

Spatial Pattern Analysis of a Serial Murder Using Geographic Information System: A Case Illustration

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Abstract

Spatial pattern analysis is an integral and significant part of geoinformatics for the analysis of various demographic and spatial data such as climate distribution, weather forecast, population census etc. however, spatial analysis of a serial crime is tricky and require the location and other relevant data in context to the serial killer and his/her victims. This study aimed to establish a spatial relationship between a well-known paedophile and serial killer, Darbara Singh, active in Jalandhar district of Punjab during 2004. Many countries are adopting geospatial mapping to link the victims to the suspect based on their residence locations, disposal of bodies, suspect's residence and native place and hunting area. It can be a preventive measure and can be used to locate next victim as well. However, this methodology is not yet used in India for offender profiling. One exception can be that of Umesh Reddy; his victim's residential location and location of her dead body was linked with another victim in the same locality though it could be an early attempt but it was effective enough to locate Umesh Reddy.

Keywords: Climate • Paedophile • Victim • Geospatial

Introduction

A serial killer kills people and find joy in doing so over a long duration, sometimes taking breaks between every killing. Killings usually follow a set pattern or similar Modus operandi therefore such killings are periodic/serial in nature [1]. Many serial killers torment their victims before taking their lives. Serial killers existed throughout the history, as per some historians. These killings were often blamed on monsters or other supernatural creatures before the term "serial killer" came into existence. Police officers, forensic psychologists, and commoners have always been interested in the psychology of killers and reasons behind the heinous acts committed by them. Another topic of debate is the mental condition of such people; whether they are mentally ill and cannot understand the seriousness of the acts or simply a ruthless act committed by people with no conscience. Normal people usually would avoid committing similar crimes [1,2].

However, even though some killers did appear to have mental disorders and psychotic episodes preceding their crimes, serial killers are found to be occasionally legally insane, i.e., they are aware of the consequences of their action yet they commit crimes. One of the most ubiquitous psychological peculiarities among these killers appears to be antisocial behaviour or a manifestation of Antisocial personality disorder, a mental instability described by the absence of compassion and an apparent incapability to sense remorse, disregard for the judiciary and legal system (they are not afraid of breaking or violating the law), and a strong longing to avenge especially against specific person(s) or civilization/culture at large via horrendous, ferocious and heinous acts [2].

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Darbara Singh was born in the Jallapur Khera hamlet of the Amritsar district. He joined the Indian Army, and the Pathankot Air Force Base was his first assignment. After a disagreement with Major V K Sharma, his senior officer, in 1975, he was accused of hurling a hand grenade at his house. The officer's teenage son and wife both suffered serious injuries in the attack. Singh was fired and imprisoned, but a jury exonerated him. Singh had three kids, but his wife ejected him from their house because of his "bad behaviour."

Darbara Singh attempted to murder and rape the child of a migrant worker in Kapurthala in 1996. After being found guilty of rape and attempted murder in three different crimes in 1997, he was imprisoned for 30 years. He was transferred from Kapurthala to Jalandhar's Central Jail and then to Ludhiana's Central Jail. On December 3, 2003, his mercy plea was accepted due to his good behaviour, and he was released from custody. By this time, he had become bitter towards immigrants and believed that they were to blame for the years of his life that had been wasted.

He left India after being set free and went to Jalandhar, where he started working at a factory close to the Leather Complex. He lived in the Model House neighbourhood, renting a room. To exact his "revenge" against the migrants, he started concentrating on their children. It is still unknown exactly how many children he has killed so far because so many young people— boys and girls— went missing in and around Jalandhar at the time. A few of the occurrences were not reported.

Because so many kids—both boys and girls—went missing around Jalandhar at the time, it's still unclear exactly how many kids he has killed so far. Some of the instances went unreported. Few victims were able to escape, but some were killed and never found [3].

Methodology

Data collection

For this case study, secondary data was collected. Name, age, sex and other demographic data of victims was collected from many news reports, witness testimony and journal articles. Due to the data being highly confidential and sensitive, some of the demographic information such as real name, age and address of some of the victims were not available.

