

Intellectual Crime Recognition System

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ABSTRACT : In many countries the amount of crime incidents that is reported per day is increasing significantly. Concerning about India, the department of Police is the major organization of preventing crimes. In general, Indian police stations utilize paper-based information storing systems and they don't employ computer based applications up to a great coverage. Due to this utilization of paper-based systems police officers have to spend a lot of time as well as human resources to analyze existing crime information and to identify suspects for crime incidents. So the requirement of an efficient way for crime investigation has arisen. Business Intelligence practices are one aspect of crime investigation, for which numerous techniques are available. This paper highlights the use of business intelligence techniques, clustering and classification for effective investigation of crimes. Further the paper aims to identify suspects by analyzing existing evidences in situations where any witness or forensic clues are not present.

Keywords -Business Intelligence, Classification, Clustering, Crime Identification, Data Mining

I. INTRODUCTION

It is very difficult to find a country which has a crime-free society. As long as human beings have feelings they bring round on attempting crimes. So the present society has also packed with various kinds of crimes. Conversely the criminals in today's society use various advanced technologies and give crimes in a really diplomatic ways. So that crime investigation has become a more complex process than early days[1]. The Police Department is responsible for enforcing criminal and traffic law, enhancing public safety, maintaining order and keeping the silence. Alternatively Crime investigation has very significant role of police system. With the increased complexity of crime investigation process police officers have to tolerate a lot of pressure than early days. The most incredible risk for the police department is investigating crimes with the current technologies, because they still use conventional instruction manual processes to handle crimes that are doing with the use of advanced technologies[2].

Therefore, police needs such a crime analysis tool to catch criminals and to remain ahead in the endless race between the criminals and the law enforcement. The police should use the current technologies to give themselves the much-needed perimeter. Availability of relevant and timely information is of extreme necessity in conducting of daily business and activities by the police, particularly in crime investigation and detection of criminals. Police organizations everywhere have been handling a large amount of such information and huge volume of records. There is an urgent need to analyzing the increasing number of crimes as approximately 18 lakhs Indian Penal Code (IPC) crime, and 39 lakhs local and Special Law crimes per year[3].

II. CHALLENGES AND APPROACH

An ideal crime recognition system should be able to identify crime patterns quickly and in an efficient manner for future crime pattern detection and action. However, in the present scenario, the following major challenges are encountered[4].

1. Increase in the size of crime information that has to be stored and analyzed.
2. Problem of identifying techniques that can accurately and efficiently analyze this increasing amount of crime data.
3. Different methods and structures used for recording crime data.
4. The data available is inconsistent and are incomplete thus making the task of formal analysis is a far more difficult.
5. Investigation of the crime takes longer duration due to complexity of issues.

All the above challenges motivated to focus on providing solutions that can enhance the process of crime identification and reducing crime in India. The main aim of this approach consist of developing analytical data mining methods that can systematically address the complex problem related to various form of crime[5]. Thus, the main focus is to develop a crime recognition system that assists the police in

1. Detecting crime patterns and performs crime analysis
2. Provide information to formulate strategies for crime prevention and reduction
3. Identify and analyze common crime patterns to reduce further occurrences of similar incidence

III. DESIGN OF THE SYSTEM

There are currently several methodologies for data mining which we can be used in many application fields. Data mining is a powerful tool that enables criminal investigators to cross-examine huge databases quickly and efficiently. The processing speed of computer aided applications range to several thousand code lines per second which helps to optimize time factor in such analysis. Data mining and decision support systems have a significant role to play in providing assistance to human assumption in this forensic field that creates one of the most challenging decision-making environments. Geographical information systems and social network analysis are utilizing data mining technologies for tasks like identification of crime networks, usage of matching semantics on crime and criminals and finally producing the results of confirmation of findings[6].

