Counter-Insurgency Visualization Strategies

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1 INTRODUCTION

Defence R&D Canada has initiated a research project, nicknamed SNAC, to explore an intelligence capability for Social Networks Analysis (SNA) in a Counter-Insurgency (COIN) context. This paper presents strategies for the development of visual analytics tools for such purposes. First, we discuss the particularities of the COIN context and the various levels and dimensions of analysis required. Then, we present the SNA capability framework as a mechanism to match visualization tools to SNA related tasks. Finally, we consider potential visual analytics solutions for social network graph analysis as well as the use of geographical and multi-dimensional representations of the variables of interest.

2 COUNTER-INSURGENCY CONTEXT

COIN is defined [1] as "the military, paramilitary, political, economic, psychological and civic actions taken to defeat an insurgency". Within this context, the insurgents will search to acquire the support from the population and in parallel will potentially conduct violent activities directed against the government in place or any instances supporting it. COIN has both overlapping concepts and differences from counter-terrorism. They are summarized in Table 1. A population-centric approach has proven to be more successful than an enemy-centric one because COIN is in competition with the insurgents for the right and the ability to win the hearts, minds and acquiescence of the population [2].

Terrorism	Insurgency
• Terrorist is seen as an unrepresentative aberration	• Insurgent represents deeper issues in society
• No negotiation with terrorists	• Winning hearts and minds is critical
• Methods and objectives are both unacceptable	• Methods are unacceptable; objectives are not necessarily so
• Terrorists are psychologically and morally flawed, with personal (psychopathic) tendencies toward violence	• Insurgents use violence within an integrated politico-military strategy – violence is instrumental not central to their approach
• Terrorism is a law-enforcement problem	• Insurgency is a whole of government problem
• Counterterrorism adopts a case-based approach focused on catching the perpetrators of terrorist actions	• COIN uses a strategy-based approach focused on defeating insurgents' strategy – catching them is secondary

Table 1: Terrorism and Insurgency as Competing Paradigms [3].

The COIN operational environment is complex and multi-dimensional. Multiple theatres of operations have to be considered and operations must be conducted in a Joint, Interagency, Multinational and Public (JIMP) environment. COIN is supported by different types of operations such as influence operations, key leader engagements and reconstruction projects. All of them require a thorough understanding of the social context of the operations. The purpose of SNA for COIN operations is twofold: it enables the understanding of the socio-cultural environment as well as the assessment of the impact of taken or considered actions by both our Forces and the insurgents. SNA can support the intelligence function through a better understanding of the population social networks and how to best influence them (or weaken them in the case of insurgent networks). Among essential COIN situation variables are: host nation governance, local population allegiance, insurgent forces, local forces, infrastructures, socio-economic welfare,

extent of criminality and corruption, general attitude of the local media towards host nation; and global level of understanding of the local culture [4].

3 FITTING THE RIGHT TOOL TO THE ANALYSIS WITH THE SNA CAPABILITY FRAMEWORK

The objective of the SNAC project is to improve the intelligence analysis capability in a COIN context through the exploitation of social network analysis techniques and methods within a SNA proof-of-concept prototype. The proposed SNA capability framework depicted in Figure 1 enlarges the scope of usual SNA methods to include the activities performed prior and after the analysis. The starting point of the intelligence SNA capability is the desired effects pursued based on the COIN strategy and its underlying objectives (1). This allows the identification of the social networks of interest and the analysis to be performed (2). Once the variables involved in the question being asked are identified, meaningful datasets can be identified and acquired from a variety of sources (3) in order to represent the social networks of interest and their significant features (4), so that the desired analysis can be performed (5). The result of the analysis will either specify the need for further refinement of the SNA to be performed or provide an intelligence SNA product (6) related to the initial issue based on the COIN objective (1).

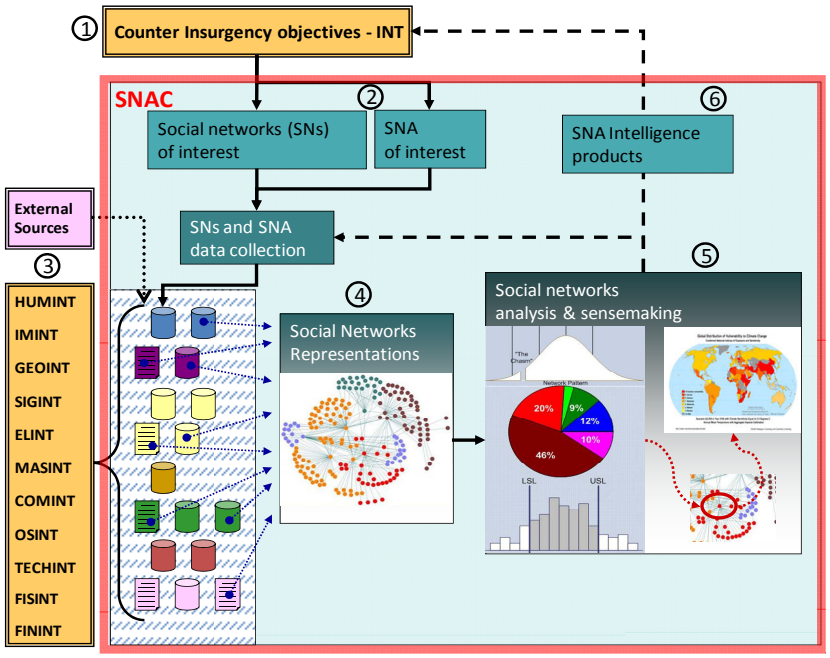

Figure 1: SNA capability framework.