Geographic location used in the project is based on the testimony of witnesses who actually saw the culprit luring the kids from a certain locality.

Therefore, all the geographic locations used might not be exact resident of the victim but the location from where the victims were being kidnapped based on whatever has been written in case files. Few victims managed to escape while most of them died and their bodies were disposed off at different locations. Demographic information about culprit was collected as well through secondary data collection method with the help of various news articles and journals [4].

Following data contains information of only few victims as the information was very sensitive and most of the missing children were only suspected to be associated with Singh. Also, name and age of the victims may vary from articles to articles. Some of the names are changed as well. A confirmed data regarding the disposal sites was not retrieved, however evidences and testimonies proved that Singh used to bury bodies after raping them in fields or dispose them in canals in different villages (Table 1).

Data integration

All the data collected was vectorized in the form of points in google earth pro and a shapefile was created for every single point. The file was added in QGIS and all the points were merged to create an ESRI shapefile. The layer was then integrated on basemap [5].

Methods

The study conducted was majorly qualitative in nature. All the data collected was first converted into a shapefile and added into QGIS. The layers were then merged in order to create a heatmap of that area. A buffer zone related to the alleged crimes was also created.

Data analysis

Geospatial analysis was done by creating a buffer around the suspect's residence at the time of murders in Jalandhar and with the help of 'connect point' a link was established between the residents of victims and culprit. A heatmap of disposal sites and areas in which the culprit hunted was also created [6].

Table 1. Bury bodies after raping them in fields or dispose them in canals in different villages.

Name of the Victim	Residential Location of Victims/ Kidnapping Site
Jatinder M/9	Leather Complex
Geeta F/5	Leather Complex
Tazbin, F/10	Avataar Nagar
Satish, M/6 (and his sister Gudia)	Model Town Jalandhar
ShankarM/8	GTB Nagar
Karu F	Leather Complex
Mumtaaz F	Avataar Nagar
Ravina, F/4	Shastri Nagar
Rajesh Kumar, M/7	Leather Complex
Ronku F/6	Basti Mithu
Sanju Kumar, M/5	Basti Shiekh
Poonam, F/7	Basti Peerdaad
Patal Kumari F	Basti Bawa Khel
Rajesh Kumar M/5	Basti Bawa Khel
Nitika F/3	Basti Danishmandan
Laloo Parsaad M/6	Leather Complex
Nishu F/7	Urban Estate Phase II
Lacchmi F/5 (and her sister Sanju)	Basti Shiekh
Amrit M/5	Leather Complex
Khursheed M/5	Basti Mithu
Attempted rape_1st crime	Kapurthala
Diksha alias Tolu F/8	Rasta Mohalla

Results and Discussion

Singh was a native of Amritsar and committed all of his heinous crimes in Jalandhar district of Amritsar, Punjab in 2003-04. He used to lure children of non-Punjabi immigrant labours through various means on a bicycle, thus Singh was also known as the cycle-borne killer (Figure 1). Many people saw him luring kids with candies or toys, in the afternoon when the labours were on duty. Few died, few escaped. The following heatmap indicates that Singh was prominently active in Leather complex area (Figure 2). The residential area or the location from where Singh used to kidnap his victims were mapped in figure 3.

It could be stipulated that Singh preferred to hunt preferably from around his workplace since most of the victims were from that area (Figure 4). This case study was implemented with the aid of GIS. No such technology was used back when the crime was actually committed so it went on for years. Darbara Singh continued his rampage in the same locality where he worked and lived for years but nobody could trace him. Following illustrations contain distances between hub and victim's places (Figure 5).

It is important to locate a suspect for him/her to link with the crimes



Figure 1. Jalandhar district in Amritsar, Punjab.

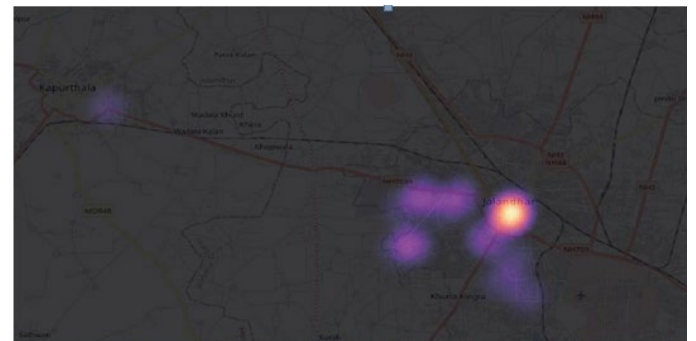


Figure 2. Hotspot of Singh's hunting spree.

