

Mapping and Monitoring Suburban Crimes using High Resolution Data

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Abstract

In recent years, the crime pattern in Chennai is mostly confined to suburban areas. Majority of theft, forcible entry, etc. were committed more in suburbs. This situation has alerted the police to find new ways of improving the security, particularly in suburbs. Besides regular crimes at suburban areas, certain illegal activities like pornography, counterfeit, manufacturing of drugs, etc. was flourishing silently for many years without any notice in suburban parts of Chennai. This way, certain crimes go unnoticed due to the favourable location in suburbs, which motivated us to handle this crime with GIS. For this, Chennai was captured in digital form. The demarcation of different areas segregated the CBD and the target area – suburban. Information gathered from various sources shown that the suburban areas recorded maximum occurrence of crimes in Chennai. Crimes varied, turned fresh, well organized and often untimely that even houses locked for more than 3 hours became the ideal target for criminals.

This level of attack by criminals has really brainstormed our attention from simple mapping of suburban crime locations to individual house level mapping which is possible only with high-resolution data. This high resolution mapping actually helps in collecting, storing and monitoring even individual house level details very accurately. This approach seem to be very much useful to map individual houses to improve safety measures, increase security personnel to isolated and long-locked houses and to increase the day time patrol in vulnerable areas. For this, unknown sample area was taken with demographical data and integrated into a database linked to a geographical data represented as polygons (houses) for analysis. It also helps in easy retrieval and manipulation of data, to update new houses, its population type, etc. to enable periodic report generation to check the crimes, its changing pattern and to improve the ultimate safety of suburbanites. Such high-resolution data can be very much useful to police, social scientists, urban planners, and NGOs to better understand the dynamics of suburban areas in Indian metros.

1. Introduction

Last year at suburban Anna Nagar in Chennai, the production and illegal distribution of pornography related activities was flashed across and upsetting the general public. The surprising fact was that the person himself was a prominent doctor who was heading this operation and sending to foreign countries. Such illegal activities were going on for quite long time without any trace or notice even to the neighbouring houses because that independent house was actually serving the patients and registered as clinic. In yet another incident, at suburban Tambaram Sanatorium, a house was looted by criminals who forcibly entered at midnight breaking the doors and escaped without trace with jewels and money worth around a lakh. The victims were unaware of this, sleeping in the adjacent room. In this looting case, the jewels were brought home just a day before from the bank locker to the house for a function, and this indicated that the victim was being closely monitored by criminals prior to the attempt. These were few incidences, particularly happening in suburban parts of Chennai where houses of independent nature, depending upon the duration of day and night time lock, presence of aged people and other related social factors make the houses ideal hunting ground (suburban) for the notorious criminals who show their hands at frequent intervals across these vast areas of suburban Chennai. Keeping this in mind, this attempt has been made to highlight the potential application of high-resolution data in mapping and monitoring the crimes taking place in suburban parts of the major cities of India. This in turn, help

periodically monitor the status of individual houses to increase security personnel at vulnerable locations and to long locked houses, and help to initiate community participation which is the key to check such incidences.

2. Methodology

In order to understand the suburban geography and the occurrence of crimes, initially, the complete Chennai city was captured with different areas. Prominent areas have been delineated with other areas merged with the existing well known areas. Data obtained from various sources have been used to populate the polygons and from that it was found that the suburban areas came under the grip of criminals for various crimes like robbery, theft, loot, murder, etc. It was also noticed that the primary areas frequented by criminals include Velachery, Tambaram, Pallavaram, Chrompet, Pammal, Madippakkam, Nanganallur, Ennore, Anna Nagar, Vyasarpadi, Thiruvottiyur, Pulianthope, Madhavaram, Manali, Avadi, Adampakkam and Ambattur. Interestingly, these areas fall under suburban category in Chennai as shown in the Figure 1 in blue color (dark color). Of these areas, few of them are industrial belts.

Many social and geographical reasons have been responsible for such increasing crimes in Chennai and other major metros of India. Changing lifestyles, migration from nearby villages and towns to major cities in search of prosperity, poor standard of living, unemployment, poverty, declining joint family system, cheap availability of land in suburban areas, etc. directly or indirectly reflect in terms of increasing crimes.

