Crime Mapping News

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The topic of this issue of *Crime Mapping News* is how crime mapping and geographic information systems can be used as tools for tactical crime analysis. This issue focuses on both mapping and analysis concepts and techniques in an attempt to bring them more closely together. The articles cover topics such as 1) basic concepts of tactical crime analysis and examples specific to mapping, 2) advanced methods of mapping serial crime, 3) computer software that assists crime mapping by providing "good" tactical crime analysis data, and 4) an example of how one department conducts tactical crime analysis. Our goal in presenting these articles is to provide information that interrelates crime mapping and analysis techniques.

Tactical Crime Analysis and Geographic Information Systems: Concepts and Examples

by Mary Velasco and Rachel Boba, PhD
Crime Mapping Laboratory, Police Foundation

Introduction

The purpose of this article is to lay a foundation for law enforcement practitioners and researchers to develop a common understanding of tactical crime analysis and the role of geographic information systems (GIS). Having observed that people in the field use the same terms in many different contexts, we feel that clarifying concepts is a necessary step to improving communication among us. It is our hope that this article will encourage a dialogue, not only about the ideas themselves, but also about how they are used in everyday crime analysis.

The aim of crime analysis in the context of law enforcement is to provide information that will inform and assist crime control activity. Generally speaking, it is the development of information of use for crime prevention and detection activities. Crime analysis can also be used to inform policy and decision makers about the actual or anticipated impact of interventions, policies, or operational procedures. In this article, we concentrate upon "tactical crime analysis," one of the three types of crime analysis as identified by Steven Gottlieb in his book "Crime Analysis: From First Report to Final Arrest" (1994).

Note from the Editors: *The opinions expressed in the articles of this newsletter are those of the authors and do not necessarily reflect the views of the Police Foundation or the COPS office. In addition, only light editing has been done to the articles in order to keep each author's voice and tone.*

Inside this Issue

In the most general sense, tactical crime analysis is the study of reported crime, calls for service, and other related information in order to inform short-term operational crime control activities and problem solving. The emphasis upon informing short-term operational activities typically means that data from immediately preceding days, weeks, or months are most useful. All of this information is analyzed by *modus operandi* characteristics, spatial and/or temporal factors, as well as offender, victim, or other target characteristics. The use of GIS is an essential component of tactical crime analysis, as spatial characteristics are key factors to linking criminal activity and identifying relationships. The goal of this article is to outline general tactical crime analysis concepts as well as provide specific examples of how mapping can be used in tactical crime analysis. These examples do not represent all that is possible in tactical crime analysis mapping, but give the reader a place to start.

Tactical Crime Analysis Approach

This first section defines the overarching concepts of pattern and trend, then defines particular types of patterns and trends that the analyst may seek to identify. Our definitions of pattern and trend are simple and based on dictionary definitions:

A *pattern* is an arrangement or order discernible in any crime-related phenomena.

A *trend* is a specific type of pattern that has or assumes a general direction or tendency. In practice, a trend often has a time component and is represented as an increase or a decrease in a given phenomenon over time.

Patterns and trends are important to the crime analyst since they represent a framework to begin identifying relationships. For practical purposes however, more specific categories of analysis are useful, and some of these are outlined below. These categories and the following examples are not meant to be comprehensive, but are designed to serve as general guidelines for analyzing criminal activity when conducting tactical crime analysis in a police department. Even though these categories of activity apply to other law enforcement information such as calls for service and accidents, this discussion focuses on and draws examples from the context of reported crime.

> "Having observed that people in the field use the same terms in many different contexts, we feel that clarifying concepts is a necessary step to improving communication among us."

Series: While the term "series" is widely used in research, law enforcement, and everyday life, this discussion focuses on a specific use of the term. Thus, a series is a run of similar crimes committed by the same individual(s) against one or various victims or targets. For example, a suspect in a white sedan is approaching young females as they walk home from school and threatening them with a handgun while ordering them to enter his vehicle or an elderly gentleman is repeatedly burgled by the same local youths. These types of activity are notable because they involve crime committed by the same individuals against various victims or a single victim.

Spree: A spree is characterized by the high frequency of criminal activity, to the extent that it appears almost continuous. It involves the same offender(s) and usually occurs over a short time period, although this could be a few hours, a few days or a longer period depending upon the circumstances. For example, the driver's side window is broken and property is stolen from several vehicles parked along the same residential street overnight. Even though there is no suspect information, this activity is categorized as a spree due to the similarities in MO and the proximity in time and location. These similarities suggest that the incidents were committed by the same individual.

Hotspot: In the context of tactical crime analysis, a hotpot is a specific location or small area where an unusual amount of criminal activity occurs that is committed by one or more offenders. For example, over several months, two armed robberies of pedestrians and seven burglaries occur at an apartment community that is usually crime-free. For tactical crime analysis, this area is a hotspot because it represents a notable amount of activity at one location. It should be noted that hotspots can overlap with the other types of activity.

Hot Dot: While this term has been coined previously to refer only to "the victim who repeatedly suffers crime" (Pease and Laycock, 1996), we have included the offender in the definition as well. We define a hot dot as an individual associated with an unusual amount of criminal activity, either as an offender or a victim. For example, over the course of two months, the same individual has been arrested for assault, theft, and criminal trespass and has also been the subject of several field contacts by police. This individual is categorized as a hot dot because of the notable amount of police activity.

Hot Product: A hot product is a specific type of property that is the target in the same or different types of crime. This term was coined by Clarke (1999), who defines hot products as "those consumer items that are most attractive to thieves." For example, during a six-month time span, twenty tailgates are stolen from trucks of various makes and models throughout the city. This activity is notable because the same type of property has been taken.

Hot Target: We propose the term "hot target" to refer to particular types of targets that are frequently victimized but which are not included in the definition of hot spot (small areas), hot dot (persons), or hot product (goods). For example, ten incidents of vandalism of churches across a city, a dozen burglaries of sports shops across the city, or a number of crimes against public transit commuters might make any of them "hot targets," particularly if there is no indication that the crimes are committed by the same offender(s).

Tactical Crime Analysis Mapping

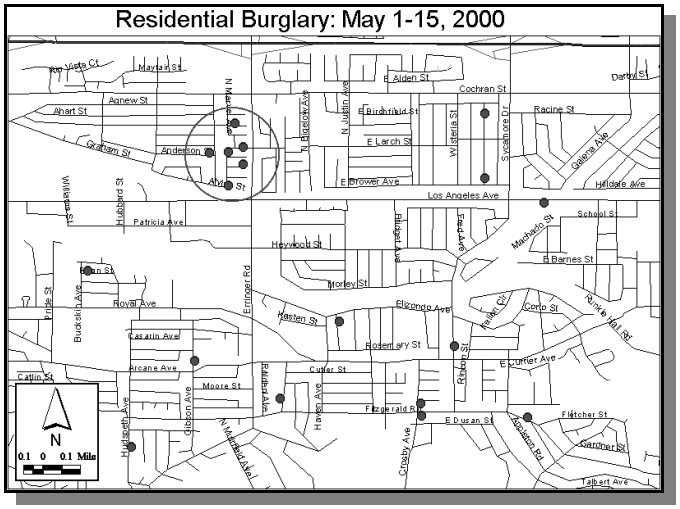
GIS is an integral part of both the analytical and presentation phases of tactical crime analysis. Tactical crime analysis mapping is not a refined process, and each analyst has his or her own methods for mapping criminal and other types of activity. For a specific example of tactical crime analysis mapping, see the article on page 10, "Tactical Crime Analysis: Musings from the Cambridge, Massachusetts Police Department," by Chris Bruce. Where police officers and crime analysts previously used pins and wall maps to geographically analyze and display data, many individuals now have the power of sophisticated GIS tools at their fingertips. GIS is not just the process whereby a computer program is used to place electronic pins on static electronic maps; it is a tool with many capabilities for analyzing and interacting with the data.

