the Crime Investigation Officer inputes the crime case into the software. It is the first step towards the investigation of the crime.

4.2 Information Retrival

Here we are going to find out brief description of the crime which includes details about location,date of occurrence of crime. Table 1 shows a description of the features that are extracted from a given input crime case. The features are selected such that these features can be mapped to any type of crime incident.

FEATURE	DESCRIPTION
Name	Names of people and organizations.
Location	Location of occurrence of crime.
Type of crime	Crime types such as Murder, Kidnapping.
Date	Date of occurrence of crime.
Time	Time of occurrence of crime.
Period of day	Period of the day as to Morning, Afternoon
Day of week	Day of the week when the crime is reported

Table 1 Description of features extracted[1]

4.3   Differentiation among relevant cases

Here we are going to find out relevent cases using K-means clustering algorithm. With the help of clustering algorithm the cases that are related to each other are gather in one cluster so we can easily neglet other cases and focused on perticular cases to find out possible suspect.

4.4 Mapping of suspect situation before & after crime

The journey to crime of suspects, who have previously committed crimes in the crime scene are then visualized[1]. Simply,here we are going to analyse suspect activities before and after crime to relate him/her with the crime.

4.5 Analysis of people at crime site

The mobile users at crime site are then classified with the help of K-means clustering algorithm. The significant features for clustering such as the number of calls made by the caller, caller's idle time, time and duration of calls etc[1]. This information can fetched by analyzing Call Detail Record (CDR) of relevant crime region.

4.6 Victim's phone analysis

Here we are going to use Apriori Algorithm for frequent pattern analysis. Here our main aim is to find the most frequent callers and callee and generating frequent item sets.

4.7 Identification of suspect

Here we are going to find out possible suspect with the help of Particle Swarm Optimization(PSO) algorithm[1]. PSO is applied to applied to the list of suspects based on suspect situation before and after crime and to the clusters obtained from K-Means clustering algorithm, to find the possible suspects.

5. CONCLUSIONS

The CDR and Tower Dump analysis system is the data analysis system for finding relevant patterns in the Tower Dump and Call Detail records. It will help in revealing the suspicious number and thus help in further investigation. Instead of having two different systems for the analysis of these two different records, we combine it into a single system that can help the users analyze these two records at once.

Association rules amongst the different records can be revealed. System provides integration with maps, where the different locations of callers can be tracked.

Most importantly the system is very simple and easy to use, which removes the barriers of requirement of efficient technological skills and thus making it beneficial for the crime department officers to handle.

6. ACKNOWLEDGEMENT

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