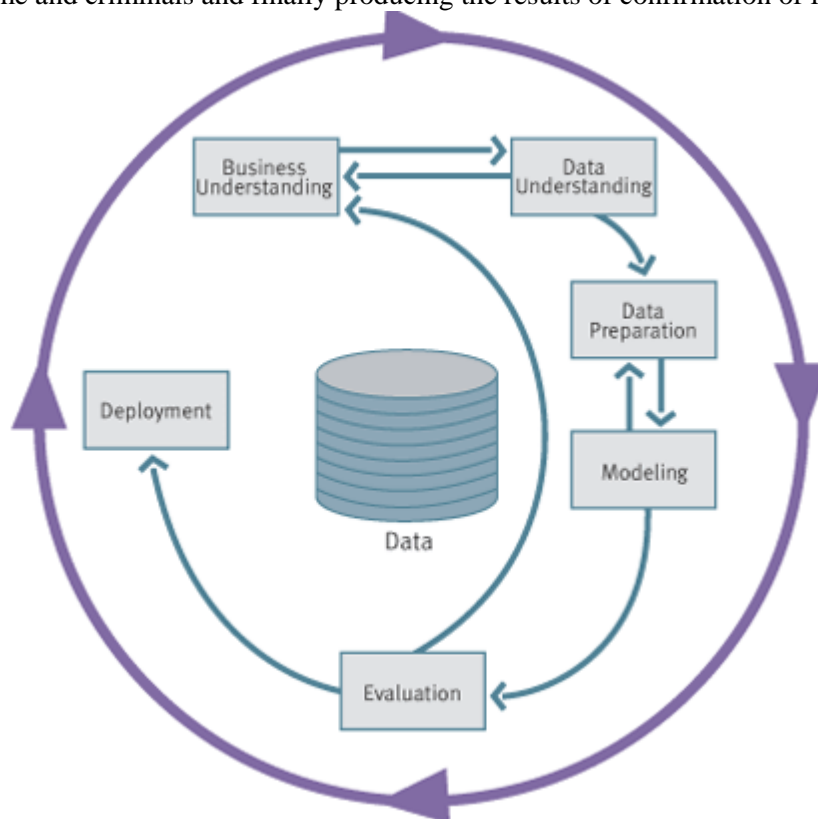


Fig. 1 The process model for data mining provides an overview of the life cycle of a data mining project.

Data mining process model consists of six steps:

1. Business Understanding
2. Data Understanding
3. Data Preparation

4. Modeling
5. Evaluation
6. Deployment

The relationships between particular phases are illustrated on Figure 1.

Data Mining is the process of extracting useful knowledge from data. Criminal Intelligence Application (CIP) is used in many ways for investigation of individual crimes, as well as criminal networks. The steps for crime investigation are also similar to steps for crime data mining. The police methodology for investigation uses case based interpretation techniques. From this viewpoint, all data sources used by the police can also be the source for crime data mining[7]. The crime investigation process therefore can be organized into the following five steps:

1. Collecting crime data,
2. Processing and storing crime data & documents,
3. Searching, retrieving, collecting additional information,
4. Analyzing information to find clues,
5. Using information to prosecute criminals.

The present approach proposes the use of combination of data mining techniques that are linked with a common aim of developing such a crime recognition tool. Data preprocessing techniques are mainly used for producing high-quality mining results. Raw data are being preprocessed before mining because data are in different format, collected from various sources and stored in the data bases and data warehouses[8]. Major steps involved in data mining are data cleaning; data integration, data transformation and data reduction have shown in Figure 2.