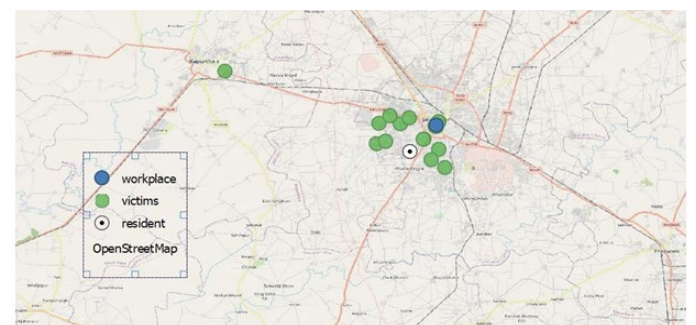


Figure 3. Vector data of Singh and his victim's location.

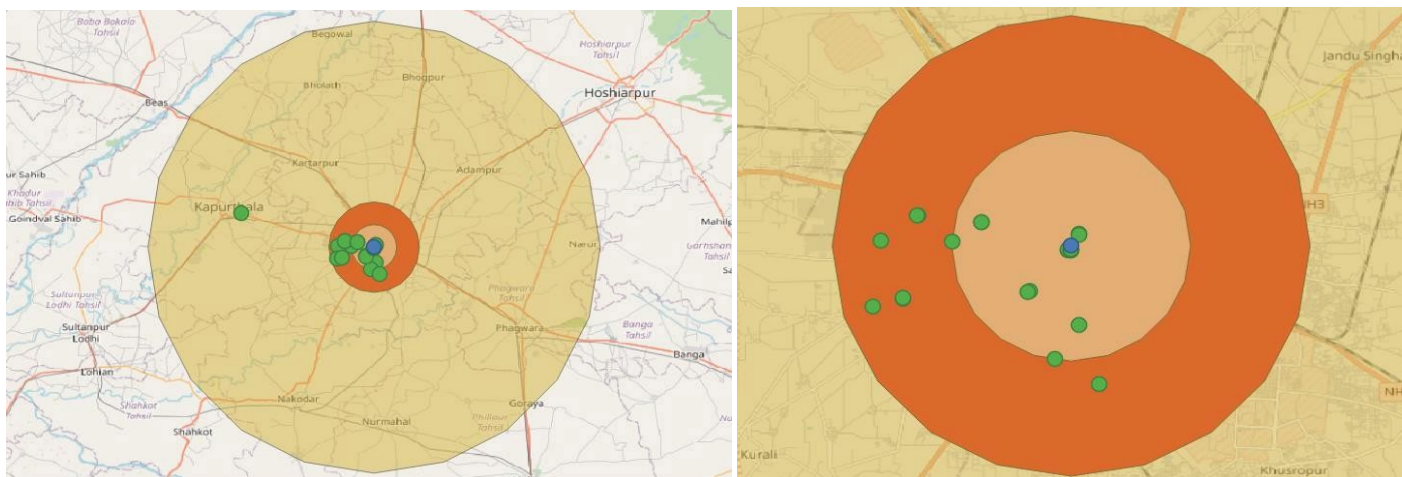


Figure 4. Buffer zone: Yellow represents least active zone; red and pink represents hotspot ranges.

