CRIME MAPPING

CASE STUDIES

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Mapping and Serial Crime Prediction

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This case study illustrates the use of mapping to assist in the capture of serial criminals. In late January 1998, Officer Timothy J. Meicher was assigned to the Crime Analysis Detail in the Van Nuys area of the Los Angeles Police Department. Van Nuys detectives were investigating a series of three robberies in which the suspect, riding a Ninja motorcycle, was snatching the purses of elderly female victims walking through shopping center parking lots. The crook was named the Motorcycle Bandit. Officer Meicher had recently attended a California Department of Justice Crime Analysis Training based on the book *Crime Analysis: From First Report to Final Arrest* (Gottlieb et al. 1994) and decided to use some of the methods he learned to predict when and where this serial criminal would strike again.

Officer Meicher employed a methodology that uses averages and standard deviations of a sample. The methodology is applied to the time of day of each incident, the number of days between incidents and the locations of each incident expressed as *x,y* grid coordinates. For example, using time of day and assuming a normal distribution, we can predict that 68 percent of the incidents (including the next incident) will occur within one standard deviation of the average times of day of the incidents and that 95 percent of the incidents will occur within two standard deviations of the average.

Officer Meicher used a hand calculator to do the math and MapInfo software to draw a map based on the three known purse snatchings. The process took some time because of the newness of the methodology and the relative difficulty of using a pocket calculator to do complex mathematical computations. The analysis provided date ranges, time of day ranges and rectangles on a map that showed 68 percent and 95 percent probabilities that the next incident would occur within the two rectangles (see Figure 1).

For example, there was a 68 percent probability that the next occurrence would occur between January 25 and February 6, between 2045 hours and 2345 hours and within the smaller rectangle drawn on the map. Similarly, there was a 95 percent probability that the next incident would occur between larger date and time of day ranges and in the larger rectangle.