Pin maps are one of the simplest methods for analyzing and presenting tactical crime pattern data. However, crime data combined with other types of geographically related data such as field contacts, schools, bus stops, or liquor stores allow for a multi-layered analysis. Additionally, using graduated symbols and colors to analyze incidents by frequency of address, date of occurrence, time between hits, or property taken are other useful methods of tactical crime analysis mapping. Lastly, aerial maps are useful for analyzing and illustrating criminal activity, as this type of map allows analysts and investigators to assess the environmental characteristics of a location, including lighting, access, and natural surveillance.

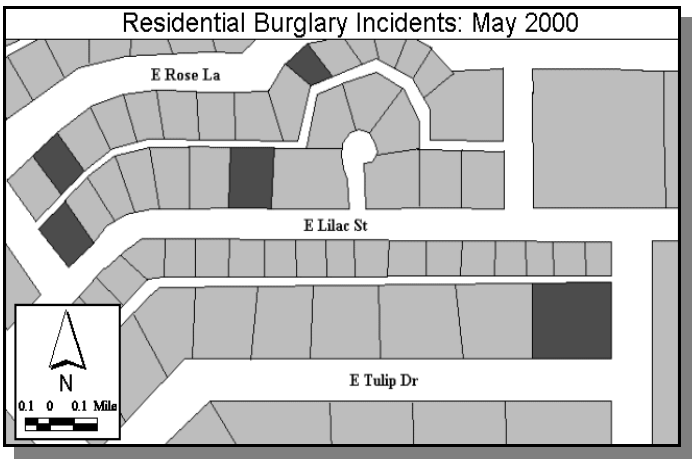
The following are three basic examples of tactical crime analysis mapping to illustrate this discussion. For more advanced examples specific to crime series, see the article on page 5, "Trendspotting: Serial Crime Detection with GIS," contributed by Dan Helms, a crime analyst for the Las Vegas Metropolitan Police Department.

Example 1: Analysis of Residential Burglary

One of the most prevalent methods for locating related property crimes is simply to map a group of incidents and look for geographic clusters of activity. A first step in analyzing residential burglary patterns and trends, as with many types of property crime, is mapping the incidents and analyzing clusters of burglaries to determine if a geographic pattern exists. Once a cluster of incidents is identified, it is possible to drill down further into the data to analyze the specific characteristics of each incident, such as point of entry (e.g. door, window), method of entry (e.g. door kick, window break), and/or property taken. The following map depicts one month of residential burglary data; the circle indicates a cluster of activity that may require a more detailed analysis.

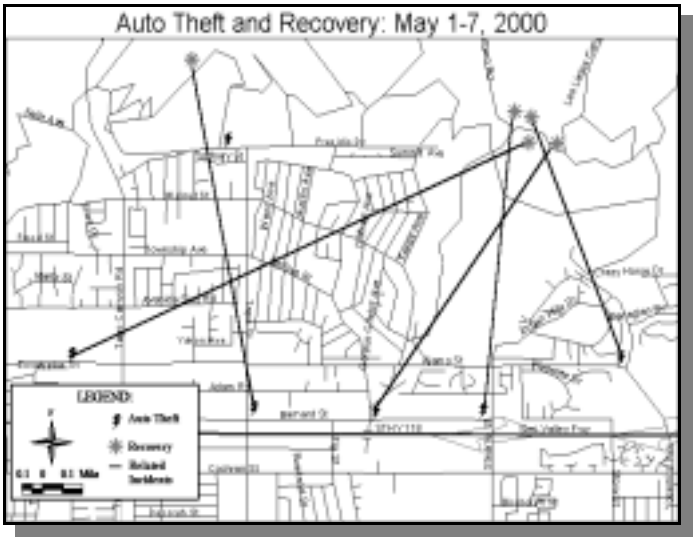


In some jurisdictions, geographic parcel data are available to use for analysis. These data consist of a geographic layer that outlines each parcel of land. Parcels are particularly helpful in mapping residential areas because they allow users to identify geographic features such as alleys, cul-de-sacs, and the specific location of an address on the street (e.g. two houses from the intersection). The following map is an example of a parcel map.



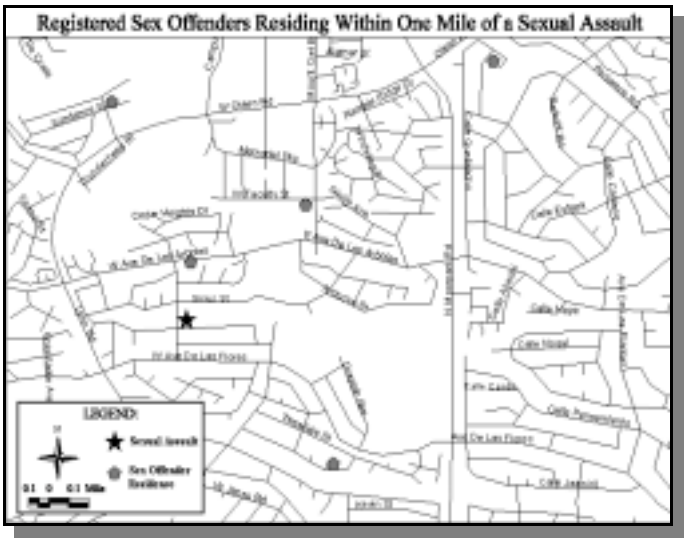
Example 2: Analysis of Auto Theft and Recovery Locations

One way of identifying auto theft patterns is to map both the auto theft and recovery locations of particular vehicles. The following map depicts one week of auto theft and recovery data in one part of a city. The group of incidents in the Northeast corner of the map represents the recovery hotspot. By drawing a line between the theft and recovery of a particular vehicle (the line does not indicate the travel pattern), one can see which incidents may be related and which may not be. Closer examination of the *modus operandi*, time of day, day of week, and/or type of vehicle may show a stronger connection such as a series or spree.



Example 3: Identifying Investigative Leads for a Sexual Assault

Tactical crime analysis also assists short-term problem solving by identifying investigative leads. For instance, to develop a pool of potential leads for a recent sexual assault, one may begin by mapping all registered sex offenders that live in the area of the incident. One can then assess the candidates based on other characteristics, such as physical description, previous offenses, and travel patterns in order to determine similarities to the crime in question. For areas with a high number of registered sex offenders, this process may need to be completed before the map is created to limit the number of candidates. In other words, this is an iterative process in that with every inclusion or exclusion of information, relationships are reexamined. The following map depicts a sexual assault incident and all registered sex offenders that reside within a one-mile radius.



