Spatial and Temporal Trends of Crimes in UCSB

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Introduction
UCSB campus area includes main campus, Isla Vista and west campus. Isla Vista is recognized as a hotspot for crime in Santa Barbara. Population of Isla Vista is about 7% of the county population, but about 25% of all serious crime in Santa Barbara County occurs in Isla Vista, including burglary, theft, sexual assault, and other crimes according to IV Foot Patrol. In this project, we are curious about the spatial and temporal trend of crime in UCSB.

Along with temporal spatial analysis, we can provide IV Foot Patrol and police department knowledge of these movement trends as well as locations of popular sites on and off campus. This project’s goal is to make Isla Vista safer and use analysis result to increase the efficiency of the law enforcement both spatially and temporally.

Method & Results

Data
Total Crime in UCSB from 1/1/2014 to 12/31/2015

Data used in this project comes from UCSB Police Department daily crime log. The scope of crime data is from January 1st, 2014 to December 31st, 2015. Assault, theft, burglary, alcohol-related crimes and sexual assaults are the crime types of interests in this project. Shapelies of UCSB and Isla Vista from ESRI Block Group is also used.

We import crime data from PDF file to CSV files and locate the incidents on shapelines. To locate incidents in Isla Vista, we use reference of interactive map on UCSB Police Department, because the scale is not file to block size. We use SQL tool to do query analysis and categorize the data.

Method

In this section, we use ArcMap Time Slider Tool to exhibit incidents’ changing patterns throughout several days and kernel density map for visually highlighting the patterns of crimes in a course of days. The example used is from 4/1/2015 to 4/5/2015, which is around Deltopia in Isla Vista. We can clearly see how crime distributed spatially and how the density changes. Similar patterns of this can be found during special weekend, Deltopia, Halloween etc., crimes move to cluster in certain blocks and disappear in several days. Generally, alcohol-related crimes are more likely to happen in Isla Vista, particularly in Del Playa, Trigo, El Embarcadero, and Sabado Tarde Road.

In ArcScene, we import a Shapeline of UCSB and Isla Vista as the base map and all the point data we have and create a 3D model. We convert time from hour to second and set it as the base height (+axis) of the point data. For example, 8pm = 20:00 = 72,000 seconds.

This model shows the pattern of crimes within 24 hours. We find out that in a course of a day, alcohol-related crimes cluster during the late night and midnight; petty theft bicycles are distributed during late afternoon and early evening; theft and burglaries are distributed mainly from evening to the night. One thing to know from this 3D visualization is that it is a circular process, so the pattern in late night and early evening are closely related.

Temporal Spatial moving average

CrimeStat is a crime mapping software program and we use it to make a Spatial-Temporal Moving Average analysis diagram. It measures changes to the mean center over the life of a series. This example shown is the moving average of alcohol-related crime happened from 10/3/2014 to 10/11/2014, which is the first week and weekend of school in fall 2014. Students came back to school after a long summer and threw parties at home. We can visualize a moving pattern of alcohol-related crime in these days with the red line, starting from the first case in El Colegio Road and the last one at Del Playa.

Conclusion

With two years of crime data, we use time slider to find out how crime distributed spatially throughout a duration of time. Similar density pattern is found during Deltopia, Halloween and special event such as concert etc. And then we use the data to generate a 3D visualization in order to find out how crime distributed temporally and spatially within 24 hours. From this method, we concluded that several crimes favor certain times in the series, which tells what time in a day the patrols should be increased. For the last method, we focus on alcohol-related crime and find how the moving average varies during a certain week.

All the results can be used to suggest the hotspot location, hotspot time period, and relationship between time and crime. Police Department can perform more efficient work allowing students can find a safer living place and be more aware of what crime would most likely happen in a day.

References & Acknowledgements

• UCSB Interactive Campus Map https://portal.armrs.com/#/Home?dateFrom=00/00/0000&dateTo=00/00/0000&agency=19
• UCSB Crime Alerts
• ESRI ArcGIS Software
• CrimeStat

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