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Crime Mapping Analysis: A GIS Implementation in Madurai City

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Abstract: ***Crime analysis is a law enforcement function that involves systematic analysis patterns and trends in crime and disorder. Crime analysis also plays a role in devising solutions to crime problems and formulating crime prevention strategies. Crime analysis identifies the distribution of the crimes to challenges faced by the police department that pursue to implement computerized crime mapping systems. This report highlights the importance of identifying the thematic map created for the urban crime prone areas that can be utilized by the police department. GIS can be used as a tool to identify factors contributing to crime, and thus allow police to proactively respond to the situations before they become problematic. The Geographical Information system (GIS) is used to create the crime maps and through which mode we are giving the solution for the society or environment using the crime analysis we are getting the Hotspot. Hotspot means the area where the concentration of Crime is more can be found. Using Hotspot analysis technique we can easily identify the high intensity crime occurring area. This research has provided valuable information concerning crimes in Madurai city.***

Keywords: Crime analysis, GIS, Hotspot, Systematic analysis pattern, Crime Mapping

1. Introduction

Crime analysis mapping is the process of utilizing the geographic information system possessing together crime analysis techniques to concentrate on the spatial context of crime and other law enforcement procedures. Maps offer graphical representation of the crime and its related issues. To improve the fact of fighting crime one must understand why and where the crime took place. Patrolling can be improved by providing the maps displaying the crime location or the area where the concentration of crime is high. A map consisting of trends of criminal activity, high density areas, and temporal information can be very much useful for the policy makers of the police department. The term hot spot has become an integral part of the study called crime analysis and has is popular with most of the analyst. A hot spot as the name suggests is a state of indicating some arrangements of clusters in a spatial distribution. Nevertheless, not all clusters are hot spots since the environments that provide existence crime; the residence places are also apt to be clusters. The cluster of geographical areas consisting of habitually high number of crime events are known as Hotspots. It will help to easily determine the site where the action can be taken. GIS based hot spot identification in the criminal cases is to precisely state the characteristics of criminal cases, the use of spatial analysis tools and techniques of criminal case which had took place to determine the spatial model, hot form of calculation action. There are different classes of Hotspot detection such as Spatial Analysis, Interpolation and Spatial Autocorrelation for finding out the Crime Hotspot.

2. Study Area

We have selected Madurai City for our research work as it is an International tourist place because Meenakshi temple and Samanar Caves, and many more. Madurai district comprises of 12 Taluks and 756 villages, covers an area of 3,741.73 sq. km. with the population of 30Lakhs. It lies in between latitude 9˚30'N - 10˚30'N and longitude of 77˚00'E - 78˚30'E. Madurai Municipal Corporation is the Prime planning organization consisting of four zones. Madurai corporation zones or boundary limits are taken for crime analysis for our study. Mapping and Analysis of Crime inMadurai Citywith a population of 1254206 as per census 2011. Its total area is nearly 147.977sq.km.Madurai is the major city in the state of Tamilnadu in southern India. Madurai is the second largest corporation city by area and third largest city by population in Tamilnadu and the 31st largest urban agglomeration in India. Madurai is an important industrial and educational hub in south Tamilnadu.Madurai is one of the cultural city in south india and lots of ancient monuments are discovered. So it is one of the main and favourite tourist city for the touristers.