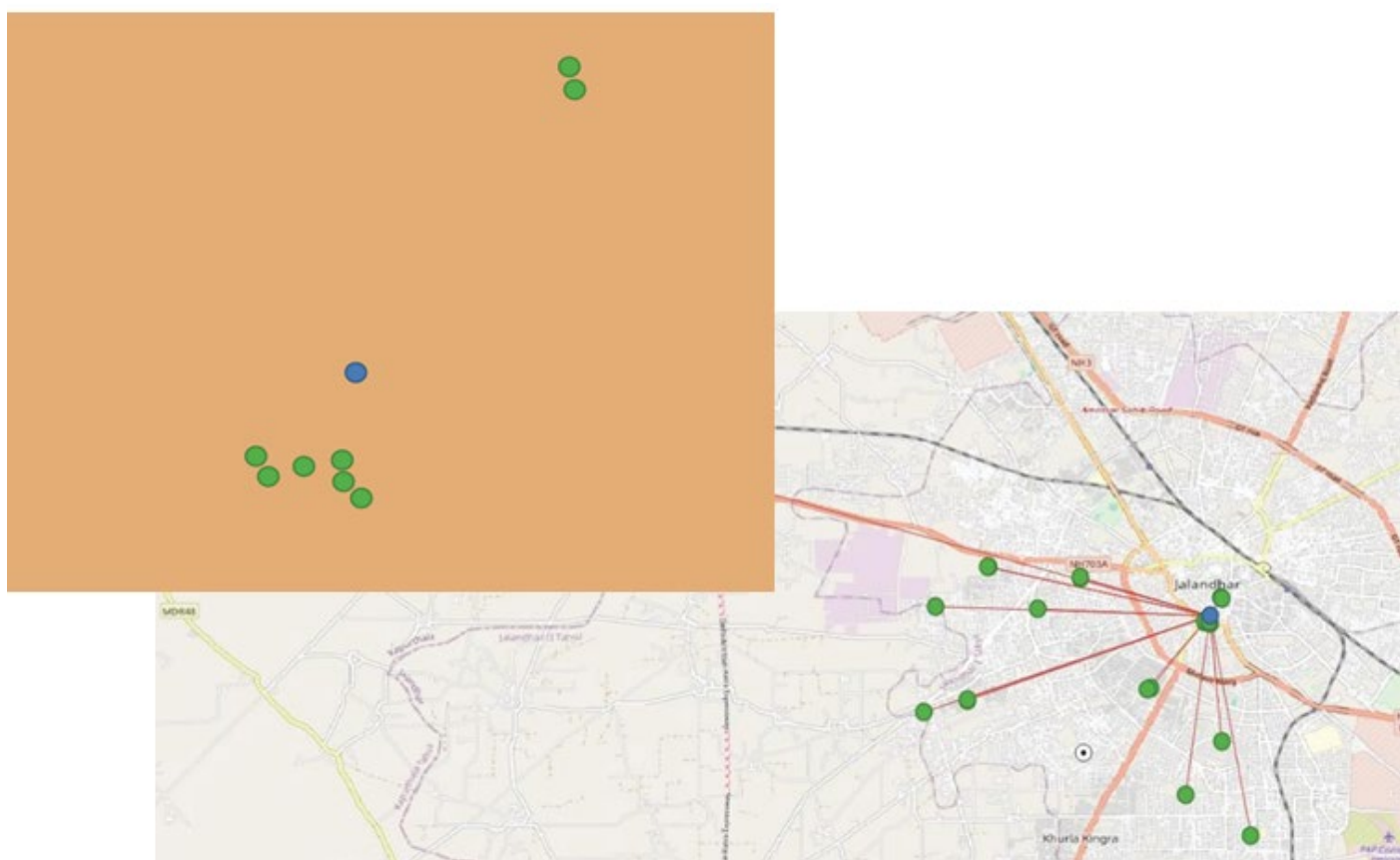


Figure 5. Calculated distance of Singh's workplace from victim's location.

using GIS. This technology was used to locate the Green river serial killer and to analyse the spatial pattern of his serial crimes (Figure 6). His potential victims were identified and he was arrested before anymore murders would

be committed by him. Similarly, objective of this study was to illustrate how law enforcements can utilize geoinformatics to identify the spatial pattern and hotspots of a serial crime (Figure 7).