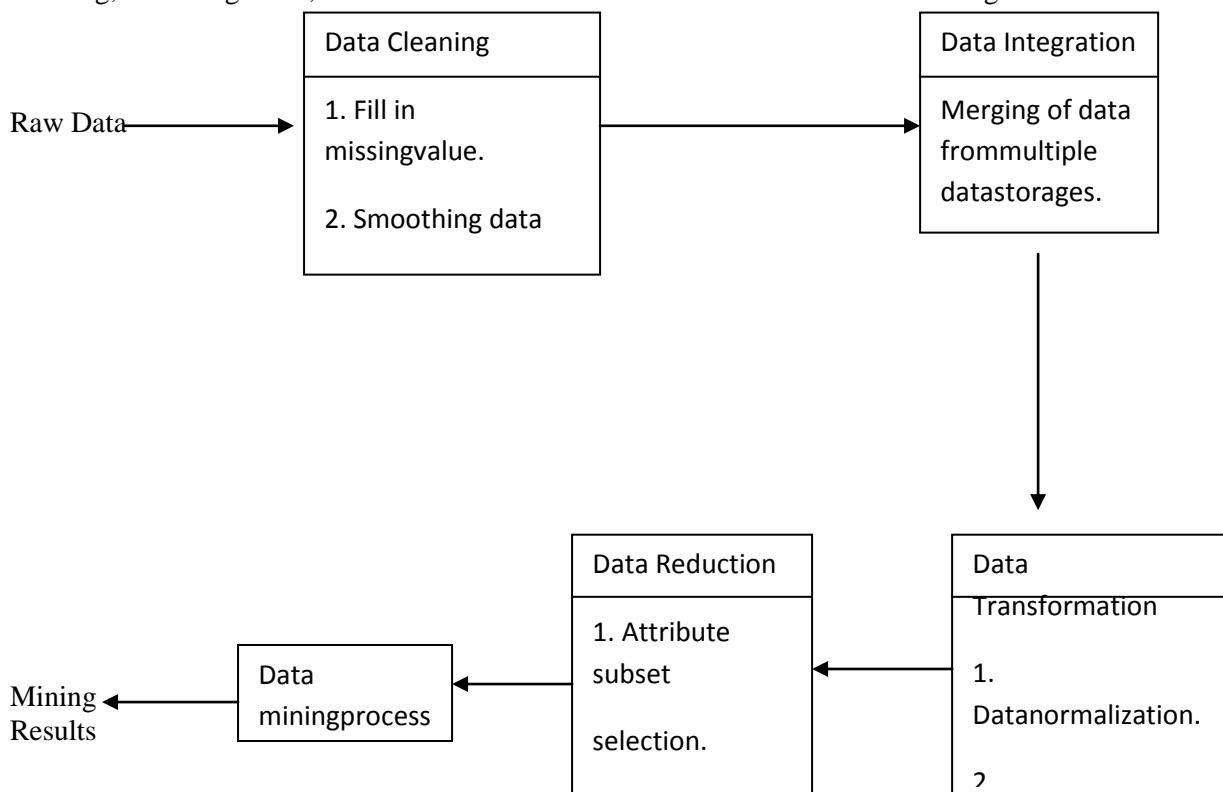


Fig.2. Data preprocessing

In the data cleaning step, omitted values will be filled, noisy data will be smoothed, outlier's data will be removed and incompatible data are determined. Data integration step undergoes integration of data. Data normalization and attribute construction are done in the data transformation for standardizing data. Attribute subsets are selected from large dataset and dimensionality has

reduced. After preprocessing, finally standard data undergo the process of mining and hence better results have obtained. For this purpose, the following specific objectives were formulated[9].

1. To develop a data cleaning algorithm that cleans the crime dataset, by removing redundant data.
2. Use techniques to fill omitted values in an well-organized manner.
3. To explore and enhance clustering algorithms to identify crime patterns from historical data.
4. To explore and enhance classification algorithms to predict future crime behavior based on previous crime trends.
5. To develop anomalies detection algorithms to identify change in crime patterns.

IV. PROPOSED IMPLEMENTATION OF THE SYSTEM

Crime Recognition Tool can be divided into several components in order to describe the system clearly. Fig. 3 shows those components and how they are interconnected within the system.

4.1 User interface

The user interface is one of the most important parts of any program because it determines how easily a user can interact with the program. The purpose of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals. As a powerful program with a poorly designed user interface has very little value, the process of designing user interface must be done very carefully. User interface, which is one of the components in Crime Recognition Tool, consists of all the web pages of the system that are displayed to users through a web browser[10].

4.2 MVC Architecture

Model-View-Controller architecture is used for interactive web-applications. This model minimizes the coupling between business logic and data presentation to web user. This model divides the web based application into three layers. It is a hybrid approach for serving dynamic content. It combines the use of both Servlets and JSP.

4.2.1 Model

Model domain contains the business logics and functions that manipulate the criminal record data. It provides updated information to view domain and also gives response to query. And the controller can access the functionality which is encapsulated in the model.

4.2.2 View

View is responsible for presentation aspect of application according to the model data and also responsible to forward query response to the Servlet controller. As Java Server Pages (JSP) are used for the implementation of User Interfaces. User input validations, for example validating user id and password and displaying error messages when validations are failed were also easily implemented using JSP 2.0. All the widgets in user interfaces such as input fields, buttons and menus were developed using JSP's. Ajax APIs has used to update the components when they have finished processing the algorithms.