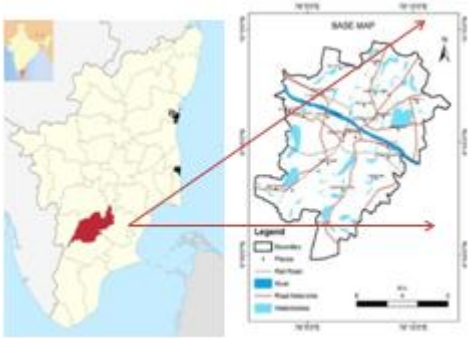


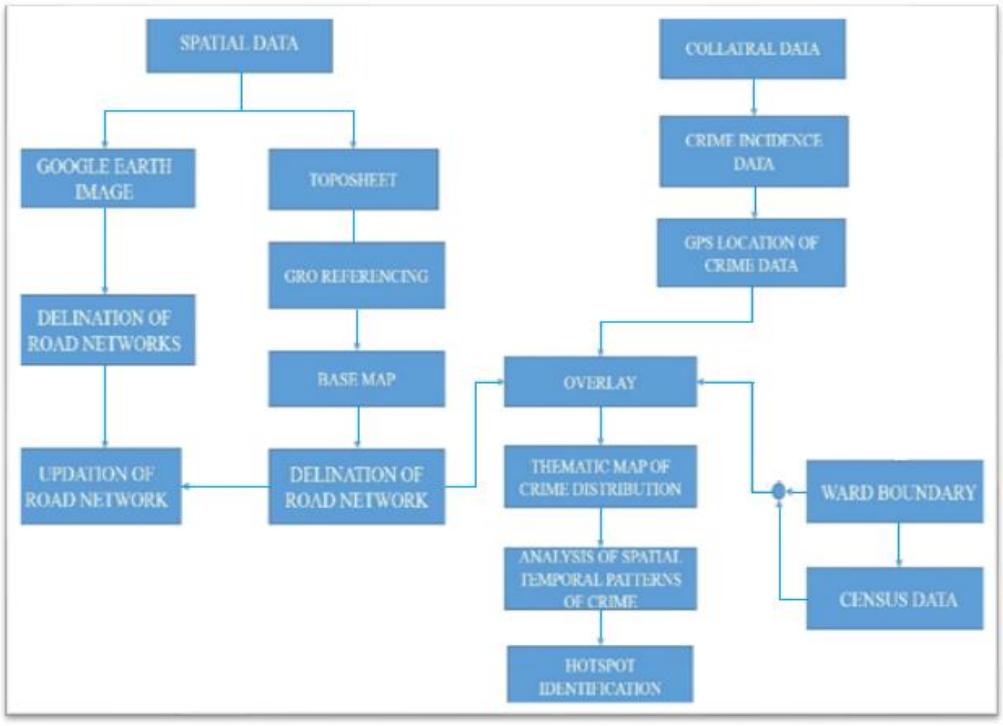
Figure 1: Study Area Map

3. Materials and Methodology

Toposheet of madurai district with the scale 1:50,000 is collected from the SOI. Crime incidences are collected from the Superintendent of police office, madurai city. Population density from the census data were collected. After that Geo referencing the toposheet using Arc GIS 10.1 and the base map were prepared with the help of Google Earth images for settlements updates. Create the Study area boundary or

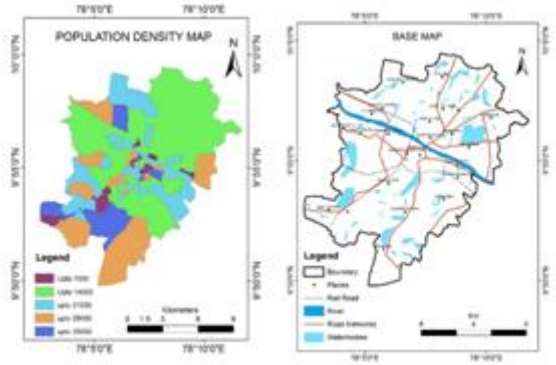
Madurai corporation Boundary for plotting the crime incidences.

