



Mapping the Criminal Landscape

GIS is being increasingly used by law enforcers to identify patterns of criminal behaviour.

Major crime and fraud is not usually detected by a single event or a single item of data but rather a collection of seemingly disparate information that form a pattern of criminal behaviour. In fact, today, patterns of criminal behaviour tend to be extremely sophisticated and very difficult to uncover. Crime analysts must process an unprecedented amount of information from a variety of sources to discover these patterns.

A well established principle of criminology is that perpetrators will tend to commit more crimes close to their homes simply because of convenience of transportation. They tend to commit crimes in their own personal "comfort zone" where they know their way around. Law enforcement is beginning to geographically profile criminals as well as crime incidents to find patterns of behaviour.

Criminal Patterns

One method for detecting criminal patterns is to determine if criminal activity involves geographic proximity or geographic clustering. Geographic patterns can be visualized by crime mapping - placing information about criminal activity on a map. Without crime mapping, the details of specific incidents can easily be lost in the detail of daily reports.

Finding crime patterns through mapping is most effective when analyzed within a specified time frame. It can be a daily process, or a weekly process. For many low-volume crimes, the analyst may want to view the past six to twelve months to find patterns, while for more common crimes, a monthly or bi-weekly time range may suffice.

Identifying patterns through crime mapping requires that the information across departments as well as multiple agencies be geographi-

cally-enabled so that it can be placed on a map. Crime intelligence comes from many sources, including reports from the media, police and fire departments, emergency management and public health agencies, airports and hospitals. Some criminal information is structured meaning that it resides in a database. Structured data can easily be geo-enabled and placed on the map.

But most criminal information is found in reports and news items which are considered unstructured data. Government agencies produce and use great volumes of data, and most of it is unstructured and the process of geo-enabling massive amounts of unstructured data can be overwhelming.

Geo-enabling information is a multi-step process. First content needs to be searched and geographic references need to be identified. This is not an easy task. Second, these geographic references are assigned country code tags and latitude and longitude coordinates so that the information can be placed on a map. Until recently, this was mostly a manual process. Analysts had to construct individual keyword searches for specific place names using a text search engine and then manually assign latitude and longitude coordinates. This method is very inefficient and more importantly can only discover a fraction of the available information.

Here is the challenge...and the solution

Current text search engines, such as Google, are unable to find all geographic references beyond the basic location name because geographic language is inherently ambiguous. For example, when you search on the term Chelsea, the results include the Chelsea Football Club, Chelsea, Massachusetts USA, or Chelsea Building Society. It would not find any information about southwest London or Sloan Square unless



A recent search on police reports in the news for copper theft.

the specific term Chelsea was used in the document.

MetaCarta can solve this dilemma. MetaCarta's Geographic Search and Referencing Platform (GSRP) can quickly and automatically geoenable and unify content from disparate data sources such as news, message traffic, Web pages, blogs, Internet/OSINT across file shares, databases, and content management systems. It can identify more than 190 million pages all over the globe and can identify locations in English, Spanish, Arabic, French and Russian.

The solution enables law enforcement agents to visualize crime-related information in the form of patterns and trends on a customizable map-based interface simply by zooming a map into their geographic area of interest.

Geographically enabled search tools – UK and US experiences

The British Transport Police is using MetaCarta and crime mapping to track copper and scrap metal theft. There is a huge worldwide demand for copper, especially in Asia and in South America, and the price of copper has risen more than 500 percent in recent years.

According to Reuters, statistics for copper theft in Britain almost precisely match the graph for the commodity's market price, according to British police, who have battled the theft of copper wire from railway lines for the past several years. "It's always been a bit of an issue, but it really erupted for us at the end of 2006," said Simon Lubin, a spokesman for the British Transport Police, which monitors the nationwide rail network. "It's our biggest challenge after terrorism."

The theft ranges from petty criminals stealing a few strands of copper from lines that are being laid, to whole drums of the metal being taken from depots by sophisticated gangs. "It's huge numbers," said Lubin, explaining that police were working with scrap dealers to try to choke off the trade.

The North Texas Fusion Centre (NTFC) uses crime mapping extensively to provide investigators viable information on gangs, drug runners, smugglers or hazardous situations by pinpointing locations of criminal incidents as icons on a map.

Fusion centres are primarily a response to 9/11 - when US homeland security officials knew scattered details about the airplane hijackers, but didn't put together the pieces by working across agencies, so the information was of little use. The fusion centre provides a central clearing-house for data, which can be analyzed and shared with the appropriate agencies. The intelligence comes from many sources, including reports from the media, police, fire departments, emergency management and public health agencies, airports and hospitals.

The documents are collected by the North Central Texas Fusion System, where they can be sifted and analyzed. MetaCarta GRSP

enables analysts to sort through millions of documents and find keyword matches automatically and programmatically.

Prior to using the MetaCarta solution, NCTFC analysts manually identified and extracted information elements and then used standard search engine query tools, such as Yahoo, Google and others, to perform unstructured textual searches. However, these results were frequently inconclusive and time- and resource-intensive — for example, searches could take up to four days. This process prevented NCTFC analysts from gaining insight as to how to associate some of their collected data to form predictions or develop timelines or sequences of events. NCTFC needed tools and techniques to automatically gather targeted data and graphically display relationships between people, places and events, and then to index and search these documents to reduce the search time and to make more accurate estimations and predictions.

"It's like a daily Google tool," said Bari Lee, senior intelligence analyst with the Collin County Department of Homeland Security. "It allows me to view the missing components of any kind of textual search. It brings up the same data that a normal Google search would, but it brings that geographic component as well."

Conclusion

Geographic text search solutions have enabled law enforcement officials to quickly and easily mine the vast repositories of crime data, structured and more importantly unstructured data that exist on the Internet and across agency boundaries. Using geography to map criminal information provides a visual tool to help law enforcement quickly and easily identify criminal behaviour patterns where in the past it may have gone unnoticed.

Article by John Donnelly III, Executive Vice President at MetaCarta



MetaCarta, Inc. is the leading provider of geographic search and referencing solutions. MetaCarta products make data and unstructured content "location-aware", making that information geographically relevant. Using a map interface, these innovative solutions make it possible for customers to discover, visualize, and act on important location-based information. Founded by a team of MIT researchers in 2001, MetaCarta is privately held, with US headquarters in Cambridge, Massachusetts and offices in Vienna, Virginia and Houston, Texas and resellers worldwide. For more information, please visit www.metacarta.com or MetaCarta Resource Centre.