95% Probability

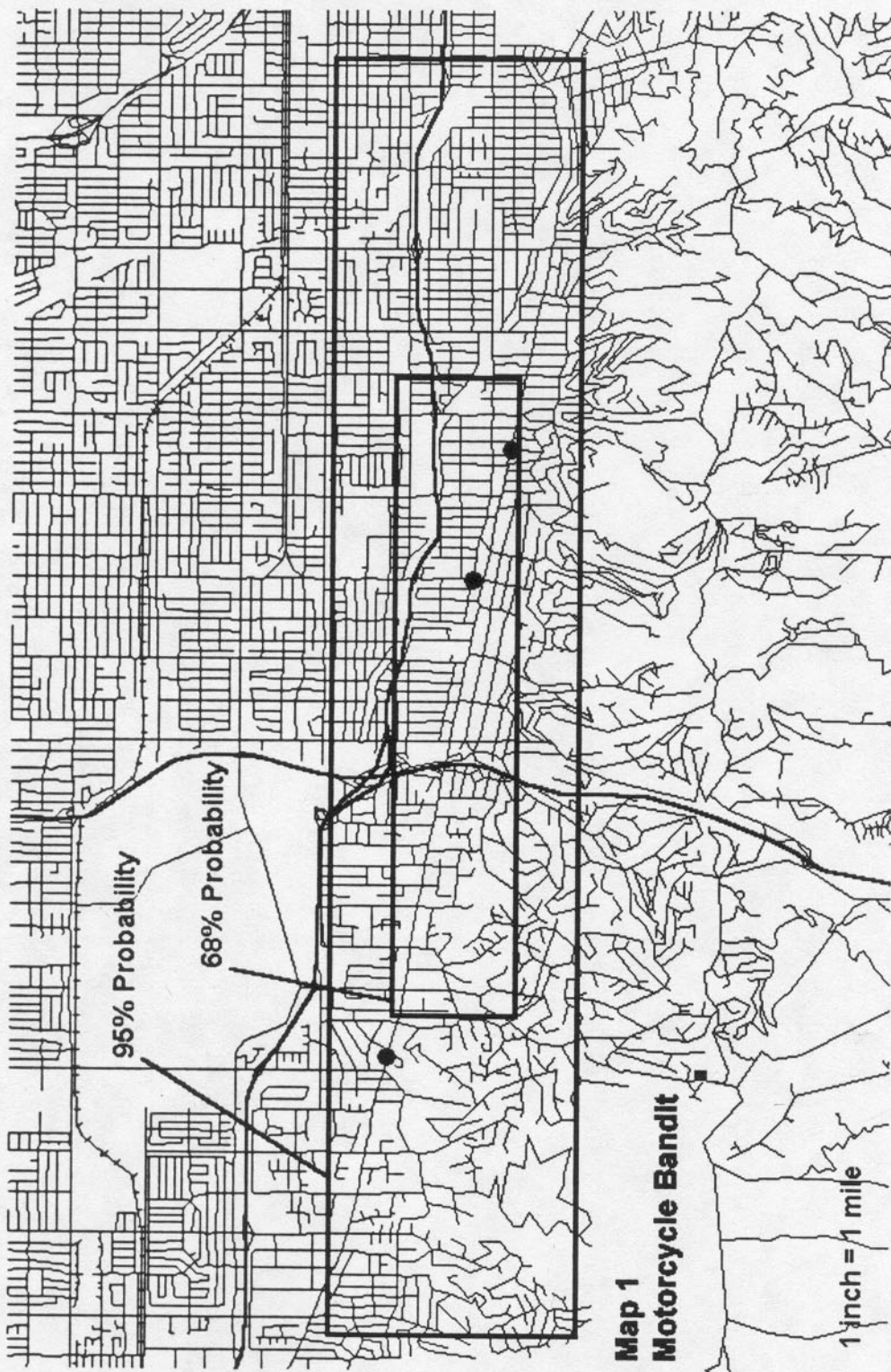68% Probability

Map 1
Motorcycle Bandit

1 inch = 1 mile

Figure 1

The officer gave these results, including a map similar to Figure 1, to the investigating detective and his commanding officer to help them decide when and where to deploy officers to capture the suspect. They gave this first prediction a cool reception and decided not to deploy resources. The next morning, Officer Meicher learned that the suspect had struck again and that the date, time of day and location of the occurrence were all within the ranges he had predicted. The commanding officer asked Officer Meicher to make a presentation at the area crime control meeting.

Officer Meicher recalculated the predictions to include the fourth incident and drew a new map with MapInfo showing both the 68 percent and 95 percent predictions (see Figure 2). At his presentation to 40 to 50 officers, there still were a lot of eyes that rolled when he made his second prediction, but the captain decided to assign a special crime suppression unit to work the problem beginning that night. The units chose their locations based on the prediction maps, and in less than 45 minutes the suspect showed up at one of the observation posts and began to look for potential victims. The suspect made eye contact with officers in a marked car and immediately took off. A brief pursuit took place, but the suspect fled on the motorcycle in the rush hour traffic. As of this writing (seven months later), there has not been a similar incident. In addition, this case convinced officers and command staff of the value of this method of serial crime prediction.

Officer Meicher agreed to work with Lieutenant Paul Geggie from the LAPD Crime Analysis Section to automate as much of this process as possible. They created a Microsoft Excel worksheet to do the math. In the new process, the serial crime incidents are entered into MapInfo tables in chronological order and then geocoded and mapped. Then latitude and longitude columns in the incident table are updated to obtain latitude and longitude values for each incident. Next, the MapInfo table is copied and pasted into the Excel worksheet (see Figure 3). The worksheet displays the date and time of day range predictions and the MapInfo rectangle object coordinates. The worksheet also automatically creates charts showing how many incidents occurred each day of the week and the probabilities that the next incident would occur during each hour of the day. This helps in choosing the best hours if deployment for only part of the predicted time of day range is possible. Finally, the MapInfo rectangle object information from Excel is used to draw rectangles on the map of the incidents. These charts, along with the map and worksheet, document the series of incidents and provide specific information that investigating and command officers can use to develop tactical plans to apprehend serial criminals.
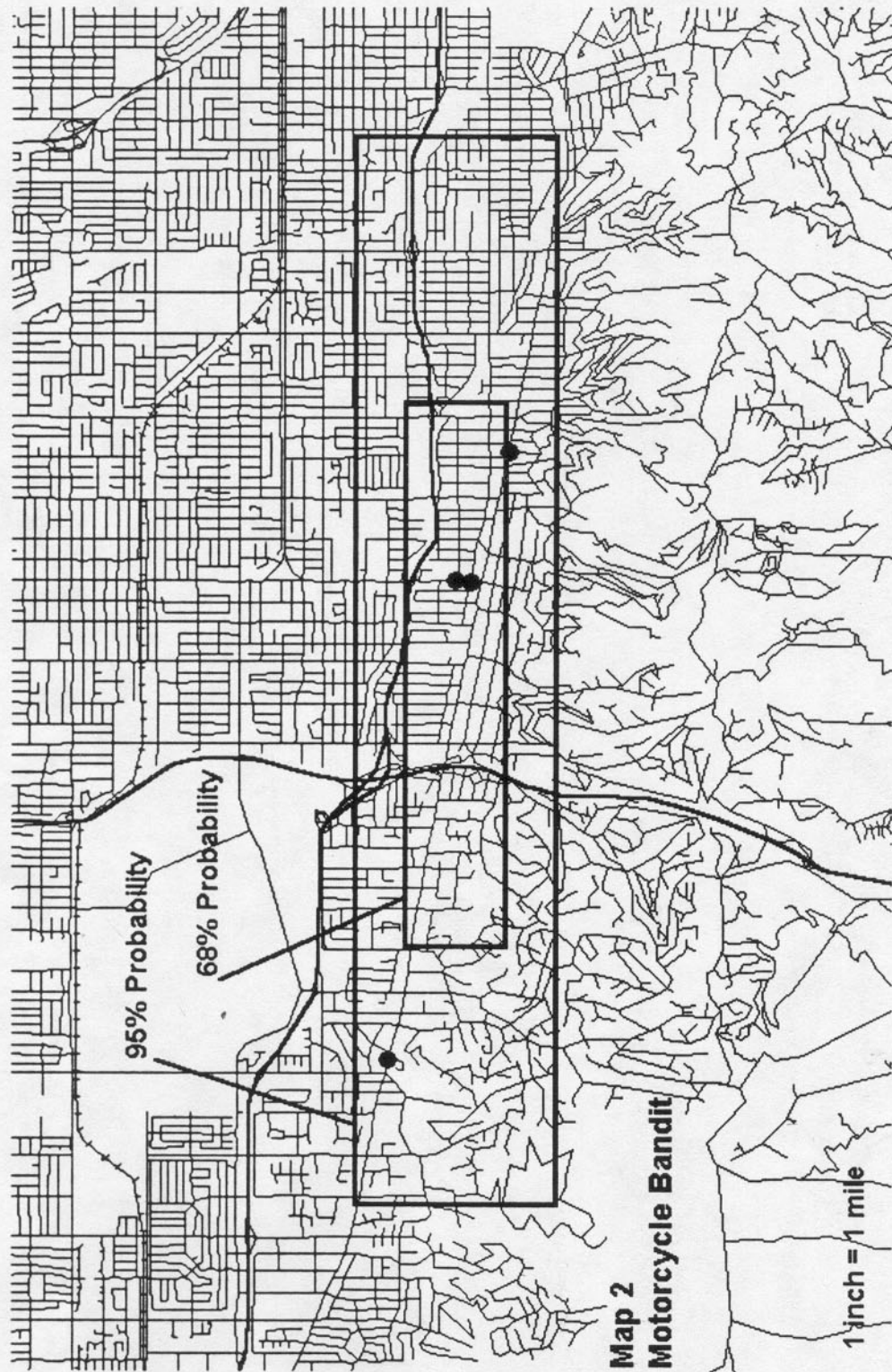
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Map 2
Motorcycle Bandit