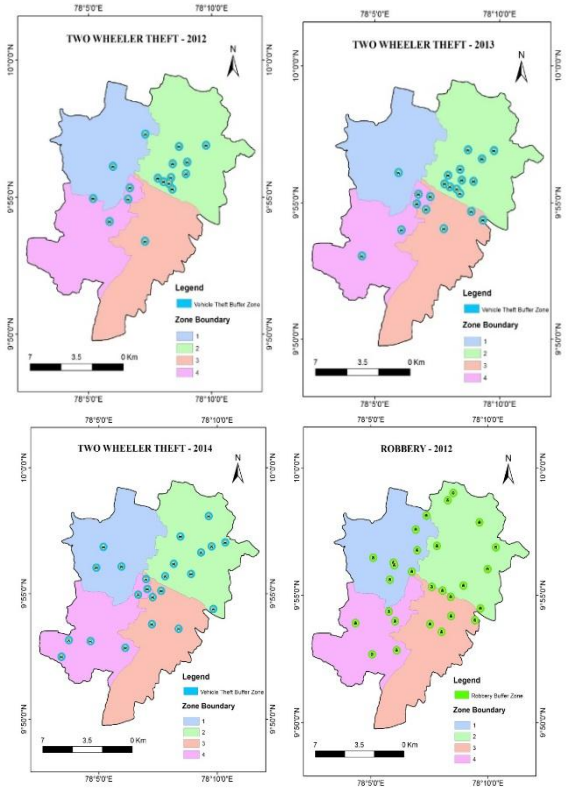
Plotting the crime incidences with their locations using ArcMap. Using that crime incident shape files we are getting the hotspots of individual crimes, from that crime data we get the crime rate of the for each zones using algorithms. Now we are gettting each crime rate density for each crimes and it is showed by table representation for easy identifications. Maps were prepared for the hotspot location analysis.

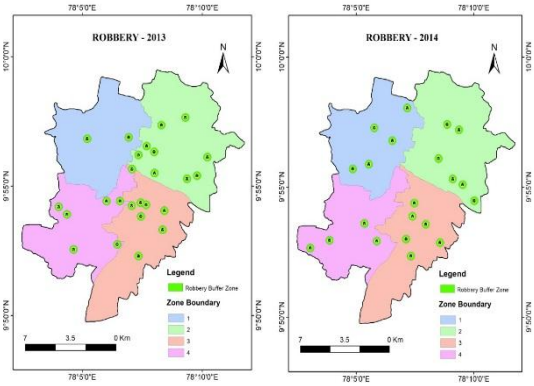


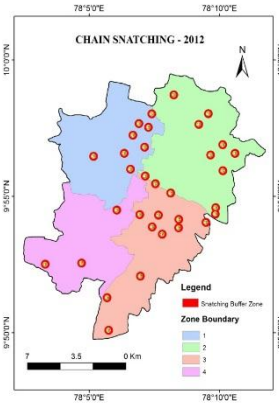
4. Results and Discussion

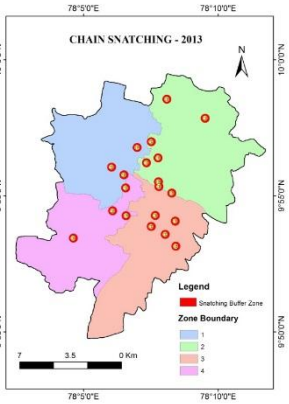
Base Map for the study area were prepared for plotting the crime incidences. Base map consist of all settlements and zone boundary for Madurai city. Using the base map zone boundary crime density rate is prepared with the help of crime data. After getting the crime map for all crime types, identifies the hotspot for each crime and their buffer zones. Using that crime rate density identify each zone hotspot of each crime for each zone.