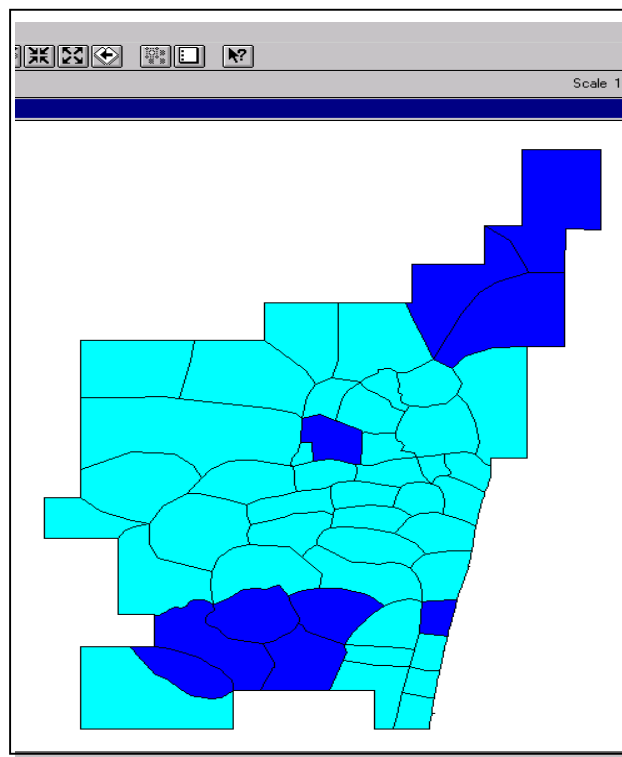


Figure 1 shows suburban crime prone areas shown in Blue (dark color) in Chennai

This simple mapping of suburban areas have not helped in better understanding the trend owing to the shifting methods adopted by the criminals. Also, they started targeting houses, which remain locked during day or night or occupied by aged people.

These incidences across the suburban Chennai helped to focus our attention to high-resolution data which alone raised the hope of mapping and monitoring individual houses at greater details with possible solution.

3. Data used

In order to handle the suburban crimes, sample data of unknown area covering the suburban type houses have been used to replicate the Indian scenario. From the orthophoto, roads, individual houses and other relevant features have been captured in AutoCAD. All the houses have been captured as polygon and after necessary editing; topology is built to populate the statistical details. This sample data covers 584 individual houses in suburban area as shown in Figure 2.

4. Results & Discussion

In this study, the use of high-resolution orthophoto has clearly indicated the immense potential of such data to know the pattern of suburban crime. It also helps to find out the social set up of individual houses and its peculiar activities. The key factor in identifying the vulnerable houses comes from the demographical data which is unique to every house in suburban areas in India. From the query based analysis in GIS environment, it is possible to identify the following set of social factors which come under the grip of criminals:

- Independent houses
- Nighttime locked houses
- Houses locked for more than 3 hours in daytime
- Aged people living in the houses
- Active during night for illegal activities
- Lack of security

The above set of social pattern existing in suburbs is incorporated into the GIS environment. Query based analysis help to identify the potential vulnerable locations and houses. When such studies are initiated at suburban areas of major Indian cities, then it can really help control the crimes. Furthermore, it helps for better user interaction when the data is maintained in GIS environment. With other tabular information like the suburban crimes, its locations, crime type, types of goods stolen, criminal records, etc. then, it gives clue to solve some of the unsolved crimes. This helps to improve the security at large and to have a balanced socio-economic development of any city.

In India, GIS based community policing is catching up and at this juncture, the use of high-resolution data can be really useful to the police across the major Indian cities to tackle this increasing crime. It helps the police to have a regular monitoring of houses in the given area which remains as a base camp of criminals for discussion, exchange of illegal goods, etc. This high-resolution mapping and analysis in GIS environment can greatly help nab the criminals before they carry out some disastrous work.

It also helps to initiate an integrated approach among various other user agencies like police, builders, urban planners, NGOs engaged in community development activities. This helps to plan for better security arrangements in vulnerable areas.

The property lost and sometimes the murder of beloved ones will be priceless. But little investment to capture, store and monitor this data in GIS environment can save lakhs and possibly the life of an individual. The data can be updated and manipulated at frequent intervals to increase security and police patrol to specific areas. This untimely loss of property and lives can be greatly minimized provided technological approach is given priority to control this suburban crime in Indian cities.

