MODELING TRIBAL LEADERSHIP DYNAMICS: AN OPINION DYNAMICS MODEL OF PASHTUN LEADERSHIP SELECTION

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Abstract:

We propose a new approach to modeling the selection of leaders in Pashtun tribal society. Pashtuns are the largest tribal group in Afghanistan. In traditional Pashtun society, leadership is manifested as an informal power system where potential leaders gain and maintain their position by means of group consensus. Leadership power is spread over three areas of influence resulting in a triad of leadership roles. These leaders compete, vying for power and control based on public opinion. The addition of extremists into this system who utilize threats of harm to gain power disrupts the traditional system, altering the balance of power. In this research we implement a bounded confidence opinion dynamics model to describe the dynamics of Pashtun leadership selection and to describe the changes resulting from the addition of extremists to the system.

Keywords:

Opinion dynamics, bounded confidence, leadership, Afghanistan, Pakistan, tribal, Pashtun, social networks.

1. INTRODUCTION

Understanding the culture of the Pashtun tribes in Afghanistan and Pakistan has been a challenge for all who interact with them, and particularly for outsiders who have attempted to occupy their territories. To be successful in counterinsurgency in Afghanistan, we need to have a better understanding of the tribal leadership dynamics. We need to understand how the structure of the social network, as well as local events and local changes affect leadership selection, allowing the assessment of the efficacy of alternate strategies.

Research methods commonly used when studying social issues are not well suited to this topic. Due to the ongoing conflict and dangerous environment in Afghanistan, performing case studies, surveys, or interviews are not feasible. Distrust of outsiders is also a factor. Outdated census data and a lack of records on leadership succession and change make numerical analysis difficult.

Simulation modeling provides a framework that is flexible enough to accommodate recent and future changes in tribal society and dynamics and also allow the integration of quantitative data as it becomes available. Opinion dynamics models capture the propagation of an opinion value across a social network. As individuals interact, their opinions change depending on how different those opinions are. This presents a suitable paradigm to examine the flow of opinions concerning potential leaders within a Pashtun community and the effects of changes in these opinions on the leadership balance of power.

2. PASHTUN TRIBAL LEADERSHIP DYNAMICS

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Who are the Pashtuns? Tribal myth states that all Pashtuns are descendants of a single ancestor, Qais Abdur Rashid (575-661), who is said to have introduced his tribe to Islam. They are located geographically on both sides of the Durand Line, the border between Afghanistan and Pakistan. Pashtuns are primarily Sunni Muslims, they usually speak Pashto, and they practice Pashtunwali or "the way of the Pashtuns" (Barfield, 2010). Variations exist but in general Pashtun culture is defined first by Pashtunwali code of values and then by Islam. These guiding principles also indirectly determine much of the way in which leaders are chosen. The dominance of the Pashtuns in the Afghanistan/Pakistan border areas mandates that we develop a better understanding of their leadership dynamics.

In traditional Pashtun society, the selection of leaders depends heavily on the opinion of the community, which can change as a result of social interactions, external events and other factors. Leadership or authority roles fall into three main categories: religious leadership (mullah), secular tribal leadership (khan), and government representation (malik). These three roles are often in competition for shares of status and power and their popular support may grow or dissipate depending on public perception. Tribal members may shift allegiance among these three leaders to gain personal advantage.

Typically each leadership role influences a restricted area of authority. The religious leader or Mullah performs religious ceremonies, tends the mosque, answers religious questions and mediates disputes. He is often of a lower class in the community so it is his religious position that conveys power, prestige and respect in the community. The secular leader or Khan provides security, invites and entertains important visitors, provides patronage to supporters in the community, mediates disputes, has exhibited bravery in battle and is an example to others by his adherence to the principles of Pashtunwali and to Islam. A Khan often comes from an influential and relatively wealthy family whose ancestors may have been leaders in the past. The government representative or Malik maintains connections with government institutions outside the community, brings in outside work and funds, provides patronage to supporters, may or may not live in the community and connects the community to the provincial/central government. Kilcullen (Kilcullen, 2009) discusses this triad of leadership authority in detail.

