

Location Data Analytics and Visualization for Criminal Network Identification

Summary

Existing data analysis tools do not provide the visualization capabilities forensic analysts and investigators need to handle the huge amount of digital trace information generated by mobile devices and associated location data. Analysts need visualization tools that quickly help them get as much usable information as possible out of the available location data. This project will result in a set of layout algorithms and software packages that display location data in a way that allows investigators to identify potentially unusual and criminal activities.

Problem addressed

Geographic location data is recorded by the ubiquitous mobile phones in large amounts, potentially enabling investigators to paint a detailed picture of a suspect's activities. However, the challenge they face today is one of data overload, and finding the golden needle in the haystack of location records is not sufficiently supported by existing methods and tools. An additional challenge lies in the fact that due to the changing nature of agents' activities, some of these analyses may need to be done in the field, often on mobile devices, exacerbating the display and interactions challenges.

Approach

The goal of the proposed work is to develop and extend visualization and analytics tools that have been previously developed to enable analysts to more effectively analyze, understand, and benefit from location-based data. The key lies in intelligent algorithms to simplify and semi-automatically filter the data as well as in more compact visualization approaches that can provide a faster overview and better understanding of the target's activities and patterns-of-life. The researchers will address issues of accuracy using statistical and plausibility approaches, then will present the data using clustering, visualization, and interaction algorithms to facilitate understanding of the data while avoiding data overload.

Anticipated Impact for DHS

The end result of the proposed work will be visualization components (software and algorithms) that integrate into other DHS and LE desktop and mobile applications and enable them to effectively handle large amounts of location-based information. The final goal is to provide analysts with a tool that helps them get as much usable information as possible out of the available location data in a short amount of time.