Conclusion

The intention of this article is to contribute to the ongoing conversation relating to terminology, methods, and techniques of tactical crime analysis and the role of GIS. By outlining some concepts used in tactical crime analysis, we hope that we have aided the development of a common language that practitioners and researchers will use to discuss and debate these ideas.

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Trendspotting: Serial Crime Detection with GIS

by Dan Helms, Crime Analyst
Las Vegas Metropolitan Police Department

Tactical crime analysts have utilized a number of methods, some highly refined and scientific, others flexible and intuitive, to detect and analyze serial crimes. In fact, most analysts can boast at least a few successes in the series-finding game, no matter which techniques they employ. Some specialize in this sort of analysis and have developed powerful analytical methods for countering the acts of the serial predator. Geographic profilers in Canada and investigative psychologists in the UK have developed powerful methods for interpolating the location of an offender's home from the location of his crimes. Other analysts have attempted to intercept crime series by forecasting the time and place of the next attack.

All of these promising techniques, however, are based on reliable knowledge of what the criminal has been doing. It is not enough to know that there is a crime series going on; the analyst must know with some degree of confidence precisely how many crimes are associated with a particular series from the list of hundreds or thousands of similar crimes under consideration in his or her data.

Most crime series are detected through "signatures," that is, unique behaviors on the part of the offender. A *serial robber* might use the same approach line in several robberies word-for-word: "Give me your billfold and I won't have to cut you!" A *serial burglar* might use a distinctive entry method, such as cutting a hole through an adjoining wall. A *serial rapist* might perform the same sexual acts in the same sequence every time. A *serial killer*, the rarest and most challenging of all predators, might choose victims who look alike or share a common trait.

It is easy enough to see the similarities in many serial crimes, enough to detect the existence of the series; however, when it comes to nailing down specifically which cases are related and which are not, even the most experienced investigators and analysts have great difficulty and often stumble. There are many reasons for this difficulty; the two biggest challenges are offender evolution and reaction reflexes.

Offender Evolution occurs when the nature of a crime series changes over time, often as the criminal acquires more expertise. For example: A serial robber might not use disguises until he gets caught. After he gets out of prison, if he re-offends, he might start using a mask. He might not use a weapon until a victim physically resists him; afterward, he might display a knife or a gun to avoid such resistance. Evolution is very common and can take many forms. Criminals can evolve from one sort of predator into another. For example, some peeping toms will evolve into rapists and others into burglars.

Reaction Reflexes can cause the offender's behavior to change drastically from one case to another. In one rape, for example, the offender might seem kindly and non-violent; but the same rapist might be vicious and brutal to his next victim. Why? Because each victim reacts differently to the rapist, causing him to react differently to them. A predator might act non-violent until his victim physically resists or screams, at which point he turns savage. Another type of predator might seem aggressive and threatening, but back down and retreat when confronted boldly. The wide differences in behavior from one crime to another committed by the same perpetrator can make it very difficult to associate the crimes with one another.

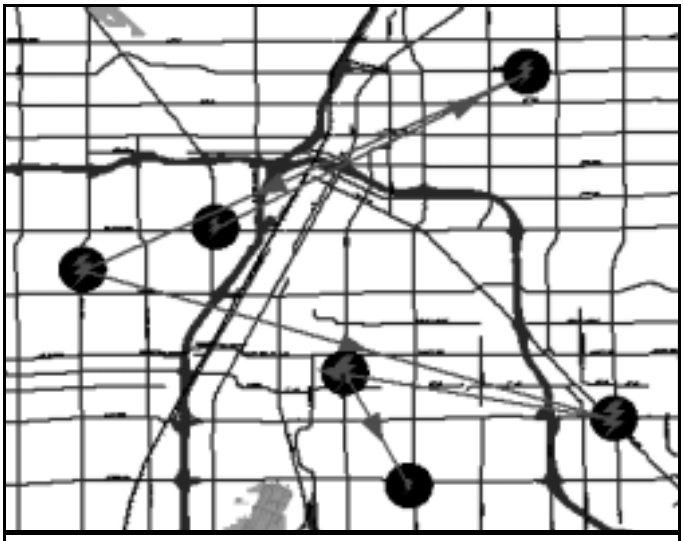
Often, the analyst will be aware of the existence of a crime series, but will have great difficulty deciding exactly which crimes to associate with the series. Is case X part of the burglary series? The entry method is the same, and the property taken was the same, but in this case the burglar ate food from the victim's refrigerator, which did not happen in any of the other cases. What about case Y? Here almost every factor seems different, but the crime occurred right across the street from where all the other burglaries were happening.

The process of delineating exactly which cases are part of a detected crime series is called refining the series, and it presents quite a challenge to the tactical analyst. Obviously, a wide variety of factors must be analyzed before any conclusions can be reached. One of the best techniques to speed up and prioritize the process is spatiotemporal analysis of the crime series, and one of the best tools in the tactical analyst's inventory is the Geographic Information System, or GIS.

Serial crimes are detectable through the commonalities they share, such as offender description, victim similarities, timing, modus operandi, and so forth. One of the most visible commonalities in many crime series is spatiotemporal distribution.

Some serial criminals attack in a single, tightly-defined area (a "cluster," or "hotspot"). Others spread their attacks out across a wide area, intentionally avoiding detec-

tion and attention. A few progress from area to area in a discernable progression. A very few do appear to strike in truly random locations. In addition to the spatial distribution of cases, there will be a related temporal distribution. Mapping the locations, as well as the sequence of the events can reveal temporal relationships (see the following map). Some offenders will strike on a weekly or monthly basis; others will strike at irregular intervals, but always at the same approximate time of day. Some increase or decrease the intensity of their activity seasonally. Some steadily increase, while others may seem to decrease.



Beginning with a suspected crime series, we can examine the sequence of events.

The combination of spatial and temporal idiosyncrasies relevant to each crime series is called the **Spatiotemporal Profile** for that series. It is usually one of the easiest parts of the series to isolate and analyze, because the location of crimes and the times at which they occur are usually known to the police with great precision (this is one of the reasons why serial murders are extremely difficult to analyze, as the location and time of the crime itself are likely to be unknown when only a dead body or a missing person are brought to the attention of police).

One of the most powerful techniques we can apply to the problem of refining our series is analysis of the spatiotemporal profile of our series. By comparing each case we suspect to be in our series with the series' spatiotemporal profile, we can determine whether or not it makes a good fit. By identifying suspicious gaps in our profile, we can infer where we might have inadvertently missed a case. We begin creating our spatiotemporal profile by choosing a group of cases we believe to be related based on MO, signature, description, and any other important linking factors we choose.

The simplest spatiotemporal profile consists of three spatial factors, three temporal factors, and three combined factors.