5. Conclusion

It is recommended and highly suggested to use high-resolution data to map, monitor and check, specially the suburban crimes in major cities. Also, the cost involved in procuring and installing such GIS data will be less when compared with the amount of distress people are put to after being attacked and killed by the criminals. It is high time now that such study be carried out in Indian cities, particularly the major metros which have been transforming as the base for criminals.

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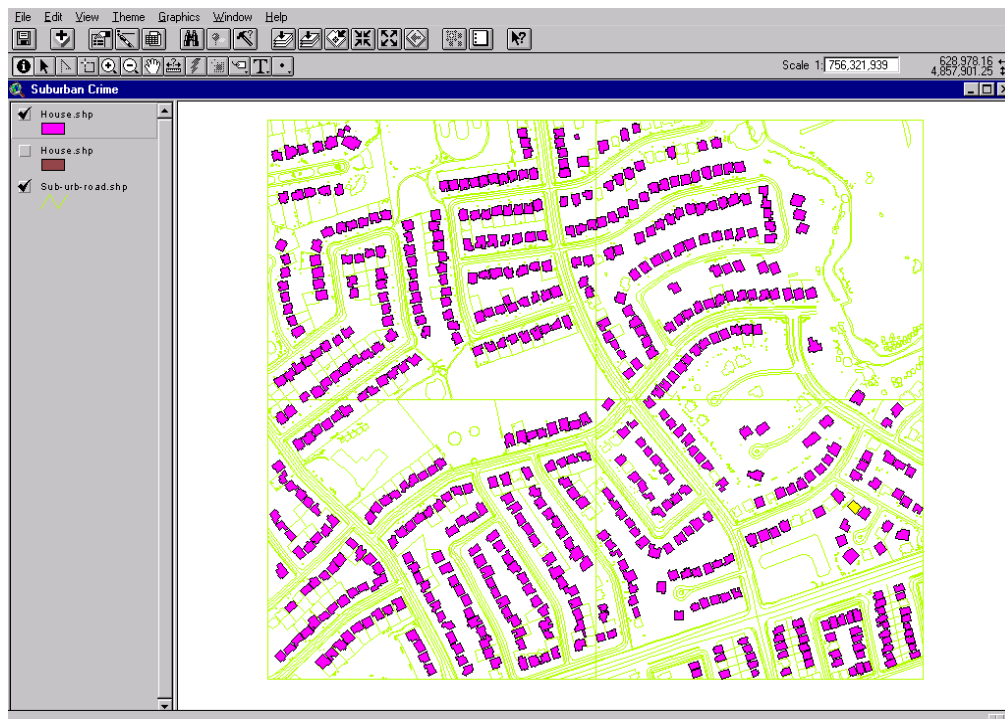


Figure 2 showing a sample data of unknown area captured from Orthophoto showing the suburban houses

The following parameters have been used to understand and monitor the individual houses across the given suburban area:

S.No	No. of Persons	Occupation	House Type	Lock Time	Lock Duration	Security	Aged Person	Night activity
1	2	Business	Indepe.	Day	0800	-	-	-
2	4	Office	Indepe		-	-	1	-
3	7	Business	Indepe.	Day	0700	-	2	Manufac.

Table 1 shows the social parameters used to identify the vulnerable areas in suburban parts of the city (applicable to Indian cities)