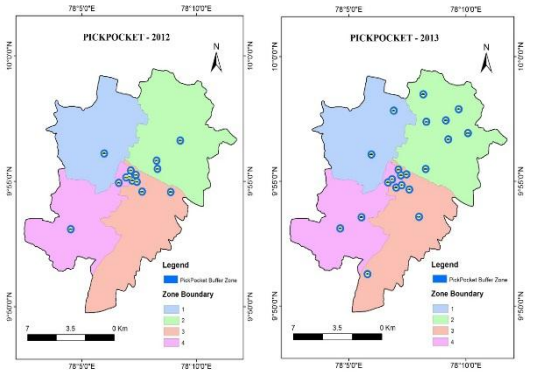


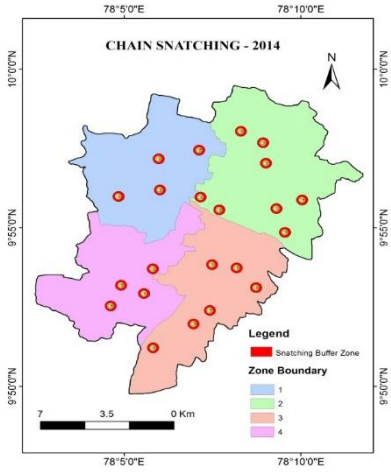


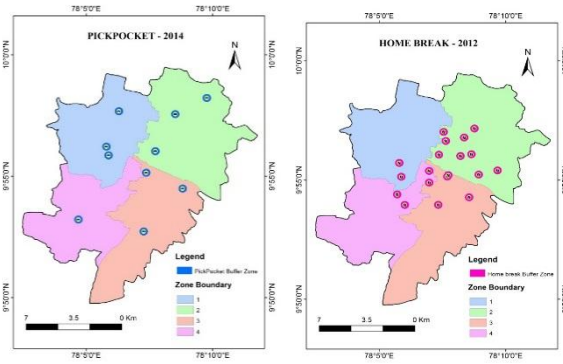


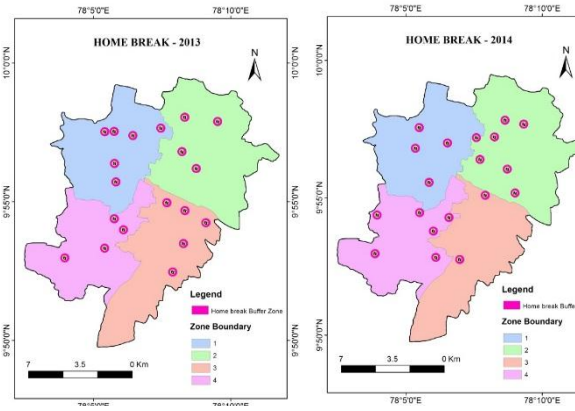












Crime Rate (2012)

	Two Wheeler Theft	Pick Pocket	Chain Snatching	Robbery	Home Break
Zone-I	**	**	****	****	**
Zone-II	****	**	****	****	****
Zone-III	*	***	****	***	**
Zone-IV	**	***	**	**	**

Crime Rate (2013)

	Two Wheeler Theft	Pick Pocket	Chain Snatching	Robbery	Home Break
Zone-I	*	**	**	**	***
Zone-II	****	***	****	****	**
Zone-III	**	***	***	***	***
Zone-IV	***	***	**	***	**

Crime Rate (2014)

	Two Wheeler Theft	Pick Pocket	Chain Snatching	Robbery	Home Break
Zone-I	**	**	**	***	***
Zone-II	****	**	****	***	***
Zone-III	**	**	***	***	**
Zone-IV	****	*	**	**	***

* Very low incidences
** Low incidences
*** Moderate incidences
**** High incidences

5. Conclusion

The finding of this study showed the using of GIS is a much more compactable means of crime pattern analysis than current processes because of its geographic referencing

capabilities and also attempted to operationalize the application and utilization of geographical information system in crime management and in security situation analysis for efficient community policing in Madurai. In this study, crime maps are generated year wise and crime wise maps of each zone to identify the hotspot, crime type of hotspot and relative information which is not only useful for police but also important for people. This study also shows that Vehicle theft is the major increasing crime day by day closely followed by Robbery, Chain Snatching, Pick pocket and Home break. The proximity to crime hotspots shows some areas are more vulnerable to crime than the others. Record keeping is in analogue format which is inefficient in crime analysis. This situation is not good enough in the light of the modern day crime fighting and policing techniques. Hence it is recommended to the police force by adopting the GIS technology to control the crime rate without further delay.

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