The spatial factors are:

- Hunting Grounds (area in which the crimes are taking place)
- Distribution (dispersion of crimes within the hunting grounds area)
- Distance (sequential distance of space from one case to the next)

The temporal factors are:

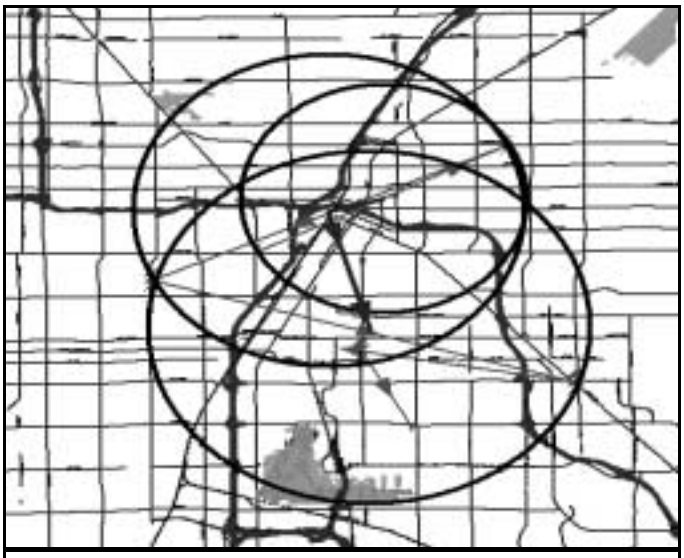
- Span (calendar period in which the crimes are taking place)
- Distribution (dispersion of crimes within the span period)
- Interval (sequential interval in time from one case to the next)

The combined factors are:

- Crawl (movement of the area within the span)
- Dispersal (relationship of the spatial distribution to the span)
- Spacing (ratio of distance to interval)

These nine factors can be used as a starting point for some fast and efficient scanning of cases. There are several alternative methods available for determining the value of each factor; we will take a moment to suggest some simple techniques that can yield quick and productive results.

Hunting Ground: While the use of kernel-smoothed, weighted-density fields is probably the most accurate method, the fastest is the "Circle Method." As outlined by Prof. Canter of the University of Liverpool, this method merely involves drawing a circle, the diameter of which is the distance



The "Circle Method" is an easy way to define the extent of the Hunting Grounds...

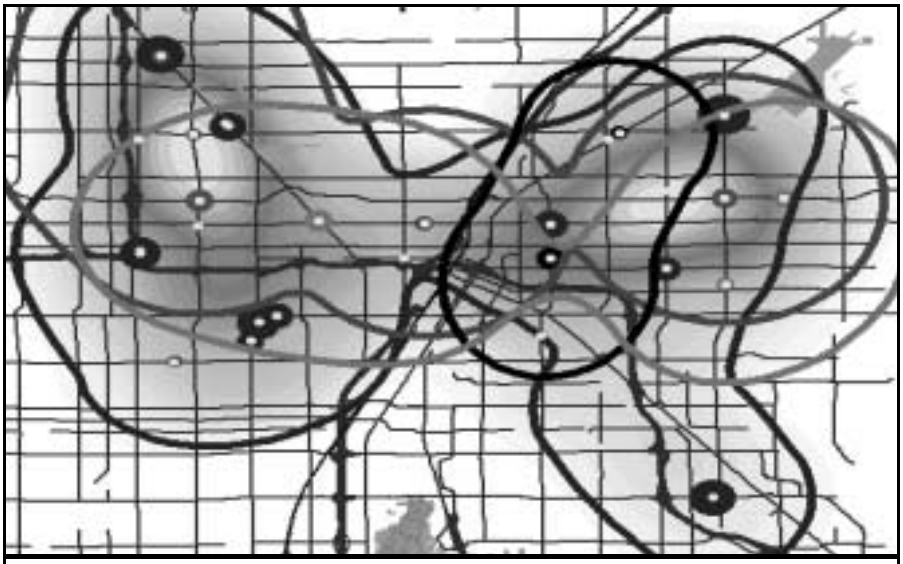
between the two most widely separate cases, each of which touch the circle.

Spatial Distribution: Can be determined using the Poisson test for Complete Spatial Randomness (CSR) or any of a variety of other Nearest-Neighbor methods. Will result in one of three values: clustered (cases tend to clump together), uniform (cases tend to spread apart), or random (cases clump or spread unpredictably).

Distance: Calculate the distance between case 1 and case 2; then case 2 to case 3, etc. The result is a distance variogram. More advanced analysts can create a "lag variogram," which calculates combinations and permutations of distances (case 1 to case 3, case 2 to case 4, etc.).

Span: The calendar period from the earliest included case until the last.

Temporal Distribution: Can be derived from spectral density analysis of the frequency timeline. The analyst should calculate the cyclic rate (if any), the acceleration or deceleration (equal to the slope of the interval trendline), and the phase of the cyclic rate.



Eventually, the analyst may re-classify every case in the overall trend into discrete series , or "subtrends," based on their spatiotemporal characteristics taken together with MO, signature, description, and other information...

Interval: The time in minutes, hours, or days between case 1 and case 2, case 2 and case 3, etc. Just like distance calculations, this variogram can be expanded into a lag variogram for more complex analysis.

Crawl: The direction and distance from the center of the Hunting Ground as defined by cases 1-2 to cases 1-3, then 1-4, etc. The line derived from these changes may reveal a direction in the movements of the offender's targeting methods.

Dispersal: The change in the CSR coefficient from case 1-2 to case 1-3, then case 1-4 etc. Like the Crawl of the series, the trend in coefficient derived from these changes may reveal whether the offender is targeting more specific areas, broadening his hunting grounds, or alternating between areas.

Spacing: The ratio of distance to interval between each sequential pair of cases. The actual measurement units employed do not matter as long as their use is uniform; the ratio is the important factor.

Once the analyst has prepared a matrix of these values, or incorporated them into a GIS project, she or he is able to examine the series to make some reliable determinations as to what does and does not belong. The refinement method consists of two stages: exclusive and inclusive.

The **Exclusive** stage involves comparing each case in the series, one at a time and individually, with the overall spatiotemporal profile of the series as it would appear without that case, checking to see if it matches well or poorly. If well, our suspicion that the case is a part of the series is provisionally confirmed and we can move on; if poorly, then we may wish to exclude this case from our analysis, or at least carefully reexamine whether or not it belongs with the others.

Begin with case 1. Draw the hunting grounds as they would appear without including case 1, then draw a point at the location of case 1. Is the point inside or outside the hunting grounds? If inside, this tends to confirm the case as part of the series; if outside, it tends to reject it.

Next compare the spatial distribution of the series excluding case 1 to the distribution that includes it. Does the distribution change? If the distribution becomes more random, this tends to confirm the case as part of the series; if it makes the series more uniform or more clustered, this tends to reject it.

Compare the distance between case 1-2 with the mean distance between all cases. Is it close? If so, this tends to confirm; if not, to reject.

Perform these comparisons with all nine key factors. Based upon the results, the analyst should be able to make a reasonable distinction between cases which seem to fit and contribute meaningfully to the series and those which seem aberrant or misplaced. Those which fail to correspond to the spatiotemporal profile should be reexamined and possibly excluded from consideration in the series.