The SNA capability framework highlights the fact that the network analyses and visualizations required are highly dependent on the objectives pursued. The variety of questions that can be asked about a social network is too great to define a procedure for each. However, some guidelines can be provided. Knowledge acquisition sessions were conducted with COIN military experts to identify first questions that can be answered by SNA, then related SNA measures to consider and finally data sources involved [5]. Reaching the analysis goals will require a mix of automated processes to manage the size of the network and appropriate interactive visualizations to support the analysis in every step of the process including activities such as exploring the social context, understanding automated measurements and data sampling or communicating results to others.

4 VISUAL SOCIAL NETWORK ANALYSIS

At some point, it is expected that the analyst will need to view a graph representation of the social network. Depending on the question being asked, this will most probably be a subset of the network with focus on the dimensions of interest (ex: political, religious, geographic, economic, tribal context, etc) where the nodes of the networks can be individual, groups or organizations. NodeTrix[6] is an example of a clever technique that can enable the visualization of links between groups or cliques and the patterns within groups. In Figure 2, communities are represented by matrices where each line/column is an individual and links between the matrices show the inter-cliques relationships. In this type of visualization, a tightly connected community will have a recognizable pattern and individuals that link communities together will stand out. Adding sorting to these matrices would make their patterns even more visual. In this example, the various communities could be tribes along with tribe leaders or central people. It would also be necessary to define the criteria for group creation in the context of the analysis to be performed.

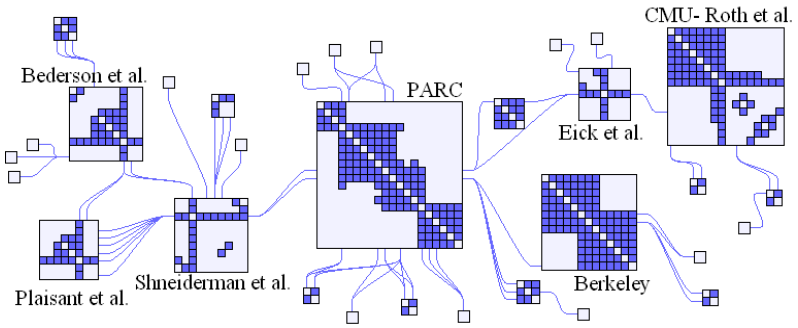

Figure 2: NodeTrix visualization [6].

COIN SNA also requires the portraying of information that is better represented using visualizations other than node-link diagrams. Moving away from the graph can help focus on other characteristics of the social network. For that purpose, we propose an extended version of the Dust&Magnets concept [7] for social networks. In this multi-dimensional interactive visualization (see Figure 3), the dots represent any type of nodes (individuals, groups or organizations). Adding labelled magnets to the display area will cause the dots to be attracted to them according to metrics that were computed from the social network or the intelligence data gathered about each node. When the analyst interacts with a magnet, the dots move according to their characteristics. In our extended version, the axes can be constrained or not.

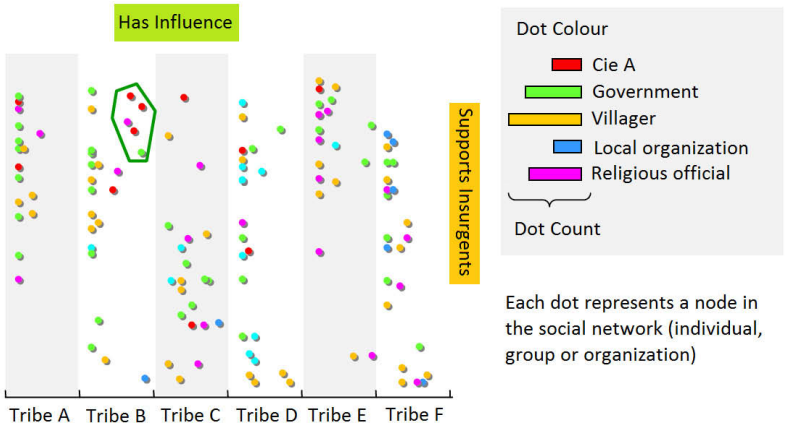

Figure 3: Extended Dust and Magnets (adapted from [8]).

In Figure 3, for example, the x axis is constrained by ethnicity and dots can only move within the vertical band where they belong. In addition, we can use colour coding and the size of the dot could also be associated with network measurements such as betweeness or centrality.

The geographical component is extremely important in COIN and it plays a strong part in the analysis. Layering information over a map display is a desired functionality. Within the project, we intend to identify which layers of information are beneficial to the different analyses and explore ways to visualize them in relation to the geographical context. In order to achieve intelligence goals supported by SNA, multiple visualizations will have to be linked together.

5 CONCLUSION

This paper described the COIN context and presented a SNA capability framework. The hypothesis of the SNAC project is that improving intelligence products through advanced SNA and visualisation/interaction will contribute to better decision making regarding the most appropriate response for a given situation. The complexity of COIN social network data stresses the point that the visualization must be tailored to the analysis question and that multiple visualization strategies are needed to improve our understanding of the situation. We showed examples of visualizations that can be extended and become potential solutions to improve SNA in the context of COIN operations.

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