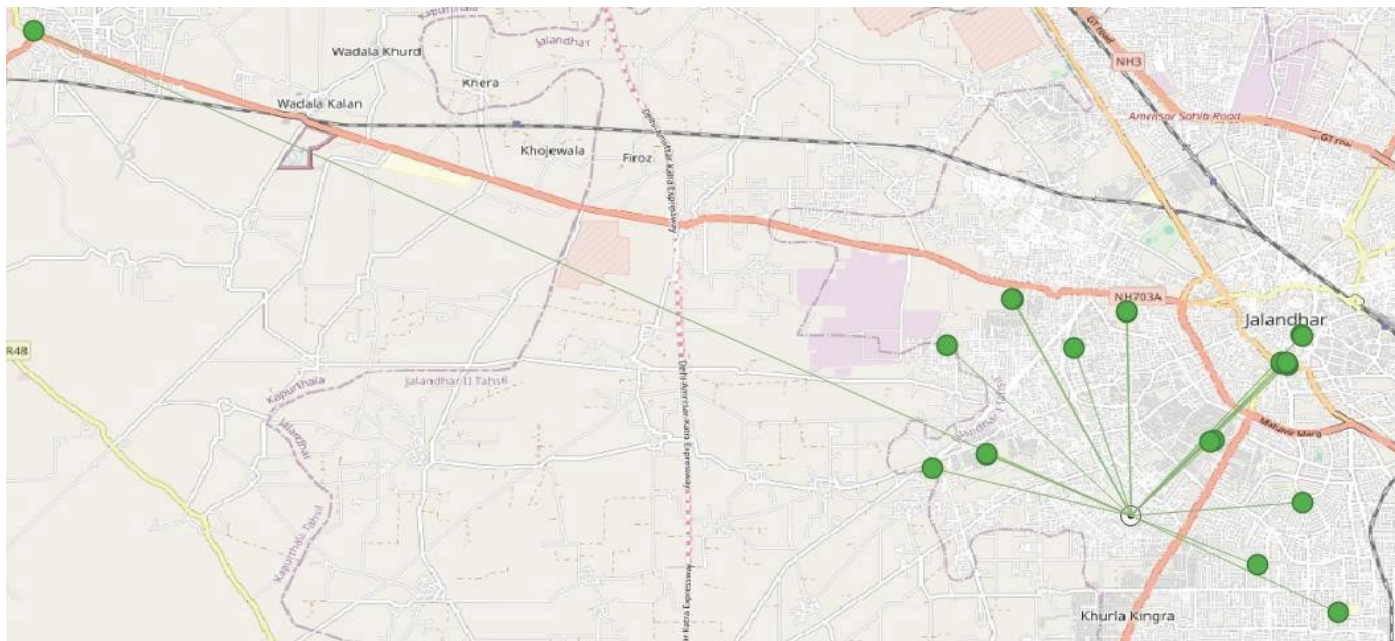


Figure 6. Calculated distance of Singh's residence from victim's location.

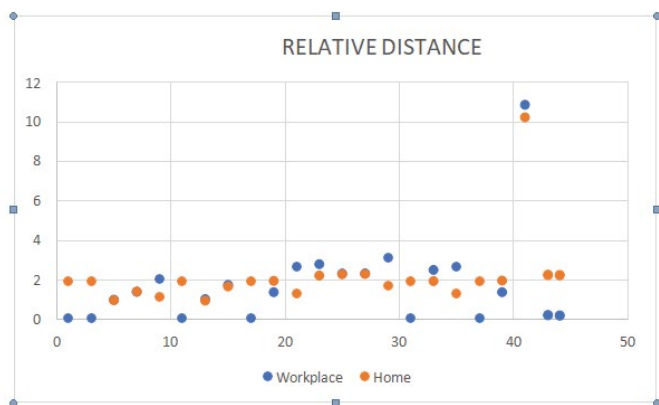


Figure 7. Relative distance from data collected.

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Conclusion

Geospatial analysis of a serial crime can be done to locate victims/disposal sites, identify suspect and his/her connections with victims and to prevent any potential crimes from being happening. As depicted in this study, the link can be made to stipulate approximate distance between the location of suspect and victims. However, for spatial pattern analysis, exact location of suspect and victim especially at the time of disappearance is required, that is due to its very sensitive nature is sometimes difficult to extract [7].

Conflict of Interest

The authors state no conflict of interest.

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