The **Inclusive** stage involves looking for holes in our profile where we would expect another case to be. Once again, we move step by step through our cases, taking each one sequentially and looking for suspicious gaps.

Based on the series spatiotemporal profile, what should have been the hunting ground for case 1? Does case 1 really look like the starting point, or might we extrapolate back one more step to an earlier, undetected case? Compare each factor to the expectation you would have based on the

profile you constructed. When you come across a distance, an interval, a distribution, or any other factor that seems too long, test to see if filling in the gap with an imaginary case makes your series profile work even better. If so, then perhaps you are missing a case. You should reexamine your database, concentrating on cases occurring within the times and areas outlined by the expectation you derived from your profile.

If you find a suspicious gap, but cannot find any case in your records which could account for it, do not worry. You are probably doing everything correctly; there are many possible reasons for such a result. The offender might have meant to commit a crime, but caught the flu that week and did not have the energy to mug someone. The victim might never have reported the crime (particularly true of crimes where the victims are themselves criminals). The crime might have been committed and reported, but the report may be lost or delayed. Unfortunate, but you can still make it work.

The creation and use of a spatiotemporal profile to refine serial crime analysis may sound intimidating, but it is actually easy to do. With so much data available to the average analyst, outdated hand-scanning methods simply cannot keep up with the needs of the community. The power of desktop GIS, now widely available, allows even time-pressed tactical analysts to implement reliable and useful series-hunting refinement methods quickly and easily. These few basics can get you started; many improvements and modifications will suggest themselves to you. No matter what methods you use, it is critical for any tactical analyst to be able not only to detect a crime series, but also to define it clearly. You can't analyze it if you can't define it.

"...it is critical for any tactical analyst to be able not only to detect a crime series, but also to define it clearly. You can't analyze it if you can't define it."

Dan Helms is a crime analyst for the Las Vegas, NV Metropolitan Police Department. He can be e-mailed at d5217h@ccgwgate.co.clark.nv.us.

Customization Survey

We have inserted a brief survey with this issue of the *Crime Mapping News*. As part of the Crime Mapping Laboratory's commitment to provide users with a comprehensive guide to mapping software, we are expanding our software review to include specific customizations and enhancements to these software programs. Customized mapping applications range from small software programs to more complex interfaces that an agency may create to replace pre-programmed software screens and functions. The purpose of the survey is to develop a comprehensive list and review of customized mapping applications that are currently being used by agencies throughout the country. Please take a moment to answer the survey questions.

Please send your responses to the Crime Mapping Laboratory via fax or e-mail (e-mails do not need to be in a particular format, simply include your responses).

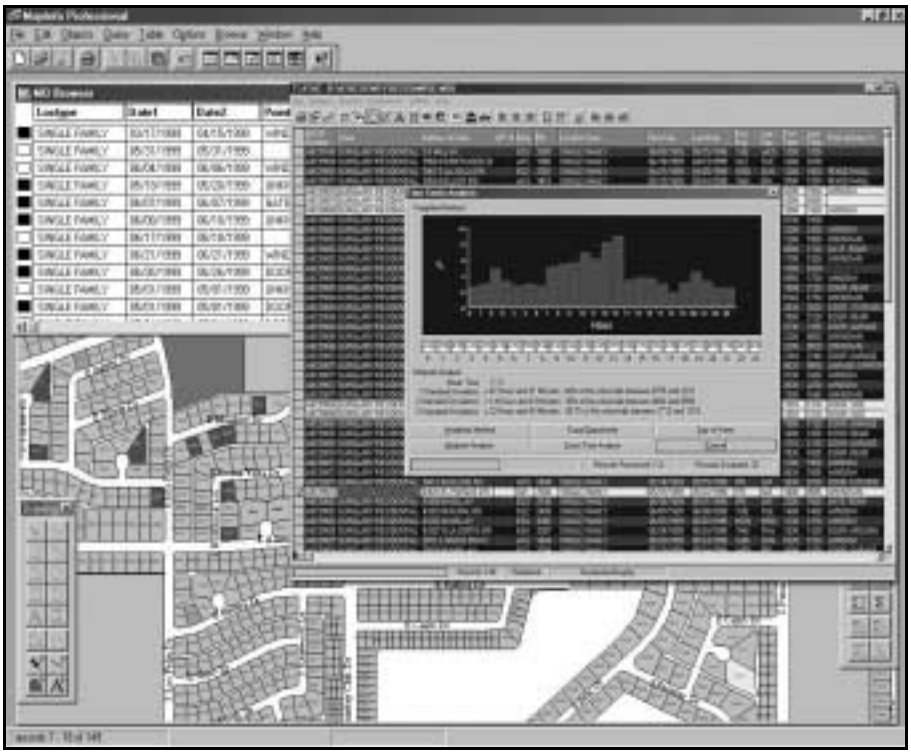
Fax: (202) 659-9149
E-mail: pfmaplab@policefoundation.org

We will also be posting this survey to the CrimeMap listserv; responses can be directed to the above e-mail address. Thank you for your participation!

ATAC: A Tool for Tactical Crime Analysis

by Sean Bair, Director
Bair Software, Research & Consulting

The key to conducting successful tactical crime analysis mapping or any crime mapping is having "good" data. In the case of tactical crime analysis, "good" data means systematically accurate and highly descriptive data. Date, time, type of crime, and location are not enough to conduct tactical crime analysis. There must be information about many more factors of the criminal incidents, such as method of the crime, suspect description, suspect actions, victimology, vehicle information, property taken, and special circumstances of the crime. The following article describes the development and characteristics of a software application specifically tailored to provide "good" tactical crime analysis data.



Eight years ago while working as a crime analyst, I was tasked with the responsibility of implementing tactical crime analysis in the Tempe, Arizona Police Department. At that time, we were performing tactical analysis by simply reading a selection of daily police reports and relying upon our memories and rudimentary paper matrices to organize and compare similar cases. Believing this process could be automated, we began to look for software to perform this task. We chose to use SPSS (Statistical Package for the Social Sciences) given its matrix approach to organizing and displaying data. We would enter key elements of a crime into the SPSS data matrix and use its query and sort capabilities to compare cases.

By using SPSS, reading the police reports on a daily basis, and relying upon our memories, we were able to identify approximately 2-3 crime trends every three months. However, we believed we could do better if we had an application more suited for the task, so I began researching the current software that was available for performing the specific task of tactical crime analysis. At that time, I identified two applications: TCAP (also known as RAMMS or InfoCOP) and MECCA. TCAP was written by a crime analyst and used a Dbase IV database structure. MECCA was written by the Institute for Police Technology and Management and used a FoxPro database. I evaluated both applications and believed they would substantially increase our ability to identify crime trends and clear cases. However, the crime analysis unit was under budgetary constraints and could not afford to pay for the modifications that would have been needed to use these programs. Instead, we decided to draw upon my experience of fourteen years of computer programming and attempt to write a tactical crime analysis application specific to Tempe's needs. The initial application was completed in late 1995, tested, and has been successfully used at the Tempe Police Department since early 1996.