The Pashtun political system is egalitarian, at least generally speaking, and all men who own land are equal. There is no de facto ruling class or inherited rule. The system is acephalous in which there is no clearly defined leader or hierarchy. Within this system, one of the traditional qualities of a leader are that he is "first among equals" in keeping with an egalitarian society. A leader has no explicit power to coerce obedience; therefore, he must convince people that his judgment is sound and it is to their advantage to support his decisions. In this environment, support for a leader can quickly fade away if a situation changes. Most major leadership decisions are made by consensus with the tribal elders. In this culture, a leader retains power by providing what the community needs: security, prestige, material goods, dispute resolution, and assistance in avoiding blood feuds. Leadership depends heavily on the opinion of the community.

Tribal culture and the distribution of power among the three areas of authority have undergone many changes in recent years (Barfield, 2010; Kilcullen, 2009). While these changes have often been as a result of war or civil conflict, economic pressures have also led to societal changes (Anderson, 1978) . The authority of tribal elders has been eroded and tribal ties have been weakened as a result of social upheaval. One of the most significant changes has been the influx of religious extremists such as the Taliban. These extremists subvert the traditional leadership dynamics, overriding group consensus decisions and using the threat of violence to achieve power. The result is change in the internal authority dynamics of the tribes.

Although researchers have begun to develop computational models related to leadership dynamics in the Afghanistan/Pakistan arena (Geller & Alam, 2010; Geller & Moss, 2008; Lustick & Miodownik, 2009), tribal leadership dynamics in this area have not been extensively explored by the research community.

3. OPINION DYNAMICS AND BOUNDED CONFIDENCE MODELS

Opinion dynamics models simulate the way in which opinions flow over a social network such that an individual's opinion is affected by his social contacts (Weisbuch, Deffuant, & Amblard, 2005). These models study the dynamics of agreement/disagreement among individuals. Opinions are modeled as variables whose dynamics are determined by social interaction. Bounded confidence models are a subset of opinion dynamics models that incorporate the concept of confidence, or how strongly a person holds their opinion. Opinions are represented on a continuum and real discussion and changes in opinion only occur if the opinions of those involved are sufficiently close to each other. Individuals in a social network interact over time and opinions change as a result of their interaction. High confidence tends to lower the influence of neighbors with dissimilar opinions.

Opinion dynamics can be seen as a quantified model implementing the dynamics suggested by structural balance theory, which in part proposes that two individuals connected by a relationship with positive affect will tend to reach affective consensus regarding a third person or object (Cartwright & Harary, 1956). In this model, which extends the general Deffuant-Weisbuch (DW) algorithm (Deffuant, Neau, Amblard, & Weisbuch, 2000) to a directed network with neighbor averaging replacing randomized interactions (Moore et al., 2011), tendency towards consensus proceeds according to the equation:

$$x_i(t+1) = x_i(t) + \frac{1}{|S_i|}\sum_{j \in S_i} \mu_{ij}[x_j(t) - x_i(t)]$$

Where $x_i(t+1)$ is the opinion value of the ith individual at the next time step, $x_i(t)$ is the opinion of the ith individual at the current time step, S_i is the set of out-degree neighbors of the ith individual with cardinality $|S_i|$, j is an out-degree neighbor of i with opinion $x_j(t)$, and μ_{ij} is the plasticity value associated with the relationship between i and j. This model also employs the constraint of bounded confidence by applying the test:

$$\left|x_i(t) - x_j(t)\right| \leq \varepsilon_i$$

Where $x_i(t)$ and $x_j(t)$ are as defined above and ε_i is the tolerance value of the ith individual. The tolerance value establishes the confidence with which i holds opinion x_i, and establishes a bound on interaction and opinion updates. If the magnitude of the difference in opinions between i and j exceeds ε_i, no opinion update occurs on i.

4. MODELING TRIBAL LEADERSHIP SELECTION

A conceptual model of tribal leadership selection abstracts the three major leadership roles and tribal members as nodes and their social connections as links between these nodes. Each individual holds an opinion of each leadership role and also has a certainty with which he holds these opinions. The social connections that these individuals maintain within their community define the relationships and daily interactions that influence their opinions of the leaders. A tribal member is assumed to support the leader that he holds the highest opinion of.

