

# An Empirical Study of Anti-terrorism Visualization Based on Social Network Analysis

Lingzhi Jiang\*, Yifei Liu

Engineering University of the PAP, Xi'an 710086, China

## Abstract

In recent years, with the development and improvement of statistics and geometry related disciplines, social network analysis, as a new sociological research method, has attracted more and more attention and been widely used in various fields. Using social network theory to model various relationships between terrorist organizations and terrorist activities can achieve quantitative analysis of hidden terrorist organization relationships and activities, and improve the ability of anti-terrorism prediction and precision strike. The network visualization analysis tool UCINET has powerful data visualization and data dynamic analysis functions. This paper first describes the steps of anti-terrorism analysis based on social network analysis and UCINET. Then, taking the "10.28" incident in Beijing as an example, we use UCINET software to conduct a visual empirical study of anti-terrorism networks, and analyze the network density and centrality measurements.

## Keywords

Prediction social network analysis; UCINET; Counter-terrorism.

## 1. Introduction

With the rapid development of network information technology, the network characteristics of terrorist organization structure are gradually replacing the traditional pyramid organization structure. The concealment and networking of terrorist organizations and their activities have brought new challenges to the fight against terrorism and terrorist activities. Social network analysis is a quantitative analysis method for the hidden relationship and hidden structure of various elements in the social relationship network. It can realize the quantitative analysis of hidden terrorist organizations and their activity relationships by building a network model of research objectives, and can provide important data support for the formulation of anti-terrorism strategies. Therefore, it is of great practical significance to use the social network analysis method to study the relationship network and activities of terrorist organizations for effectively and accurately combating terrorism.

This paper first describes the steps of anti-terrorism analysis based on social network analysis and UCINET, and then takes Beijing "10.28" as an example to conduct a visual empirical study of anti-terrorism networks using UCINET software, and analyzes the network density and centrality measurements.

## 2. Steps and Indicators of Anti-terrorism Visual Analysis Based on Social Network Analysis Method

### (1) Analysis steps

First, intelligence collection and acquisition. It is to collect relevant information through various methods, understand the background of terrorist events, clarify the history and details of events, and provide a basis for determining the relationship between various elements. Data on anti-terrorism research is different from all other public data, so data can only be obtained from

other channels. As a data source, intelligence is obviously more reliable and direct. Researchers can use the information and intelligence of the anti-terrorism department to have an accurate understanding of the personal information of terrorists and more details of terrorist activities, so as to determine the relationship that is more in line with the actual situation. Due to the confidentiality of data, it is necessary to increase the sorting of archives, terrorist news, documents and Internet information.

Second, the construction of terrorist sub relationship matrix. Use the six dimensional space theory to analyze the elements related to terrorists. The rows or columns of the relationship matrix are used to represent terrorists and their related skills, resources, tasks, locations and other elements, and the relevant values are used to represent the tightness of the relationship between terrorists and various elements. For example, when conducting network analysis on a terrorist event, people, organizations, skills, resources and tasks can be determined. Then, the relationship between various types is determined according to the specific facts of terrorist events. If there is a relationship, it is 1, otherwise it is 0. The construction of relational matrix is the premise of building network model.

Third, the construction of anti-terrorism network model. The terrorist relationship matrix is introduced into the social network analysis software UCINET to establish the network model of terrorist organizations.

Fourth, the analysis of anti-terrorism network model. After measuring and calculating the terrorist organization's network, we use UCINET and other software to study the characteristics of terrorist organization's network relationship. The commonly used analysis indicators are density, centrality, structural equivalence, etc.

#### (2) Analysis indicators

Anti-terrorist network analysis needs to use the analysis methods in social network theory. The main indicators are density, centrality, subgroup, faction, etc. According to the practical needs of anti-terrorism, the anti-terrorism network analysis mainly reflects the anti-terrorism network by measuring the density and central indicators.

#### (1) Density analysis

Density reflects the tightness between nodes in the network. When carrying out anti-terrorism actions, it is often necessary to determine the stability of a terrorist organization based on the close relationship between terrorists or key factors in an organization, so as to formulate the correct countermeasures. For example, in a terrorist network, the density reflects the closeness between characters; Computing the density of the resource network can determine which type of resources are most closely related to terrorists, so as to control such resources and achieve the purpose of preventing terrorist events.

#### (2) Centrality analysis

The analysis of anti-terrorism network centrality mainly focuses on the analysis of intermediary centrality, proximity centrality and point-to-point centrality. The high centrality of the intermediary indicates that the node affects the connection between many nodes; The high centrality indicates that this node generally represents the person who plays a key role in terrorist organizations; The high degree centrality indicates that the node is in the core position in the network and generally represents the leader. By calculating these kinds of centrality, we can quickly find important persons in terrorist organizations, which provides a basis for further effective fight against terrorist organizations.