The application is named ATAC, an acronym for Automated Tactical Analysis of Crime. ATAC was written in the Windows® environment using a modern relational database. The following are the major components of ATAC:

Entry Module: The Entry Module enables the user to quickly and precisely enter information. It makes the task of data entry easy by incorporating single character value recognition, defaults, and point and click capability. In addition, it contains a variety of useful data integrity checks that assures the information entered is accurate.

Hub/Matrix: The Hub or Matrix is where the data are housed and displayed in the traditional form, the matrix. With the matrix, one can view the data, select, and sort—key features crucial for analysis.

Query Wizard: The Query Wizard enables the user to build complex, cross-table queries by simply pointing and clicking on the desired constraints. It is possible to query data using partial word, whole word, phrase searches, or soundex searches. Another feature is the SQL (Structured Query Language) Viewer which allows the user to view, change, and/or copy the current query in the Query Wizard. Finally, the SQL Builder is a feature that allows the user to actually create,

modify, and save SQL statements.

Trend Wizard: The Trend Wizard allows the user to weigh characteristics of a particular crime according to their importance (e.g. suspect description would be weighed more for robbery than for burglary). Using these weights, the wizard will either compare one incident with all other incidents, or compare all incidents to one another and mark those that are similar.

Time Series Module: The Time Series Analysis module enables one to perform most time series methods on all or a selection of the data. The Time Series module supports several statistical models including: exact time analysis, weighted method, equal opportunity, midpoint analysis, and day of the week analysis. The Time Series module will display the results of the temporal distributions through an area, line, or bar graph. It also calculates means and confidence intervals of 1, 2, or 3 standard deviations, providing both potential beginning and ending times for each deviation.

Mapping Capabilities: ATAC does not currently have its own mapping function, but it allows the option of exporting all or sections of the data in Dbase IV format for use in GIS packages such as MapInfo and ArcView. The data can then be easily geocoded and analyzed spatially.

Other features of ATAC not mentioned in this article are the Sort Wizard, Statistics Menu, Trend Manager, and Reports, among others. ATAC has undergone significant enhancements and modifications since its introduction; it has been updated to a 32-bit environment and uses a Microsoft Access 97 database as its engine and will soon include its own crime mapping module. To learn more about ATAC, visit the Bair Software Web Site at www.bairsoftware.com.

Sean Bair is a former crime analyst and currently a police officer at the Tempe, AZ Police Department. He is also the director of Bair Software Research & Consulting. He can be reached at sean@bairsoftware.com.

NEXT ISSUE

The topic of the next issue will be regional (cross-jurisdictional) crime mapping and data sharing. We look forward to your participation in submitting articles for the upcoming issue.

If you are interested in contributing to the next issue or any future issue, please contact the Crime Mapping Laboratory at:

pfmaplab@policefoundation.org
or (202) 833-1460

Mapping in Action:

Tactical Crime Analysis: Musings from the Cambridge, Massachusetts Police Department

by Chris Bruce, Crime Analyst

Tactical crime analysis is the meat and drink of a crime analyst's life. It is fast-paced and exciting, dealing with the immediate, the critical, the here and now. It is dirty, grueling, arms-in-the-mud work that has to be done every day. There is no rest for tactical crime analysts, no breaks. Strategic crime analysts can stay in their ivory towers, dithering with their inferential statistics and long-term trends, afraid to get their hands dirty. They can work on the new redistricting plan for next year; we'll be identifying, analyzing, and putting an end to that robbery pattern that's happening right *now*. Tactical crime analysis is where the action is—which is why it's also called "action-oriented analysis."

Both urgent *and* important, tactical crime analysis is the crime analyst's A-1 priority. When it's effective, it's done *first*—before you answer your e-mail, before you make those phone calls, before your morning break. No time to mull over coffee: Read! Analyze! Disseminate!

Such is the philosophy of the Cambridge Police Department's Crime Analysis Unit, which is proud of its fierce dedication to this process. Consequently, we've developed a number of procedures and policies to help us optimize this vital job:

The Day Begins with the Reports

We have written a document called *The Ten Commandments of Crime Analysis*. Commandment #2 is: "Thou shalt read thy agency's crime reports every day." This means reading the physical copy of the written report, not the RMS or CAD entry. There's just something about poring over those actual carbon copies, with a blue pen and a caffeinated drink close at hand, that embeds the crime into your mind—so that when you come across a related incident, you're likely to identify a pattern instantly. Plus, it avoids the problems of timeliness, accuracy, and other data quality issues inherent in many records management systems.

Calls for service are important too, and many of them don't result in written reports, at least in our department. Thus, while one analyst works his way through the pile of crime reports, the other reviews the non-crime entries in the CAD system.

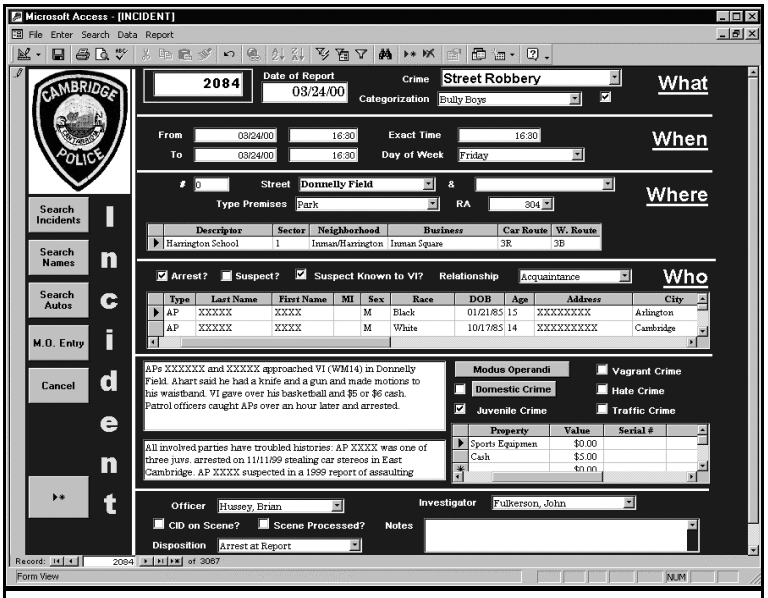
The analyst with the reports cross-checks each one against the crime analysis database for any related incidents. The manner in which each report is checked varies from report to report. For a regular housebreak, for instance, the analyst may look for all housebreaks in the same neighborhood for the past month. A housebreak with a peculiar MO may warrant a check of all housebreaks, going back several months for a similar MO. If the report lists a suspect or an

arrested person, the name will be checked for any previous reports. By this method, we try to catch any pattern, series, or hot spot within two or three incidents.

A Database for Crime Analysts

The Cambridge Police Department's quest to procure a "new" records management system—now in its tenth year—is a comedy of errors that we won't bore you with here. But it has indirectly benefited the Crime Analysis Unit because, faced with no adequate commercial system, we were forced to design our own—and of course, we designed it to be of optimal use to crime analysis.

