

## Chapter XIV

# The Simulation of the Journey to Residential Burglary

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### **ABSTRACT**

*This chapter presents an innovative approach to the study of the journey to residential burglary. We demonstrate a simulation model that is built upon the integration of cellular automaton (CA) and multi-agent system (MAS). The model utilizes both social disorganization (SD) and routine activity (RA) theories to predict locations of residential burglary targets. The model simulates an offender as an intelligent agent of MAS that interacts with the target and place automata of CA. The likelihood of a residential burglary is modeled as a function of offender's motivation, target desirability and place guardianship, which in turn are determined by the offender's individual characteristics often used by RA and the target and place's neighborhood properties frequently utilized in SD. The model was initialized and parameterized using*

*“real” crime data from Dallas, Texas Police Department. Results under two different weighting scenarios were obtained and compared with the actual distribution of offense locations, revealing the flexibility of model in its capability to assessing the influence of the two theories in burglary crime simulation. In closing we propose possible modifications that could be made to the model in the future.*

## **INTRODUCTION**

In this chapter, the offender and the residential location that was targeted for burglary are discussed in the terms of modeling them as agents and automata in a cellular automaton (CA) and multi-agent system (MAS) modeling. The offender agent has the following properties: age (i.e., experience), race, and gender that are related to motivation (i.e., poor neighborhood burgling in a wealthier neighborhood). In addition to its location, the target has properties such as income level (i.e., wealth of neighborhood) and race composition that determines its desirability. The residential location also has several properties that define the lack of guardianship (e.g., commuting time of residents and tenure, etc.). Our model is developed based on the essential components of routine activity (RA) and social disorganization (SD) theories, calibrated and validated utilizing the attributes of both the offenders and residential targets from the reports database from the Dallas Police Department (Dallas, TX). Our models are also supported by publicly available neighborhood attribute information (e.g., U.S. Census and tax parcel data), and location and distance information derived through geographic information systems (GIS) techniques in the model of the journey to crimes of residential burglary.

## **JOURNEY TO CRIME**

The study of journey to crime is an evaluation of offense patterns—exploring the distance traveled between an offender’s residence and the offense

location. “Distance, so far as it enters into human relationships, is thus entirely relative to the available techniques for overcoming the friction of space” (Hawley, 1950: 237). Time and space are obstacles in human movement; criminal behavior is not exempt from these constraints. Research demonstrates that offenders generally commit crimes close to home, although significant differences exist by type of crime. The average crime trip is relatively short, reported as 1.66 miles (White, 1932), 1.43 miles (Philips, 1980), 1.22 miles (Gabor & Gottheil 1984), 1.93 miles (Costello & Wiles, 2001) and 0.4 miles (Turner, 1969). Many of the studies that measure crime trips as distances report a significant percent occurring over less than one mile (Costello & Wiles 2001; Rengert, Piquero, & Jones, 1999; Turner, 1969). When compared, property offenses are consistently committed farther from the home than crimes against persons (DeFrances & Smith, 1994; Pyle, 1976; Rand, 1986; Rhodes & Conly, 1981; White, 1932). The difference is related to the motivations behind crimes and the availability of suitable targets.

Considerations of the journey to burglary must account for a target selection process. Burglars begin in a general area, from which they select a specific target (Wright & Decker, 1994). An area’s attractiveness can influence the direction and timing of burglaries (Rengert, 1981). Burglary follows the typical journey-to-crime pattern: many offenses are located within a few miles of the burglar’s home (Costello & Wiles, 2001; Ratcliffe, 2001; Snook, 2004) and the number of burglaries committed decreases as the distance from the offender’s home increases (Rengert,

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