

## Visual Analysis of Terrorists' Networks Extracted from the Public Knowledge Bases

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### Abstract

Understanding the conceptual, temporal and social properties of terrorism is essential to unlock terrorists' minds, track terrorists and make policies for emergency responses to terrorists' attacks. The primary goal of this article is to introduce an integrative approach to study the ideology of terrorism, social structures of terrorists' organizations and consistent patterns of terrorism events hidden in the public knowledge bases. Specifically, our approach aims to solve the tasks with the questions like:

1. What are the major terrorists' organizations at the Middle East? And what is the ideology for the organization?
2. Who are the key leaders of a terrorists' group?
3. When are the peak periods of terrorism attacks? And Why?
4. Are there emergent patterns connecting attacks with certain groups?
5. What is the lesson learned from an emergency case, such as Cuba Crisis?

Our system, Storylines [1], provides a novel storytelling framework to examine our approach and to help user visually and interactively explore textual information from multiple resources with diverse perspectives. The system enables user study a body of unstructured text without prior knowledge of its thematic structure and automatically find Who, When, What and Where in a salient story. It integrates natural language processing, latent semantic indexing and social network analysis. Natural language processing extracts data signatures, such as single key words, n-grams and named entities (People, Location, Organization and Time). Latent semantic analysis supports visually systematic exploration of the data signatures with reference to quantitative measures of importance and their associations. Measuring the data signatures by their contributions to the global latent concept space or a local latent concept dimension provides a unique way to understand the context and nature of the terrorism ideology. Social network analysis combines co-occurrence analysis of named entities and importance measures such as degree centrality and betweenness centrality. Named entity inter and intro relationships networks aware user the social structure and key players of terrorists' organizations. The temporal distribution variation of terrorism events, the ideology concepts and social structures with time, location and organization accelerate user sense making processes involving high-complexity and high-dimensionality problems. Our system has been applied to the 2006 VAST contest data that is a synthesized dataset. Our next step is to extend the work to large scale real-world datasets such as news archives, live news feeds, email archives, citation records and web blogs. The data sets of test cases we may use for this poster include a concentrated terrorism news resource ICT (<http://www.ict.org.il/>), Google news and a web resource related to Cuba Crisis.

### Publication

[1] **Zhu, W.**, Chen, C. (2007) Storylines: Visual exploration and analysis in latent semantic spaces. *International Journal of Computers and Graphics*. Special Issue on Visual Analytics. In Press.

[2] Chen, C., **Zhu, W.**, Tomaszewski, B., MacEachren, A. (2007) Tracing conceptual and geospatial diffusion of knowledge. [HCI International 2007](#). Beijing, China. July 22-27, 2007.