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Geographic Profiling

Overview

A geographic profile is a contoured map that predicts the probable location from which an offender operates. GeoProfile models the psychology of spatial behavior and target selection to recreate an offender's cognitive map from the distribution of his crime scenes. The primary goal of geographic profiling is to provide investigators with a search area that can be used to prioritize leads and allocate resources.

The Spatial Psychology of Serial Offending

The serial offender's operating location is vitally important to an investigator since that information can lead to the offender's identity and arrest. This location is called an anchor point; it is the place from which the offender leaves to commit a crime, returns to after committing a crime, or both. Most often the anchor point is a residence, but it could also be a workplace or other central location. The offender's anchor point is directly related to the locations of his crime scenes. The pattern describing this relationship can be simply stated as follows:

1. Offenders commit crimes close to their anchor points.
2. The frequency of offending decreases as the distance from their anchor points increases.

This pattern is referred to as the distance decay model because the probability of committing an offense "decays" with distance. Researchers have developed a number of "distance decay functions" to mathematically model the observed rate at which the probability decreases. It should be noted that the observed decay rate is non-linear; for this reason, among others, **traditional density maps do not model the observed spatial behavior of serial offenders.**

The distance decay pattern can be explained by understanding the psychology of target selection in terms of cognitive mapping theory. Cognitive mapping is the process by which people construct and use subjective mental representations of their surrounding geography. Cognitive maps consist of a hierarchy of subjective “spaces,” or mental representation of specific areas.

Anchor points, or specific locations that an individual frequents, make up the foundation of a cognitive map. The most influential anchor points are the residence and workplace, but can also include any location that is frequented by the person.

The areas directly surrounding the anchor points and the paths between them are called “activity spaces.” Since people frequently travel through their activity spaces, they have detailed knowledge of these areas.

Around these activity spaces are “awareness spaces.” People are familiar with these areas but rarely venture into them. Beyond awareness spaces lie areas that are unfamiliar to the individual.

Target selection theory uses cognitive mapping to explain how offenders locate targets. According to the theory, offenders most often find their targets in one of two ways:

1. They become aware of targets while moving throughout their activity space during their non-criminal activities.
2. They find targets by actively searching areas in their awareness space.

Although there are exceptions, offenders are less likely to commit crimes in unfamiliar areas because doing so increases their risk of apprehension. (See the **Cautions** section below for more information.)

By finding targets within their activity and awareness spaces, serial offenders unknowingly leak valuable information. Each incident exhibits a piece of their cognitive map, revealing the areas likely to contain the offender’s anchor point.

Cognitive maps, and subsequently crime scene distributions of offenders, display a distance decay pattern; people tend to visit locations closer to their residences more often than locations further away because of the “friction effect”—traveling further away from an anchor point requires more time, money and energy.

Cautions

Marauders v. Commuters

Serial offenders can be divided broadly into two categories: marauders and commuters.

Marauders are offenders who commit crimes outward from their anchor points as outlined in the method described above.

Commuters are offenders who travel outside of their normal activity spaces to commit crimes. This is most likely done in an attempt to leave no connection between their offense locations and residences.

Note: Geographic profiling will not identify the anchor point of a commuter. Investigators should consider the possibility of a commuter when a geographic profile puts major highway exits near the highest points of the probability map.

Even Distribution of Targets

Geographic profiling assumes that the target is distributed more or less evenly throughout space. Consequently, geographic profiling works well for cities and suburban areas where people and buildings are uniformly situated across an area. However, it does not work well for rural areas where populations are irregularly clumped together between empty spaces such as fields, mountains, or water. The targets must also be evenly distributed. For example, analysis would be appropriate for a bank robber in a suburban area because most banks have a number of branches spread throughout a community. However geographic profiling does not work for an offender whose targets are restricted to selected parts of a city. For example, geographic profiling would not be recommended for a serial killer who targets prostitutes since red light districts tend to be limited to only one part of a city.

Incorrectly Linked Incidents

Incorrectly linking incidences to an offender can corrupt a geographic profiling by merging the cognitive maps of multiple offenders. However, with enough correctly linked incidents in a series, the occasional incorrectly linked incident will have little effect. Running the profile with different sets of incidents based on certainty can help determine if potentially incorrectly linked incidents will distort the profile.

Interpreting the Geographic Profile

The Probability Map

The probability map is a visual representation of the most probable location of an offender's anchor point. It can be viewed with discrete contours or as a blended heat map. The number and size of the contours are irrelevant; they simply provide a visual cue to aid in sectioning off geographic areas to search. The number contours can be adjusted to create search areas that match an agency's resources.

The Suspect Report

Suspects are ranked based on their search cost—the percentage of the map searched before reaching the suspect’s anchor point. The search is conducted from the highest point of probability to the lowest; therefore, the lower the search cost, the more viable the suspect. If the geographic profile is accurate, the offender will have a low search cost.

In the case of search cost, “map” refers to only the portion of the profile containing the crime scenes. As a result, suspects can have a search cost greater than 100%, which means a space larger than the area containing the crime scenes would have to be searched before reaching their anchor point.

Applying the Geographic Profile to an Investigation

A geographic profile can aid an investigation in two major ways:

1. A geographic profile can help **prioritize information** related to the investigation. Database searches, leads, and suspects can be ranked by where the respective location data falls on the geographic profile. Suspects living or working in the top most contour can be investigated before those living in the next highest contour and so on. Furthermore, database searches can be narrowed to the addresses located within the top contours.
2. A geographic profile can assist in efficiently **allocating resources** or extending limited resources. Concentrating in the highest probability areas, agencies can saturate patrols and canvass particular neighborhoods with a higher success rate of gathering useful information.

Further Information on Geographic Profiling

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