As masters of this system—created in Microsoft Access—we assumed data entry responsibility for crime incidents, hiring a full-time data entry clerk for this task. A lot of units might balk at the idea of taking on Records Unit responsibilities like this, but the confidence we feel in the accuracy and timeliness of the information outweighs the six to eight hours a week we have to spend on it.



The Cambridge Police Department's Crime Analysis Database entry screen. This is a Microsoft Access database developed by the Crime Analysis Unit over the course of several years.

One field in particular makes this database unique: the "analysis" field. It allows the analyst to enter his or her own notes and thoughts about a crime and the likelihood that it's connected to a pattern. A note on a housebreak might read, for example, "Two blocks away from break yesterday, but significant differences; probably no pattern." Or: "One of two breaks in this building this date. Such incidents unusual for this building on such a high floor—maybe inside job?"

The "analysis" field for an acquaintance house burglary reviews the history of the parties involved: "Suspect and victim go way back. Suspect used to live in the building, and had some kind of relationship with VI, producing several assault reports. Since suspect moved out sometime in 1999, she has tried to break into victim's apartment twice."

Of course, a large number of reports simply read, "No history on suspect," or "No patterns in the area." Overall, this system makes it easy to keep track of patterns, and to provide investigators a way to look up a quick analysis on their assigned cases.

Mapping

Once a pattern is found, mapping helps us analyze it and provides a visual aid for the written analysis published in the *Daily Crime Bulletin*. (Just in case we've missed something in our daily review of crime reports however, we map and review each of our five "target crimes"—street robberies, housebreaks, larcenies from motor vehicles, auto theft, and commercial breaks—once per week. Occasionally, we catch a pattern during this review process that we originally missed. An example of one of these reviews appears with this article.)

Geography being one of two ways that potential crime patterns are initially identified (the other is *modus operandi*), many agencies do map crimes on a daily basis to find patterns. These agencies need to be aware that a *cluster* of crimes does not necessarily signify a *pattern* of crimes. The map is never the end product, and any apparent cluster needs to be analyzed more thoroughly before the existence of a pattern can be ascertained. Geographic coincidences occur far more often than one might expect, so that four housebreaks that occur over the course of a week within two blocks of each other may be obviously and entirely unrelated (e.g. one is a professional job, another amateur, the third between warring acquaintances, and the fourth a landlord/tenant matter).

Tactical crime mapping, like tactical crime analysis, can be a down and dirty process. The annals of etiquette in crime mapping go out the window. When you're trying to quickly find or display a crime pattern, elements like scale bars, legends, layout windows, tables imported from your RMS, and other frilly GIS features take more time than they're worth. It's a thirty second process: CTRL-F a dozen locations on the street layer, choose a symbol, zoom in, and maybe drop some text, circles, lines or arrows on the cosmetic layer to highlight certain features. Then copy the entire mess to the clipboard and paste it into your word processing application. Sure, it's only a few degrees removed from paper maps and push pins, but it gets the job done fast. (Incidentally, for this type of "down and dirty" crime mapping, we find MapInfo to be a more user-friendly, adaptable application than ArcView, though we own and use both applications.)

Dissemination

Since the Crime Analysis Unit's inception more than 20 years ago, the primary means of dissemination of crime and pattern information has been the *Daily Crime Bulletin*. In

the early days, we used a typewriter and a drafting table; now we use Microsoft Word. Among other things, the *Bulletin* contains:

- a review of all target crimes since the previous bulletin
- an analysis of any current crime patterns and trends
- a comprehensive review of that day's target crime
- a list of recently issued warrants
- abstracts of articles from various newspapers
- interdepartmental memoranda and notices

Creating a four-page bulletin for your department every day can be a grueling, repetitive process. This is why we recommend interns. We employ a full-time and a part-time intern from Northeastern University to edit and publish the *Daily Crime Bulletin*.

More recently, we've availed ourselves of technology to put this information out faster. A daily e-mail goes out to all command staff members and superior officers as soon as we have finished going through the crime reports for the day. This e-mail serves as a pre-*Bulletin*: a way to get pattern information out in a more timely manner.

The next step, of course, is live, interactive information via an intranet, currently under development. This may serve to replace the paper *Bulletin* entirely, once it is accessible from the MDTs in the cruisers.

The End of the Day

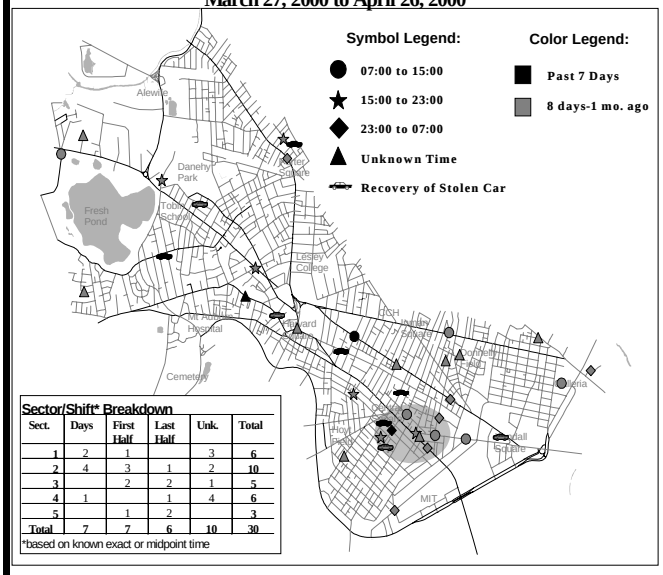
By two o'clock, the *Bulletin* is done, and we have moved into strategy development, the stage of the tactical crime analysis process that we no longer directly control. The Crime Analysis Unit can now focus on other projects, including the occasional strategic crime analysis.

But tactical crime analysis is like garbage collection: there's always more waiting for you the next day; and if you don't do anything about it, it gets out of control very fast. Our nights are filled with tortuous dreams of the insidiousness occurring in our jurisdictions while we sleep; our mornings brim with nervous anticipation until we hold a new, fresh stack of poorly-written, illegible, coffee-stained reports once again.

Chris Bruce is a crime analyst at the Cambridge, Massachusetts Police Department. He can be reached at (617) 349-3387 or e-mailed at cbruce@ps.ci.cambridge.ma.us.

Crime Review — ***Auto Theft***

March 27, 2000 to April 26, 2000



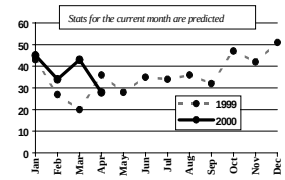
Sector/Shift* Breakdown

Sect.	Days	First Half	Last Half	Unk.	Total
1	2	1		3	6
2	4	3	1	2	10
3		2	2	1	5
4	1		1	4	6
5		1	2		3
Total	7	7	6	10	30

*based on known exact or midpoint time

There were 30 auto thefts reported in Cambridge in the past month, a **19% decrease** from the 37 reported during the same period of 1999. This is the first monthly decrease this year.

