Network Science Center at West Point

Advancing the Study of Network Science

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SPECIAL POINTS OF INTEREST

Welcome Kristine Ringler!
Kristine will be a research assistant for the Minerva Project.

SNAC is here at West Point

Social Network Analysis Club meets every Monday 12:00 in the Math conference room. Please encourage faculty and cadets interested in Network Science to participate.

To learn more about the Network Science Center at West Point go to:

www.netscience.usma.edu/default.html

Social Networks:

Facebook

Twitter

Linked In

Using algorithmic Network Science for Counter-Insurgency

CPT(P) Paulo Shakarian, PhD

In 2010, something amazing happened in the village of Gizab in Afghanistan. The villagers evicted the Taliban without direct support by U.S. ground forces. Part of the reason that they were able to pull off the rebellion was because U.S. Special Forces had trained and equipped them. This operation led to much enthusiasm in the defense community – could such rebellions spread throughout Afghanistan? However, training locals to evict the Taliban requires resources. There are thousands of villages in Afghanistan and only a very limited number of Special Forces teams. We might also expect that the Taliban would fight back to re-take lost ground. So this leads us to an interesting research question: can we identify a limited number of villages to support which will lead to a wave of successful rebellions against the Taliban?

Here at the Network Science Center at West Point (NSC), we are taking a network-science based approach to the problem. We are creating a "village relationship graph" of 1543 villages in the Helmand and Kandahar provinces with relationships based on tribal affiliation and proximity on the road network.

We then view the initiative of rebellion for a given village as a mutant gene – it can either spread throughout the population (i.e. fixate) or go extinct. Further, as time progresses, some mutants may die off (just as the Taliban can re-take a village). The classic work of Lieberman et al. (2005), known as "Evolutionary Graph Theory," studies the propagation of a mutant in a graph-structured population. We are looking to extend this work to identify the "best places" for the mutant to start – these would in turn be the "best villages."

This project is being explored by a newly formed team of researchers at the NSC called the Algorithmic Network Science Group. We are dedicated to exploring network models from various disciplines – such as Evolutionary Graph Theory – and inventing new algorithms for a variety of applications – ranging from counter-insurgency to cyber-security.

Recently, we have developed a new algorithm for addressing evolutionary graph theoretic problems. A peer-reviewed conference paper by Paulo Shakarian and collaborator Patrick Roos will be presented this November at the 2011 International Conference on Computational Intelligence and Bioinformatics. Also, Paulo Shakarian, Patrick Roos, and Anthony Johnson have recently written a research review of evolutionary graph theory that has been accepted to the Elsevier journal BioSystems. To view pre-prints of these articles, or learn more about Algorithmic Network Science, please visit our new page here: http://ow.ly/6Xzqh

Economic Development Papers

The Network Science Center at West Point will be publishing a series of "thought papers" focusing on two subjects: 1) The Role of Small and Medium Enterprises in Frontier Markets and 2) The Role of Social Capital in Understanding Frontier Markets.

As our team conducts their analyses, certain findings and insights might arise that are not directly related to the research question at hand but, we believe, are important to both the academic and policy communities. This particular series of "thought papers" will address insights concerning economic development issues.

The Network Science Center at West Point has been involved in ongoing research exploring the network topologies of Capital Markets in Frontier Capital Markets. Our team's research has involved extensive data collection including numerous interviews with financial leaders and innovators in these emerging economies. During the course of this data collection and the subsequent analysis, the research team has identified additional topics that we believe are ripe for analysis. We believe that addressing these research topics is vital to understanding and devising potential innovations in economic development.

These papers will be published on a weekly or bi-weekly basis. You can access these "Thought Papers" on our Publications Page on our web site at: http://bit.ly/nOV9vj

Important Dates:

Abstracts for Sunbelt conference are due by 30 Nov 2011

Application deadline for Minerva positions - Oct. 15

Guest lecturer—Dr. David Alberts speaks on agility 24 October WP Club 12:00

Upcoming Brown bag lunches - Oct. 19 and Nov. 2

Current Publications:

Current articles are on NSC website under Publications or linked below:

Fast and Deterministic Computation of Fixation Probability in Evolutionary Graphs

Lessons and Impressions of the Ghanaian Capital Markets

The Influences of Social Networks on Phishing Vulnerability