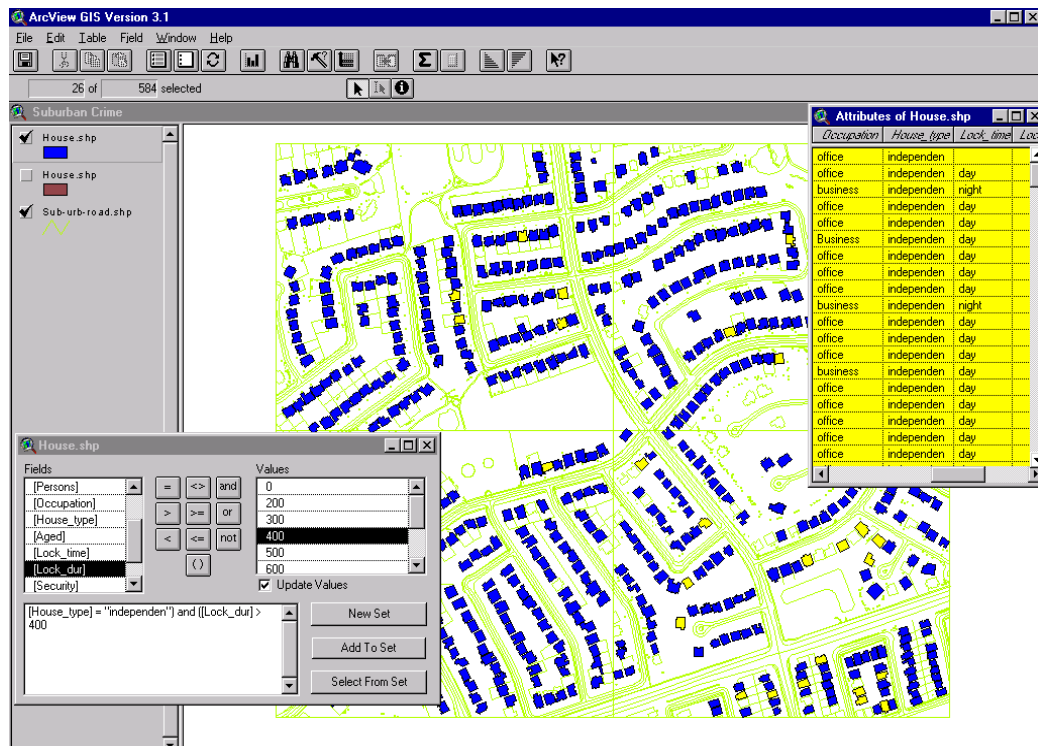


Figure 3 showing the independent houses with lock duration more than 4 hours (vulnerable under suburbs of Chennai)

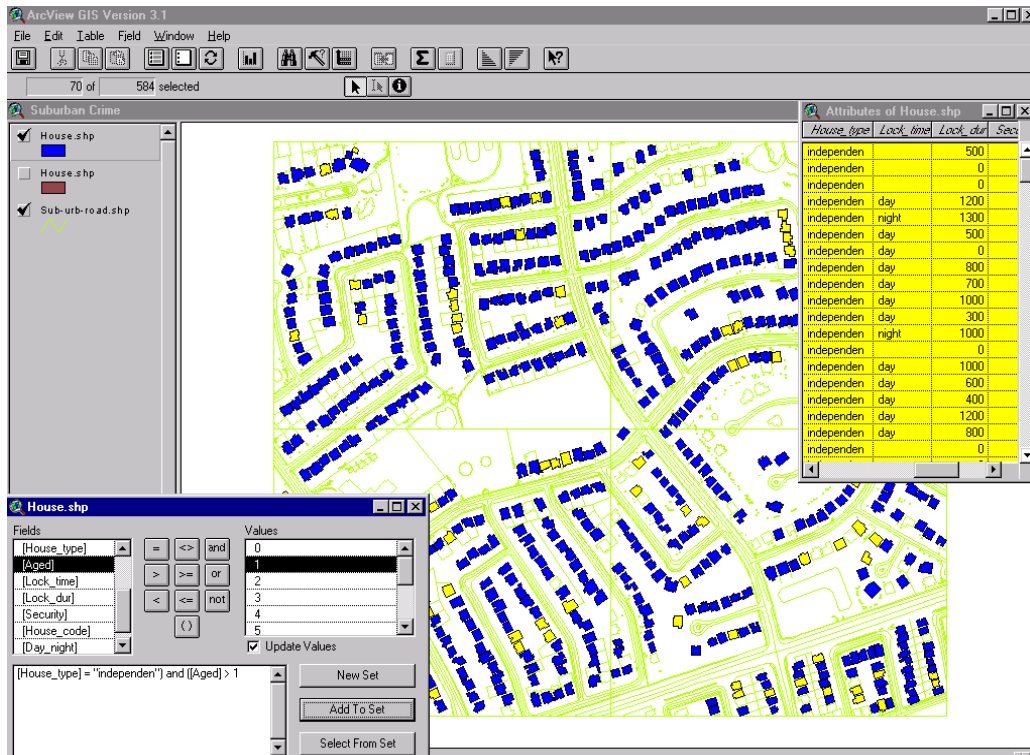


Figure 4 shows the houses vulnerable to varieties of crimes which are independent and having aged people who stay alone in day time as highlighted in yellow (light color) (Typical of suburban crime in Chennai)