This conceptual model is instantiated as a bounded confidence opinion dynamics computational model. The model is constructed as a variation of the DW model as discussed above. We apply the opinion dynamics algorithm to an individual's opinion relative to each of three tribal leaders. Each tribal member holds three distinct opinions representing their opinion of each of the potential leaders. These opinions are assigned randomly, drawn from a uniform distribution on the continuous interval [0, 1]. The highest of these three opinions determines the leader the tribal member supports.

The three leaders are also each assigned three opinion values. These opinions effectively define each leader's relationship with the other leaders. For example, a higher opinion of one of the other leaders may indicate an alliance against the third leader.

In addition to opinion values, individuals are also assigned a tolerance threshold $\boldsymbol{\varepsilon}$ which defines how open the individual is to influence from others with differing opinions. If the difference between their opinions exceeds $\boldsymbol{\varepsilon}$, then there is no interaction and no change in either opinion.

The DW model is applied to a directed social network. We create a series of random scale-free networks using preferential attachment (Barabasi & Albert, 1999). Three nodes of the network are assigned to the three leadership roles. These individuals are well-connected and have an outdegree of 0, so while they influence others' opinions their own opinions do not change.

The model represents a social network of tribal members who are seeking a consensus on leadership for the community. When the model is run over time, at each time step, each tribal member interacts with his social contacts and adjusts his opinion values closer to the mean of his contacts. In the results presented here, we consider each opinion to propagate independently, such that an opinion increase or decrease relative to one leader does not have an effect on the absolute opinions associated with the other two leaders. When equilibrium is reached, the leader with the majority of high opinions is the consensus leader.

The leadership selection model described to this point represents an idealized traditional situation. The addition of extremists such as members of the Taliban has altered this traditional balance of power. To model the subsequent effects of this type of change, we make several modifications to the network. A node is added to the social network that is attached to the religious leadership role. This node is assigned opinion values that represent strong support of the religious leader and little or no support for the other leaders. The ability of this extremist to influence the opinion of the religious leader will serve to radicalize this leader over time. We also adjust the plasticity value $\boldsymbol{\mu}$ of the other two leaders' relationships to indicate the inhibiting effects of the extremist's threats of violence. This reduces the ability of the non-religious leaders to influence opinions. After these changes have been made to the network, the model is again run over time and the consensus leader identified.

Figure 1 illustrates a social network after the addition of a religious extremist. The extremist is connected to and influences the opinion of the religious leader or Mullah. The other two leaders, the secular leader or Khan and the government agent or Malik experience a reduction in their ability to influence opinions due to the threats of violence. Links marked with blue circles have a reduction in plasticity $\boldsymbol{\mu}$.

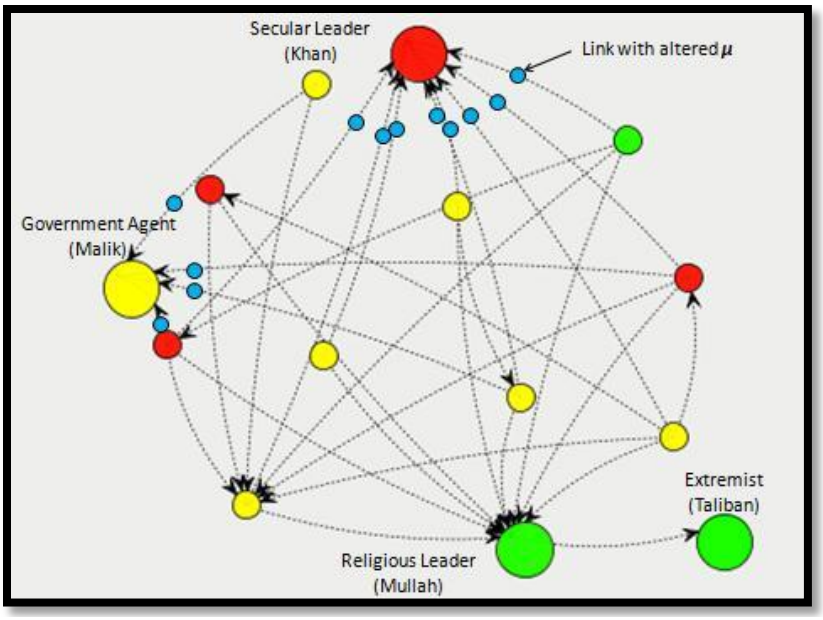

Figure 1: Social network indicating leaders, extremist, and links experiencing a decrease in plasticity μ due to addition of the extremist to the network.

