IDEA GROUP PUBLISHING **ITB10844**

701 E. Chocolate Avenue, Suite 200, Hershey PA 17033-1240, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com

This chapter appears in the book, *Geographic Information Systems and Crime Analysis*, edited by Fahui Wang. © 2005, Idea Group Inc.

Chapter VI

Geographic Profiling for Serial Crime Investigation

D. Kim Rossmo, Texas State University, USA

Ian Laverty, ECRI, Canada

Brad Moore, Ontario Provincial Police, Canada

Abstract

This chapter describes the technique and application of geographic profiling, a methodology for analyzing the geographic locations of a linked series of crimes to determine the unknown offender's most probable residence area. The process focuses on the hunting behavior of the offender within the context of the crime sites and their spatial relationships. Rather than pinpointing a single location, it provides an optimal search strategy by making inferences from the locations and geometry of the connected crime sites. Geographic profiling can therefore be thought of as a spatially based information management tool for serial crime investigation. Tools based on geographic information systems (GIS), such as the Rigel geographic profiling system, allow the rapid computation and visualization

of the geographic profile as a three-dimensional probability surface, which can then be combined with other geographically based information to narrow the offender search parameters for the criminal investigator.

Introduction

Perhaps the most empirically certain aspect of any crime is the location where it occurred. It is therefore natural to consider whether crime locations can be used to help identify unknown criminals. This question becomes even more relevant when a linked series of crimes is identified. Is there a significance to the geographic pattern of the crimes? Everyone is familiar with the concept of putting pins in a map to mark crime locations, and then studying the pattern formed to see if some something obvious jumps out at the observer. At the very least, we understand that when crimes cluster around a particular area, there is something about that area which draws the criminal. But the question becomes a more complex one when we try to define a specific empirical process to follow. What do we mean by "cluster"? How should multiple clusters be interpreted? Should anomalous outliers be ignored? Does background geography or street layout distort the pattern? Should the timing or order of the crimes be considered? Should some crimes be weighted more heavily than others? And what should we be looking to find in this pattern?

Geographic profiling tries to answer these questions by starting from the basics – what influences a criminal's journey to a crime site? We understand certain things intuitively, and these tend to be confirmed by studies. Nobody wants to go further than necessary to accomplish his or her goal; this is known as the *least effort principle* (Zipf, 1950). If the opportunity and the desire to commit a crime exist, the criminal is more likely to take the first, or closest, opportunity. On the other hand, there exists a well-documented aversion to committing crimes too close to home, within a mental "*buffer zone*" (Brantingham and Brantingham, 1981). In practical terms, this can be seen as the desire for anonymity, or diversion of attention away from one's home location. This conflicts with the desire to travel no further than necessary, resulting in a lower probability of crime site selection close to the criminal's home, and then a more typical *distance-decay function* further away (see Figure 1).

Based on these principles of environmental criminology, *geographic profiling* evaluates possible journey-to-crime scenarios for every point on the map, and produces a probability surface indicating the likelihood that any given point is the offender's base. This anchor point is most commonly the home or work site of the offender.