

Project Title: Visual Analytics for Geo-Spatial Temporal Re-Construction of Situations in Criminal Intelligence Analysis

Keywords: situation re-construction; criminal events and networks; visual analytics for geo-spatial temporal analysis; human reasoning and inference making; criminal intelligence analysis

Brief Description:

Situation Re-construction is a function in criminal intelligence analysis required to develop explanations of how a crime was carried out or events that led to it. Situations are generally geo-spatial and temporal in nature and involve interacting networks of relationships, activities, socio-cultural and organisational factors, influence and people. This is further complicated by the problems of Big Data, and that situations evolve unpredictably over time in the real world. Social network analysis, while effective in modelling basic networks, known communications links, and may be possible to infer some missing links, i.e. the 'hard' aspects of networks; but by themselves are not adequate for capturing and re-presenting the temporally un-folding complex combination of associations found in real world criminal situations or the 'soft' factors such as the socio-cultural and organisational factors, power and influence, which are necessary for deriving insight about how groups or networks work and interact.

The purpose of this research is (i) to characterise the nature of and the interaction between 'hard' and 'soft' networks that may be encountered in Pattern of Life studies and Human Terrain Analysis when re-constructing situations from Big Data sets, (ii) so as to identify and define the functional relationships that are to be represented, and (iii) to design and develop Visual Analytics prototypes based on geo-spatial-temporal and network methods that represent these functional relationships that support the understanding of the crime and circumstances, and to then project future possibilities that can guide further criminal investigations.

Relevant Publications:

Natalia Andrienko, Gennady Andrienko, Louise Barrett, Marcus Dostie, Peter Henzi, (2013). Space Transformation for Understanding Group Movement, IEEE Transactions on Visualization and Computer Graphics, vol. 19(12), pp.2169-2178.

Walker, R., Slingsby, A., Dykes, J., Xu, K., Wood, J., Nguyen, P., Stephens, D., Wong, B.L.W., and Zheng Y. (2013). An Extensible Framework for Provenance in Human Terrain Visual Analytics. IEEE Transactions on Visualization and Computer Graphics, 19(12), 2139-2148.

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