Central Square has emerged as the prime hot spot for auto theft, particularly the area around **Lafayette Square** (Sector 2, Route 4R, Walking Routes 4A and 4B). These have been primarily **Hondas** and **Toyotas**. Times of day have varied. Six of the cars stolen in this area have since been recovered, all of them in the north shore communities of Lynn, Revere, and Chelsea. Chelsea Police, while making the most recent recovery of a 1998 Honda Accord stolen from Washington Street, chased two white males in their 20s, both over six feet tall. Neither was caught. The most recent three thefts have been off of **Main Street**.



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The COPS Internet — Information on COPS and Community Policing is just a CLICK away

WWW.USDOJ.GOV//COPS

Visit the redesigned and easier to use COPS web site at www.usdoj.gov/cops.

Five key channels provide up to date information on COPS and its programs:

News & Information: For the latest grant announcements, press releases, and upcoming events

Grants, Programs, & Activities: For a list of current funding opportunities complete with application kits and comprehensive descriptions on all our grant programs and more, including training and technical assistance, compliance and monitoring, and program assessment and policy support

Grantee Toolbox: Resources for our grantees including contact information, tips, grant owner's manuals, and progress report forms

Community Policing Resources: A respository of excellent community policing resources including COPS funded studies, reports, curriculums, tools, and tips, conference capsules, ongoing assessments, and promising practices from the field

Freedom of Information Act (FOIA): For FOIA contact information and an electronic reading room, including state listings of all COPS grantees

Visit the COPS Site today!

New material is posted to the site daily. Check it often for the latest news on the COPS program.

Upcoming Conferences and Training

June

Microsoft Office for Crime Analysis Training
June 12-16, 2000
University of North Texas
Denton, TX
Call (972) 664-3468, ask for Lynn

Twentieth Annual ESRI International User Conference
June 26-30, 2000
San Diego Convention Center
San Diego, CA
http://www.esri.com/events/uc

July

Annual Conference on Criminal Justice Research and Evaluation
July 16-19, 2000
J.W. Marriott Hotel
Washington, DC
http://www.nijpcs.org/upcoming.htm

August

Urban and Regional Information Systems Association (URISA) 2000 Annual Conference and Exposition
August 19-23, 2000
Omni Rosen Hotel
Orlando, FL
http://www.urisa.org/2000conference/prelim/cover.htm

International Association of Chiefs of Police: Advanced Crime Analysis
August 21-23, 2000
Toledo, OH
Tuition: IACP Members: $360
Non-members: $460
Contact: Tresonya Ball, ball@theiacp.org

General Web Resources for Training Seminars and Conferences

http://www.urisa.org/meetings.htm
http://www.ifp.uni-stuttgart.de/ifp/gis/conferences.html
http://www.geoinfosystems.com/calendar.htm
http://msdis.missouri.edu/
http://magicweb.kgs.ukans.edu/magic/magic_net.html
http://www.nsgic.org/
http://www.mapinfo.com/events
http://www.esri.com/events
http://www.ojp.usdoj.gov/cmrc/training/welcome.html
http://www.nlectc.org/nlectcrm/cmaptrain.html
http://www.nijpcs.org/upcoming.htm
http://www.usdoj.gov/cops/gpa/tta/default.htm
http://giscenter.isu.edu/training/training.htm
http://www.alphagroupcenter.com/index2.htm

Early Reminders!

International Association of Crime Analysts Training 2000
November 1-4, 2000, Denver, CO
Registration information at www.iaca.net/Conferences/2000/2KConference.htm

First Annual Birmingham GIS Conference
November 27-29, 2000, Birmingham, AL
For information, contact Brian Boyle (800) 414-9408

Fourth Annual International Crime Mapping Research Conference
December 9-12, 2000, San Diego, CA
Registration available at www.nijpcs.org/upcoming.htm

Web Site Reviews

Cambridge, Massachusetts Crime Analysis Unit Web Page
http://www.ci.cambridge.ma.us/~CPD/analysis.html

This Web site is divided into four sections: *Reports; Monthly Statistical Updates; Patterns, Trends, Problems;* and *Weekly Crime Reviews*. The *Reports* section features a wealth of historical information, including Part I Crime statistics dating back to 1980 and comprehensive Annual Crime Reports dating back to 1995. It also includes Neighborhood and Business District Profiles that allow users to click on a map of the city to access useful crime and demographic information for a selected geographic area. The *Monthly Statistical Updates* include yearly Part I Crime comparisons as well as commentary on the most recent month's activity. The third section, *Patterns, Trends, Problems*, highlights the Cambridge Crime Analysis Unit's focus on tactical crime analysis. This section includes brief synopses and maps of recent patterns, trends, and series to help warn and educate the public, and the page is updated regularly. The last section, *Weekly Crime Reviews*, includes detailed maps and synopses for selected crimes such as street robbery, housebreaks, and theft from cars.

Tempe, Arizona Crime Analysis Unit Web Page
http://www.tempe.gov/cau

This Web site features a table of contents that guides users through the many different types of informational reports that are provided by the Tempe CAU. The section titled *Most Frequently Asked Questions of Crime Analysis* is designed to address common questions from individuals looking to relocate to Tempe or from individuals concerned about crime or activity at a specific location. The *Reports and Bulletins* section includes monthly crime and calls for service hotspot maps, beat information, and calls for service bulletins for Tempe apartment communities, mobile home parks, schools, and parks. This section also includes a complete version of the Annual Report on Policing in Tempe and the results from the Annual Citizen Survey.

One of the featured pages on this Web site is called *Tactical Crime Analysis*. This section includes useful definitions pertaining to tactical crime analysis as well as recent crime pattern bulletins. These bulletins include brief synopses of the incidents, time span charts, maps, and crime prevention tips. Another featured page on this Web site is the *Beat Information* page, which allows users to click on a map of the city to access crime and demographic information by beat and reporting district.

San Antonio, Texas Police Department Web Page
http://www.ci.sat.tx.us/sapd

The San Antonio Police Department's Web site includes a useful *Crime Data Directory* that guides users through the site and includes links to both current and historical Part I Crime data for the city and by police service area. The *Current Crime Data & Maps* section presents bi-weekly maps depicting the location of crimes and corresponding tables that allow users to view crime data by patrol district number, type of crime, date, time, and location. The crime maps are broken down by police service area and include separate maps for violent crime, burglary, and vehicle theft.

Another link on the page, the *Neighborhood Calls for Service Report*, allows users to access and download calls for service data for selected neighborhoods. Some of the most useful features on the San Antonio Police Department's Web page are the definitions of crime and calls for service and the explanations of the data. These explanations serve to acquaint the general public with common police terminology and prevent misinterpretation of the data.

We are interested in highlighting your Web site!

If your department or organization posts maps or has interactive maps on the Web, please let us know.
We will highlight your page in a future issue!
For contact information, see page 12.

ABOUT THE POLICE FOUNDATION

The Police Foundation is a private, independent, not-for-profit organization dedicated to supporting innovation and improvement in policing through its research, technical assistance, and communications programs. Established in 1970, the foundation has conducted seminal research in police behavior, policy, and procedure, and works to transfer to local agencies the best new information about practices for dealing effectively with a range of important police operational and administrative concerns. Motivating all of the foundation's efforts is the goal of efficient, humane policing that operates within the framework of democratic principles and the highest ideals of the nation.

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