### **3. An Empirical Study on anti-terrorism of Beijing "10.28" Incident Based on UCINET**

#### (1) Intelligence information collection

The basic information of Beijing's "10.28" incident was collected by using the Internet search engine as follows: On October 28, 2013, Usman Aishan and his mother and wife drove into Chang'an Street, deliberately hitting people while driving, resulting in 2 deaths and 40 injuries. Finally, the car lost control and hit the bridge fence, causing the car to catch fire. Three violent terrorists died on the spot. According to a series of clues, the Beijing police determined that this was a violent terrorist attack. After careful investigation, the police found two machetes and extreme religious flags in the car. Finally, the Beijing police, together with the Xinjiang police, arrested the other five accomplices.

### (2) Construction of terrorist relationship matrix

From the perspective of the cause and process of the Beijing "10.28" incident, the incident can be divided into two stages. The first stage is the organization and planning stage, and the number of participants is small. The second stage is the implementation action stage. Due to the large number of participants in the second stage and the complex personnel composition, it is difficult to collect and determine the information of participants. According to this process, four basic elements can be determined by summarizing web page text information. First, terrorists involved in planning organizations are represented by A. Second, the required skills are represented by K. Third, the background event of the case is represented by B. Fourth, specific tasks are represented by T. The basic relationship between the event elements is shown in Table 1.

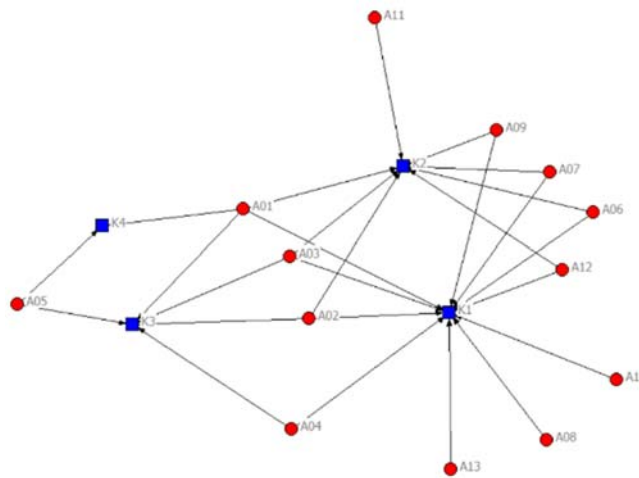
**Table 1.** Terrorist Relations in "10.28" Incident

Number	Terrorist	Event	Skill	Task
A01	Usman Hasan	T1,T2,T3,T4,T5	K1,K2,K3,K4	B01,B02,B03,B04
A02	YushanRiver·Wuxuer	T1,T3,T4,T5	K1,K2,K3	B01,B03,B04
A03	Yusuf·Wumalnyaz	T3,T4,T5	K1,K2,K3	B01,B03,B04
A04	Yusupu·Ahemaiti	T3,T4,T5	K1,K3	B03,B04
A05	Gurikezi·Eni	T2,T4,T5	K2,K3	B02,B03
A06	Kuwanhan·Reyimu	T2,T5	K1,K2	B02,B04
A07	Gulina·Tokhutiniazi	T3,T5	K1,K2	B03,B04
A08	Abdukadir	T3,T5	K1	B03,B04
A09	Toheti·Maiheti	T2,T5	K1,K2	B04
A10	Tuxunjiang·Abulizi	T4,T5	K1	B04
A11	Abra·Niyaz	T4,T5	K2	B04
A12	Contact of "Xinjiang independence" terrorist organization	T1	K1,K2	B01
A13	Contact with overseas violent terrorist organizations	T1	K1	B01

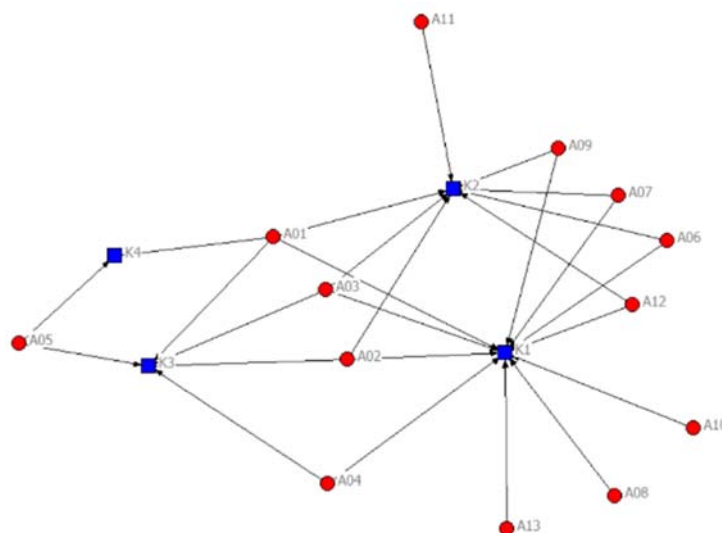
### (3) Using software to build terrorist network model

