



Chapter XV

Identifying “Hot Link” Between Crime and Crime-Related Locations

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Abstract

Crime is typically a multi-location event where multiple locations are associated through one crime incident. Understanding the patterns of the spatial association between crime locations and their corresponding crime-related locations (for example, the residence location of an offender or that of a victim) can enhance our capability to explain and predict crime patterns. GIS technologies coupled with spatial statistics have been widely used to model areas of high crime (that is, crime hot spot). But very limited effort has been spent to investigate the spatial association between crime locations from a crime hot spot and the corresponding crime-related locations. This chapter introduces the concept of “hot link” to describe the spatial autocorrelation of the one-to-one relationship between a crime location and a crime-related location. It develops an approach for the hot link analysis problem. Related techniques are applied to the hot link analysis between auto theft and recovery locations in the city of Buffalo, New York. Identifying the patterns of hot links from auto theft locations to

recovery locations is important for understanding auto thieves' travel behavior. Related findings can contribute to the law enforcement's effort to fight against auto theft. The hot link analysis method can be easily extended to analyzing spatial patterns of other types of crime and crime-related locations.

Introduction

It is until the last decade of the 20th century did the systematic applications of *Geographic Information Systems* (GIS) and related spatial analysis methods to crime pattern analysis become widely accepted (for example, Harries, 1999; Getis, Drummy, Gartin, Goor, Harris, Rogerson, 2000). One important topic in crime spatial pattern analysis and also one that has benefited from GIS and spatial statistics largely is crime “hot spot” analysis (Sherman, 1995). Investigating the spatial autocorrelation of crime incidents, hot spot analysis has been an important approach for the explanation and prediction of crime spatial patterns. Instead of focusing on crime location solely, another group of crime spatial analysis tries to explain the spatial patterns of crime through investigating criminals' mobility. Both journey-to-crime research (for example, Capone & Woodrow, 1976; Rossmo, 2000) and journey-after-crime analysis (for example, Lu, 2003) belong to this group. Moreover, there are studies looking into the spatial patterns of crime triangle defined by three anchor locations – offence location, criminal's residence, and victim's residence (for example, Rand, 1986). By linking offense locations with other crime-related locations, these analyses attempt to explain crime concentration as related to the spatial patterns of other anchor locations.

However, there is one important aspect that has been missing so far – the stability and intensity of the spatial association between different crime anchor locations. Are there consistent patterns showing that criminals who commit at certain crime hot spot are more likely to come from a hot spot of offender's residence locations? Do criminals who commit property crimes at certain hot spot tend to travel to clustered fence locations? Searching answers to these questions is a process of examining the spatial autocorrelation of the spatial association between crime and crime-related locations. This study refers to the spatial autocorrelation of the linkage between a crime hot spot and a crime-related location hot spot as “hot link,” emphasizing that there are certain factors purporting the consistent links between these two hot spots. Identifying crime hot links can advance the understanding of crime by steering resources towards explaining hot links. Moreover, police manpower can be deployed more effi-

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