1 inch = 1 mile

95% Probability

68% Probability

Figure 2

Figure 3

LOS ANGELES POLICE DEPARTMENT CRIME SERIES PREDICTOR

Series Title: Motorcycle Bandit

Crime No.	Start Date	End Date	Start Time	End Time	Location	X Long.	Y Lat.	Day Of Week
980904412	01/04/98		2235		14500 Moorpark St	-118.44817	34.151732	Sunday
980904912	01/08/98		2230		13900 Ventura Blvd	-118.43431	34.148417	Thursday
981006323	01/22/98		2315		16823 Ventura Blvd	-118.49875	34.159025	Thursday
980906941	01/24/98		2020		4500 Van Nuys Blvd.	-118.4479	34.153055	Saturday

DO NOT USE MORE THAN TEN INCIDENTS

68% Prediction

		Dates			Time of Day
	Bet.	01/25/98	Bet.		2045
	and	02/06/98	and		2345

Rectangle Object
Bounds X1: -118.485678 deg   Y1: 34.148626 deg
Bounds X2: -118.428887 deg   Y2: 34.157488 deg
Center X: -118.457282 deg   Y: 34.153057 deg

95% Prediction

		Dates			Time of Day
	Bet.	01/19/98	Bet.		1930
	and	02/12/98	and		100

Rectangle Object
Bounds X1: -118.514073 deg   Y1: 34.144195 deg
Bounds X2: -118.400491 deg   Y2: 34.161919 deg
Center X: -118.457282 deg   Y: 34.153057 deg

Time of Day Method of Analysis
NOTE: All are exact time incidents, use Mid Point Chart.

The worksheet has been distributed both inside and outside the Los Angeles Police Department, along with training on its use; slowly, more and more people are using it. It still takes good investigation, good reporting and good analysis to first identify a crime series. And the patterns of a serial criminal may be obvious without using any of these methods. Predicting the future is never going to be an exact science; suspects change their patterns of behavior for a variety of reasons. However, if it is true that 80 percent of crime is committed by 20 percent of criminals, then having tools like these helps focus police resources on the right 20 percent—the serial criminals. These methods can also be used to identify the "hunting" patterns of parolees, sex offenders and other career criminals.

REFERENCES

Gottlieb, S., S. Arenberg and R. Singh. 1994. *Crime Analysis: From First Report to Final Arrest.* Montclair, Calif.: Alpha Publishing.

ABOUT THE AUTHOR

Paul Geggie received his bachelor of science degree in law enforcement from Michigan State University in 1973. He has been an officer with the Los Angeles Police Department since 1974 and is currently assigned to the LAPD Crime Analysis Section, where he has functional supervision of more than 100 crime analysts. He also provides staff support for the department's quality control process, modeled after the New York Police Department's Compstat.