Import the relational matrix (excel format) data into UCINET software, and use the visualization tool NetDraw in UCINET to draw the person task relationship as shown in Figure 1, the person

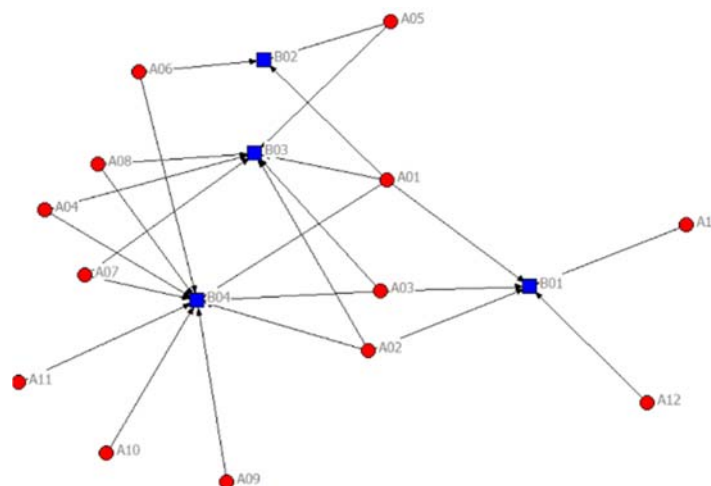
skill relationship as shown in Figure 2, the person event relationship as shown in Figure 3, and the task skill relationship as shown in Figure 4.



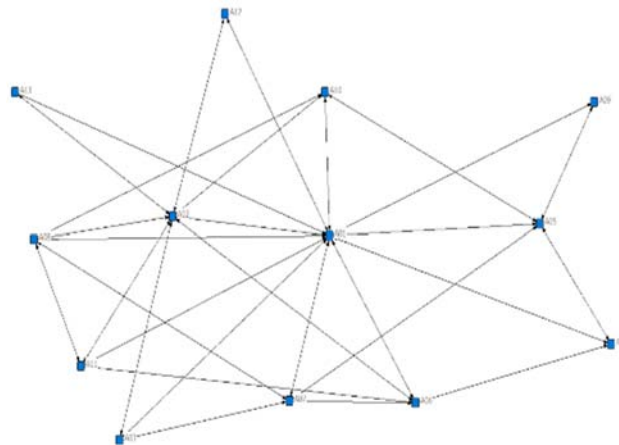
**Figure 1. Terrorist Incident Relationship**



**Figure 2. Terrorist skill relationship**



**Figure 3. Terrorist Mission Relationship**



**Figure 4.** Terrorist Terrorist relationship

**(4) Analysis on the Hidden Network of Terrorists**

From Figure 5, we can see that the network density of the terrorist terrorist relationship is 0.3846, which is not high, indicating that not all terrorists involved in the "10.28" incident are connected. And from Figure 6, it can be seen that A01 and A02 have a high degree of centrality and middle centrality, indicating that they have a wide contact with terrorists and are the main planners of this terrorist incident. To sum up, in the fight against terrorists, we should focus on attacking terrorist leaders, rather than attacking them on a large scale.

Relation: 1

Density (matrix average) = 0.3846  
Standard deviation = 0.4865

Use MATRIX>TRANSFORM>DICHOTOMIZE procedure to get binary image matrix.  
Density table(s) saved as dataset Density  
Standard deviations saved as dataset DensitySD  
Actor-by-actor pre-image matrix saved as dataset DensityModel

**Figure 5.** Calculation of terrorist density

	1	2	3	
	Degree	NrmDegree	Share	
1 A01	12.000	100.000	0.200	
2 A02	8.000	66.667	0.133	
6 A06	5.000	41.667	0.083	
7 A07	5.000	41.667	0.083	
5 A05	5.000	41.667	0.083	
8 A08	5.000	41.667	0.083	
10 A10	4.000	33.333	0.067	
11 A11	4.000	33.333	0.067	
3 A03	3.000	25.000	0.050	
4 A04	3.000	25.000	0.050	
9 A09	2.000	16.667	0.033	
12 A12	2.000	16.667	0.033	
13 A13	2.000	16.667	0.033	

**Figure 6.** Terrorist Centrality Calculation

**4. Conclusion**

With the continuous deepening of anti-terrorism research and the intensification of anti-terrorism efforts in various countries, the organizational structure of terrorist organizations has gradually changed into a more hidden and flat structure, and the activities of terrorist organizations are more hidden. In this paper, the social network analysis method is used to establish the network relationship model of typical violent terrorist events, and to analyze the network relationship of terrorists has become an important means to disrupt terrorist

organizations. The research on evaluation indicators of open-source data acquisition and anti-terrorism network model needs further in-depth research.

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