5. PRELIMINARY RESULTS

As an initial exploration, 100 networks were generated, each containing a total of 100 nodes. Each node was added to the network with preferential attachment of five edges. The leadership nodes were assigned opinion values of themselves of 0.85 and 0.25 towards the other two leaders. In all figures, green nodes support the Mullah, yellow nodes support the Malik, and red nodes support the Khan. The larger nodes represent the leadership nodes.

Figure 2 displays a generated network with initial opinion values. Nodes are approximately evenly split between the three leadership nodes. Figure 3 shows this network after equilibrium has been reached. In this instance, both the Mullah and the Khan have gained followers while the Malik has lost a significant number of followers.

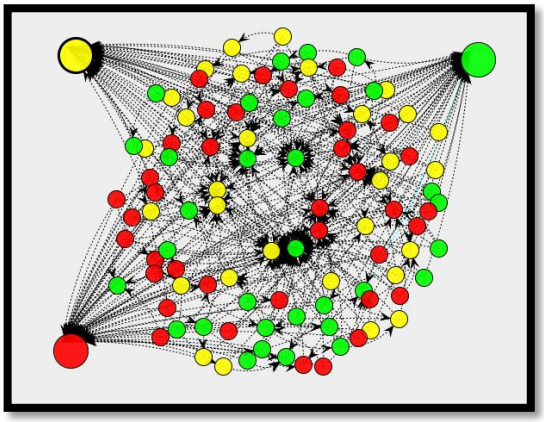

Figure 2: Network with initial opinion values. Leadership selections:
Mullah – 33 (green)
Malik – 31 (yellow)
Khan – 39 (red)

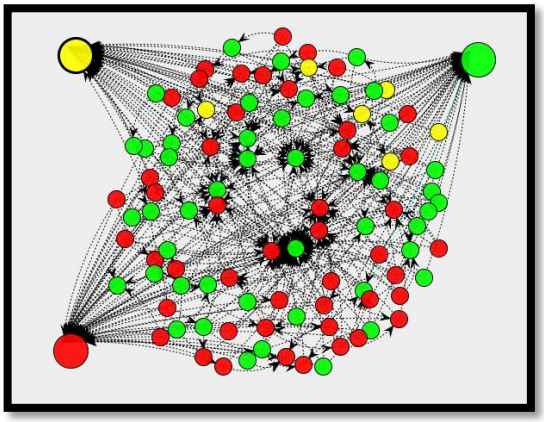

Figure 3: Network at equilibrium. Leadership selections:
Mullah – 48 (green)
Malik – 7 (yellow)
Khan – 48 (red)

Figure 4 shows the same network at equilibrium after the addition of the Taliban extremist. The Mullah has now gained additional supporters and both the Malik and Khan have lost supporters. Because the Mullah now has the majority of followers, he is the consensus leader. Figure 5 displays the evolution of the number of supporters for each leadership role over the length of the simulation run. The first plateau corresponds to the first equilibrium. Then the Taliban extremist is added to the network and the second equilibrium reached.

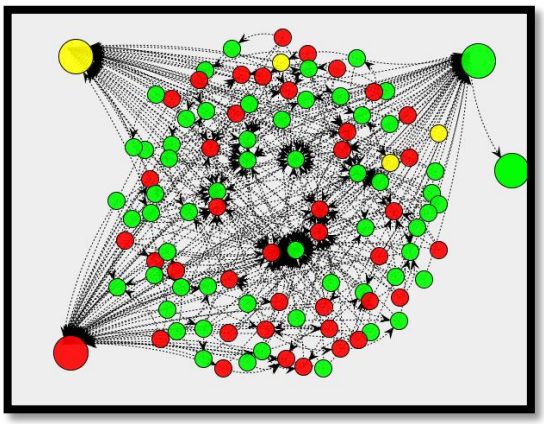

Figure 4: Network at equilibrium after addition of extremist. Leadership selections:
Mullah – 59 (green)
Malik – 4 (yellow)
Khan – 41 (red)