4.2.3 Controller:

Controller accepts and intercepts user requests and controls the business objects to fulfill these requests. An application has one controller for related functionality. Controller can also be depends on the type of clients.

Though MVC comes in different flavors, the control flow generally works as follows:

1. The user interacts with the user interface in some way (e.g., user presses a button)
2. A controller handles the input event from the user interface, often via a registered handler or callback.
3. The controller accesses the model, possibly updating it in a way appropriate to the user's action (e.g., controller updates crime record). Complex controllers are often structured using the command pattern to encapsulate actions and simplify extension.

4. A view uses the model to generate an appropriate user interface (e.g., view produces a screen listing the crime contents). The view gets its own data from the model. The model has no direct knowledge of the view. (However, the observer pattern can be used to allow the model to indirectly notify interested parties, potentially including views, of a change.)
5. The user interface waits for further user interactions, which begins the cycle anew.

4.3 Database

Database stores all the crime and criminal information as well as the patterns or the clusters of crime incidents.

Moreover it stores the details of Crime Recognition Tool System's users as well. To implement the Oracle Database Express Edition can be used. After successfully creating the database we can configure the database connectivity of the application server (WebLogic Server) by configuring a JDBC data source and then deploying that JDBC resource to the application server [11].

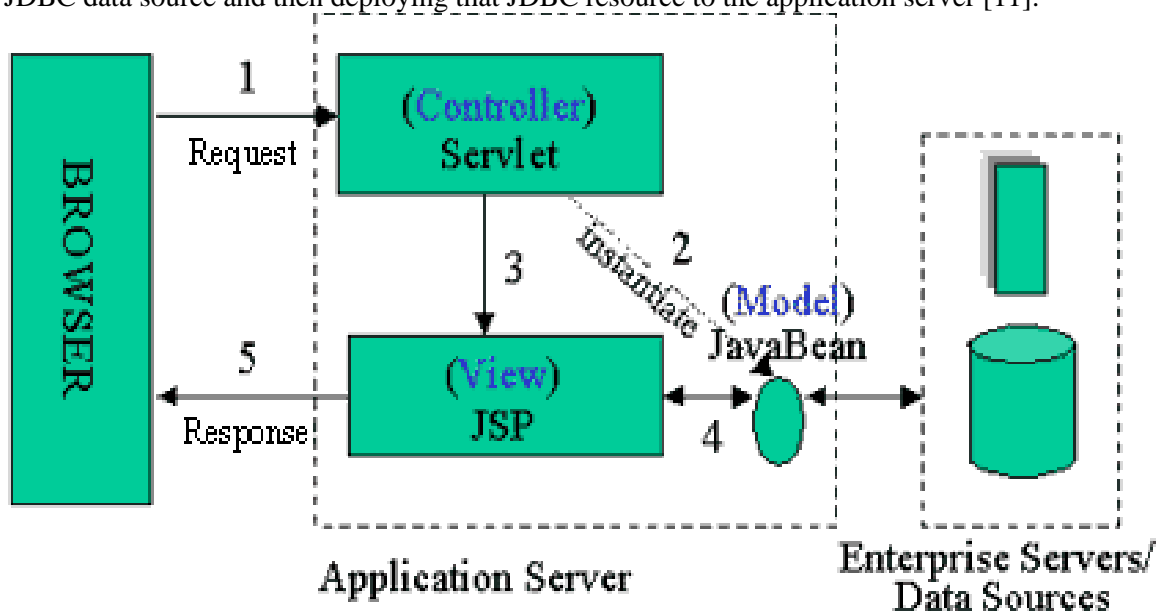


Fig.3. MVC Architecture

V. CONCLUSION

In today's IT enabled era many techniques are available for crime prevention and investigation. This paper presents a methodology of recognizing a criminal record by using existing evidences in situations where any witness or forensic clues are not present. The system uses an unambiguous clustering mechanism to fragment crime data into subsets, or clusters based on the available evidences and classification techniques has used to recognize most possible suspect/ suspects for crime incidents. Data mining supports enhanced decision making and analysis, and is a powerful tool that can be used to address the large volume of crime information. Data mining practices is one aspect of crime investigation, for which numerous technique are available. The system has used the communication power of multi agent systems to increase the efficiency in identifying possible suspects.

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