

New analysis method uncovers factors in vehicle burglary rates

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By applying a new method to modeling spatial patterns of crime, University of Texas at Dallas researcher Dr. Yongwan Chun analyzed vehicle burglaries in Plano, Texas, and found factors associated with increased and decreased burglary rates.

Chun, an assistant professor of geospatial information sciences (GIS) in the School of Economic, Political and Policy Sciences, used GIS data from the Plano Police Department to analyze the 17,549 vehicle burglaries that occurred from 2004 to 2009 in the Dallas suburb.

The method Chun applied is an extension of eigenvector spatial filtering (ESF), which was originally developed by two UT Dallas GIS faculty members, Dr. Daniel Griffith and Dr. Michael Tiefelsdorf. Chun's study was published online in *Geographical Analysis* in April.

"Dr. Chun's recent article presents a refinement of a relatively new and sophisticated mathematical modeling methodology that allows effective and efficient analysis of crime data, while accounting for the geographic location and time stamp of crimes," Griffith said. "It furnishes a practical application of this methodology to Plano car burglaries and summarizes results that can be helpful to the local community and law enforcement, as well as fellow researchers."

Chun used ESF to determine whether there were significant links between socioeconomic and physical environments and vehicle burglaries in Plano.

The study included socioeconomic factors, such as median home value, poverty and unemployment rates, and variables that reflect social instability, such as rates of homeownership, residential mobility and house vacancy.

Because people who are at home may play the role of "guardians" over the property, Chun said, the rates of people working at home and households with young children also were considered. He also examined whether railroads or parks were nearby and the distance to a major highway.

Chun said three of his findings were expected:

- Vehicle burglaries increased when the home vacancy rate increased.
- Vehicle burglaries decreased when the median home value increased.
- Vehicle burglaries decreased when distance to the highway increased.

"The distance is very interesting to us as spatial scientists," Chun said.

"One thing I can interpret is when a vehicle burglary happens, the burglar wants to get out of the site as fast as possible. If they have a close distance to the highway, it might be easier for them."

A fourth finding—vehicle burglaries increased with increased homeownership—needs further investigation, Chun said.

"It is counterintuitive," he said. "Usually when we have a higher rate of homeownership, we think that there is a higher level of guardianship of the area, but it shows a positive association."

Chun hopes the new method will make it easier for fellow scholars to apply the spatial aspect into their studies.

A decade ago, it was almost impossible to collect such comprehensive data, he said, but many police departments, including Richardson and Frisco, now have GIS systems with computerized data points.

"Usually, crime analyses focus on the large cities, so we have a number of papers about crime in places such as Chicago or Dallas," Chun said. "Suburban areas have not been investigated as much in the field, primarily because of lack of data. Fortunately, the Plano Police Department has a great, rich data set, which is collected, organized and managed using their GIS system."

"The study presents one application for that type of data that can be applied to other smaller, suburban cities."

More information: Chun, Y. (2014), "Analyzing Space–Time Crime Incidents Using Eigenvector Spatial Filtering: An Application to Vehicle Burglary." *Geographical Analysis*, 46: 165–184. doi: 10.1111/gean.12034

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