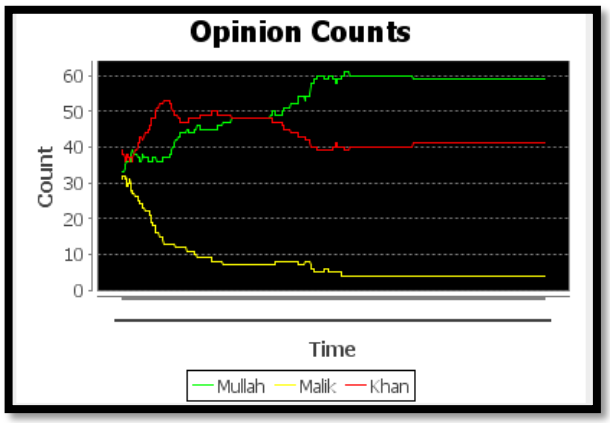

Figure 5: Opinion counts for one simulation run. The first plateau is at equilibrium. Then the extremist is added and the second equilibrium is reached.

Figures 6 – 8 graph the opinion history of the nodes of the network for all three opinions. As in Figure 5, the first equilibrium is visible as well as subsequent changes after the addition of the extremist.

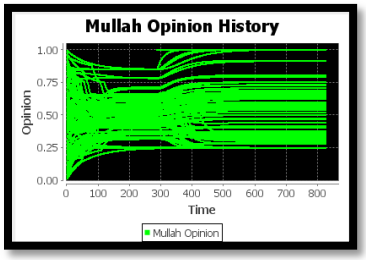

Figure 6: Mullah opinion history

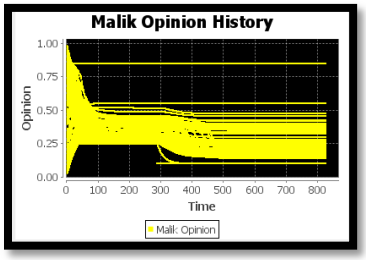

Figure 7: Malik opinion history

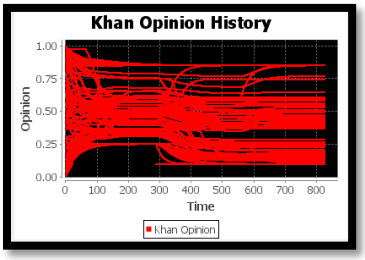

Figure 8: Khan opinion history

Figure 9 charts the count of networks selecting each type of leader initially, at equilibrium, and after the addition of the Taliban extremist. Addition of the extremist increases the influence of the Mullah and as a result he is much more likely to be selected as the leader. Figure 10 displays the average number of nodes in a network selecting each type of leader. Again, note that adding the extremist increases the average number of supporters of the Mullah.

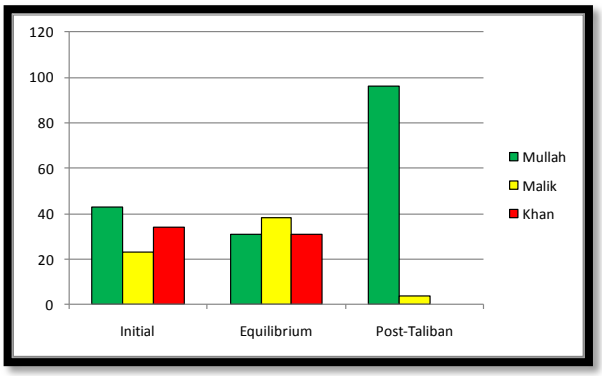

Figure 9: Number of network runs selecting each leader initially, at equilibrium, and after the addition of the Taliban extremist.

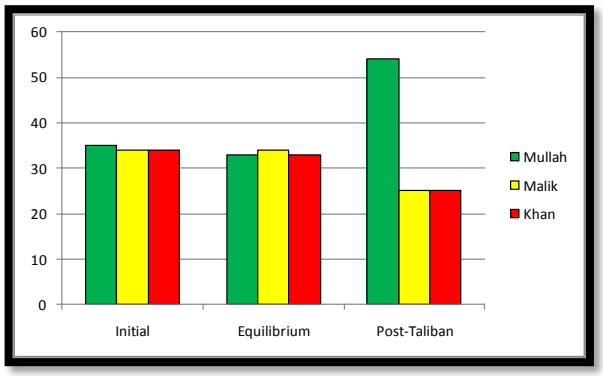

Figure 10: Average number of nodes selecting each leader initially, at equilibrium, and after the addition of the Taliban extremist.

