

# GIS IN CRIME ANALYSIS

M.A.P.Chamikara

*Board of Study in Statistics and Computer Science*

Crime data collection and dissemination is a cyclical and an on-going process due to the increased frequency of crime incidences in all around the world. Crime information has become vital for conducting crime analysis. The vast geographical diversity and the cognitive biases of the criminals have made crime analysis a very difficult task (Giles and Brian, 2011). To address this complex issue, many computer based methods are being practiced in police departments all over the world. In crime analysis, both qualitative and quantitative techniques are used to analyze crime data in a more effective manner (Chen *et al.*, 2004). Qualitative data and analytical techniques refer to non-numerical data analysis where it helps to discover underlying meanings and patterns. Quantitative analysis is based on data primarily in numerical or categorical format. Quantitative data is used primarily in the sense of statistical analysis. Crime analysis employs both Qualitative and Quantitative analysis of data and techniques which depend on the analytical and practical need.



Figure 01: Crime Mapping



Figure 02: Crime Hotspot Detection

GIS (Geographical Information Systems) which is one of the very effective quantitative data analysis methods which have become one of the best technologies used nowadays by these security institutions to improve the crime investigation quality, because maps have the power of offering crime analysts the crime related issues in a notion of graphical mechanism. GIS facilitates the modeling of the workflow of a crime and captures its best practices. The location where crimes or activities occur and the relationship of those places to one another and to other information is an important factor in crime analysis (Chamikara *et al.*, 2012). It is not only important where a crime takes place but also the characteristics of those places and the environment in which the crime occurs. Thus, examination of spatial data such as streets networks, parcel information, orthophotographs, school locations, business and residential zoning, among others, is imperative for effective crime analysis. Simple maps that display the locations where crimes or concentrations of crimes have occurred can be used to help direct patrols to place where they are most needed. Policy makers in police departments might use more complex maps to observe trends in criminal activities, and maps may prove invaluable in solving criminal cases. Digital maps are the quickest means of visualizing the entire crime scenario. The locations of crime events, arrests, etc. can be routinely displayed on maps. This provides an easy method of viewing activities in an area rather than searching through a list of events. Maps can also be used to convey more than one type of information at a time. Crime locations can be symbolized according to the day of week, type of crime, modus operandi (a particular suspect's method of operation when committing a crime) or frequency (Agrawal *et al.*, 1993).

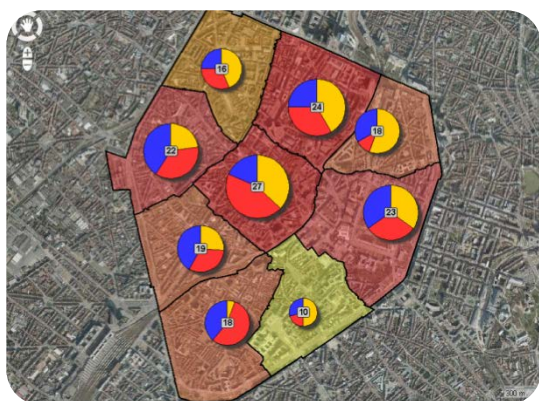


Figure 03: Geographical Crime Comparison

In addition, mapping and GIS can support community and problem oriented policing. Mapping and GIS can show detailed relationships between the crime, victim, and the offender. Some other very important aspects of mapping and GIS are, showing of demographic and population changes, assisting in resource allocation, integrating data from community and government sources, providing effective communication tools. Figure 01, Figure 02, and Figure 03 depict the graphical interpretations of the three applications, crime mapping, crime hotspot detection, geographical crime comparison respectively. GIS aids crime analysis also by identifying and highlighting suspicious incidents and events that may require further investigation. Supporting patterns and trend analysis across multiple jurisdictions, enhancing the implementation of various policing methodologies to

reduce overall crime and disorder, and integrating traditional and non-traditional law enforcement data to improve overall analysis are few other very important applications of GIS which aids the crime analysis process in a drastic manner. One other very important facet of GIS is educating the public with visual information to clarify crime concerns and enlist community action, providing tools and techniques to capture crime series and forecast future crime occurrences (Koperski and Han, 1995).

Primary goal of law enforcement is anyhow to prevent crimes through the methods other than apprehension. Therefore, GIS lends itself particularly well to assist for crime analysts towards the need of crime prevention of many security institutions.

#### References:

- Agrawal, R., Imielinski, J. and Swami A. (1993). Mining Association rule between sets of items in large databases, *Proceedings of the ACM SIGMOD International Conference of Management of Data*, New York: Association for computer machinery, 207-216.
- Chamikara M.A.P., Yapa, Y.P.R.D., Kodituwakku, S.R. and Gunathilake, J. (2012). SL-SecureNet: Intelligent Policing Using Data Mining Techniques. *International Journal of Soft Computing and Engineering (IJSCE)*, 2(1), 175-180.
- Chen, H., Chung, W., Xu, J. J., Wang, G., Qin, Y. and Chau, M. (2004). Crime data mining: a general framework and some examples. *Computer*, 37(4), 50-56.
- Giles Oatley and Brian Ewart (2011). Data mining and knowledge discovery. *Wiley Interdisciplinary Reviews*, 1(2), 147-153.
- Koperski, K. and Han, J. (1995). Discovery of spatial association rules in geographic information databases, *Proceeding of the 4th International Symposium on Spatial Databases, Advances in Spatial Databases*, 47-67.