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Chapter IX

Geographic Surveillance of Crime Frequencies in Small Areas

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Abstract

In this chapter, I describe a system for monitoring crime frequencies for a set of small areas. The objective is to detect as quickly as possible any increase in any area's crime frequency, relative to a specified expected frequency. The system uses a cumulative sum approach, cumulating differences between the observed and expected frequencies of crime in each area. The approach is illustrated using 1996 burglary data from Buffalo, which is available by census tract. Computer code associated with the geosurveillance program is provided in the appendix.

Introduction

An important aspect of crime analysis is the daily, weekly and monthly monitoring of crime reports. Quick detection of significant increases in the frequency of crime and/or changes in the geographic pattern of crime can lead to efficient reallocations of enforcement effort. There may also be interest in detecting any *decreases* in crime frequencies that may, for example, result from crackdown efforts. Rogerson and Sun (2001) provide an example of such monitoring in the context of crime analysis.

In this chapter, I describe a simple system for monitoring crime frequencies in a set of small geographic areas. The purpose of the system is to signal to the crime analyst any significant changes in the frequency of crime that may occur in any of the small areas. Crime frequencies will exhibit natural fluctuations over time, and it is important to be able to distinguish significant changes in the underlying rate of crime from these natural fluctuations. The statistical detection of a significant increase in burglaries could imply, for example, that criminals had recently targeted the area; quick reaction to the statistical increase could lead to added patrols and, ultimately, to either arrests or declines in criminal activity.

The geosurveillance system is based upon methods developed in industry for the quick detection of faults in manufacturing processes (see, for example, Montgomery, 1996; Wetherill & Brown, 1991; Ryan, 1989). It makes use of the *cumulative sum* of the excess of observed frequencies over some expected, baseline frequency. If the cumulative sum of these excesses reaches some critical value, an "alarm" is sounded, and the analyst then investigates the nature of the change. In the criminological context, the alarm would imply that the frequency of criminal activity had increased by a statistically significant amount. The increase presumably would be worth investigating – it might ultimately be traced to some known cause (for example, there may have been a long spell of hot, dry weather; weather conditions are known to be correlated with criminal activity). But the cause also might be due to one or more criminals who have begun to operate in the area. Quick detection could conceivably lead to quicker arrests.

Section 2 describes the monitoring system and section 3 provides an illustration using burglary data from Buffalo, New York. The final section contains a discussion of potential extensions of the method, as well as a summary of its limitations. Computer code is included in the appendix.