6. ANALYSIS

The preliminary results presented above represent a small initial sampling of simulated networks. The effects of the addition of an extremist to the network is evident based on the number of networks selecting the Mullah as the consensus leader. There are a small number of networks that did not move to select the Mullah as leader. These networks will be analyzed for characteristics that aid in resisting radicalization by the Taliban and the Mullah. Sensitivity analysis will be performed on the change in $\boldsymbol{\mu}$ to determine the level of significance. We will also examine whether removal of the Taliban extremist results in a return to the original steady state.

7. CONCLUSIONS

In this research we explore the use of an opinion dynamics bounded confidence model to simulate tribal leadership selection among the Pashtun tribes. The preliminary results and analysis demonstrate the value of this approach. The model accurately reflects the triad of authority roles and the even distribution of leader selection if left unmodified. The model also shows the unbalancing effect of the addition of an extremist to the social network and the subsequent tipping of power to the Mullah.

8. FUTURE RESEARCH

The purpose of this model is to aid in understanding the social dynamics of leadership selection in Pashtun tribal society and the effects of extremists on the traditional consensus selection of leaders. In the absence of specific information about the composition of Pashtun social networks, we have used random networks with the characteristics of typical social networks. As information becomes available concerning the tribal social networks, this information can be incorporated into the network generation process.

The model also has the potential to analyze metrics defining political power, explore the effects of extremism in tribal members, examine the effects of loss of a leader and how possible replacements might be identified, and ultimately phase in quantitative data such as demographics, social connections, spatial locations, external events, and individual movement.

This model represents an ideal of the historical leadership situation. Recent events have disrupted and/or altered this dynamic in multiple ways depending on location. Adapting this model to accommodate other leadership configurations and including other pressures influencing opinions such

as the loss of current or potential leaders, the effects of an influx of money, etc. may also be helpful and add insight.

9. ACKNOWLEDGEMENTS

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10. REFERENCES

Anderson, J. (1978). There are no Khans Anymore: Economic Development and Social Change in Tribal Afghanistan. *Middle East Journal, 32*(2), 167-183.

Barabasi, A. L., & Albert, R. (1999). Emergence of scaling in random networks. *Science, 286*(5439), 509-512.

Barfield, T. (2010). *Afghanistan: A Cultural and Political History*. Princeton, NJ: Princeton University Press.

Cartwright, D., & Harary, F. (1956). Structural Balance: A Generalization of Heider's Theory. *Psychological Review, 63*.

Deffuant, G., Neau, D., Amblard, F., & Weisbuch, G. (2000). Mixing beliefs among interacting agents. Advances in Complex Systems. *Advances in complex systems, 3*, 87-98.

Geller, A., & Alam, S. (2010). A Socio-Political and -Cultural Model of the War in Afghanistan. *International Studies Review, 12*, 8-30.

Geller, A., & Moss, S. (2008). Growing *qawm*: An evidence-driven declarative model of Afghan power structures. *Advances in Complex Systems, 11*(2), 321-335.

Kilcullen, D. (2009). *The accidental guerilla: Fighting small wars in the midst of a big one*. New York: Oxford University Press.

Lustick, I., & Miodownik, D. (2009). Abstractions, Ensembles, and Virtualizations: Simplicity and Complexity in Agent-Based Modeling. *Journal of Comparative Politics, 41*(2), 223-244.

Moore, T. W., Finley, P. D., Linebarger, J. M., Outkin, A. V., Verzi, S. J., Brodsky, N. S., . . . Glass, R. J. (2011). *Extending Opinion Dynamics to Model Public Health Problems and Analyze Public Policy Interventions*. Paper presented at the Eighth International Conference on Complex Systems.

Weisbuch, G., Deffuant, G., & Amblard, F. (2005). Persuasion dynamics. *Physica A: Statistical Mechanics and its Applications, 353*, 555-575.