A Visual Analysis of the “11.13” Terrorist Attacks in Paris Based on UCINET

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Abstract. As a tool of quantitative analysis, Social Networks Analysis (SNA) has attracted more and more attention and favor. Among them, the network visualization analysis tool UCINET has powerful data visualization and data dynamic analysis functions. By analyzing the relationship between the analysis points and points with UCINET, the visualization relationship network diagram and quantitative data can be obtained. Taking the "11.13" anti-terrorism attack in Paris as an example, this paper carried out a visual empirical study with UCINET software, and analyzed the network density and centrality measurement, which can provide a useful reference for the formulation of counter-terrorism strategies.

Introduction

At present, the networking tendency has become the main characteristics of terrorist organizations, so social network analysis is particularly important. Compared with general social network analysis software, UCINET is the one with the highest utilization rate and the strongest operability, which is most suitable for beginners to use [1].

UCINET software is integrated with NetDraw, Mage, Pajek and other main functions. NetDraw can analyze one-dimensional data as well as two-dimensional data. Mage can display and analyze three-dimensional data. Pajek can be used for large network analysis [2]. Therefore, UCINET can simplify complex matrix algebraic calculation and statistical analysis.

In studying the characteristics of counter-terrorism network, density, centrality and other analysis indexes are often used. Density measures the closeness of connections between nodes in the network. In a network diagram, density is proportional to the numbers of connections between nodes. Centrality reflects who or what is at the center of terrorist activity [3].UCINET can be used to construct and analyze the visual network diagram of terrorist organizations, so as to provide valuable data for counter-terrorism.

Network Construction of "11.13" Events in Paris

1. Background of the event.

According to baidu baike [4], on November 13, 2015, a series of terrorist attacks in Paris killed at least 132 people. Since then, the French mainland and the island of Corsica have entered a state of emergency. Countries around the world have condemned the terrorist attacks and expressed their support and sympathy to France and the French people. There were five bombings and five shootings in Paris. Three explosions were reported near the stade DE France. All the attackers were killed. The death toll rose to 132 and more than 300 were injured. The attack was an "act of war" and was planned and carried out by a group known as “Islamic State” abroad, assisted by French domestic forces.

2. Data compilation. Due to the great uncertainty of personnel information in the event, the table of figures, methods and location is sorted out for detailed expression. The specific contents are shown in Table 1.

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Table.1, The table of figures, methods and location

No.	**Figures**
S01	Ahmed mohamed
S02	Sami amimour
S03	Ismail omar mosteffi
S04	Bilal hadfield
S05	Bouhaim abdeslam
S06	Abdelhamid abaaoud
	Methods
E01	The shooting
E02	The explosion
	Location
A01	Stade DE France
A02	Rue Bichat
A03	Avenue de la République
A04	Rue sharona
A05	Rue voltaire
A06	Le théâtre bataclan
A07	Rue bomacher

3. Network relationship construction. The basic relationships between these event elements are shown in Table.2.

Table.2. The basic relationships

No.	Location	Methods	Figures
A01	Stade DE France	E02	S01
A02	Rue Bichat	E01	S06
A03	Avenue de la République	E01	S02
A04	Rue sharona	E01	S04
A05	Rue voltaire	E02	S05
A06	Le théâtre bataclan	E01, E02	S02, S03
A07	Rue bomacher	E01	S01

According to the above table, the following three most critical relationship matrices are constructed: the location-methods relationship matrix, the location-figures relationship matrix and the figures-methods relationship matrix. The relation matrix can be obtained from the relation table. See Table.3, 4 and 5 respectively. By using matrix algorithm, the location-location relationship matrix can be obtained as shown in Table.6.

Table.3. The location-methods relationship matrix

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11
S1	1	0	1	0	0	1	0	0	0	0	1
S2	0	1	1	0	0	0	1	0	0	0	1
S3	0	1	1	0	0	0	1	1	1	1	1
S4	0	1	1	0	0	0	1	0	0	0	1
S5	0	1	1	1	1	1	0	0	1	0	1
S6	0	1	1	0	0	0	1	1	0	0	1
S7	0	1	1	0	0	0	1	0	0	0	1
S8	0	1	1	0	0	0	1	0	0	0	1
S9	0	1	1	0	0	0	1	0	0	0	1

Table.4. The location-figures relationship matrix

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
S1	1	1	1	1	1	1	1	0	1	1
S2	0	0	0	1	1	1	0	0	0	1
S3	1	1	1	1	1	1	0	1	1	1
S4	0	0	0	1	1	1	0	0	0	1
S5	1	1	0	1	1	1	0	0	1	1
S6	0	0	0	1	1	1	0	0	0	1
S7	0	0	0	1	1	1	0	0	0	1
S8	0	0	0	1	1	1	1	0	1	1
S9	0	0	0	1	1	1	0	0	0	1

Table.5. The figures-methods relationship matrix

	K1	K2	K3	K4	K5	K6	K7	K8
S1	0	1	0	1	1	1	1	0
S2	0	1	0	1	0	0	1	0
S3	0	1	1	1	1	1	1	1
S4	0	1	0	1	0	0	1	0
S5	1	1	0	1	1	1	1	1
S6	0	1	0	1	0	1	1	0
S7	0	1	0	1	0	1	1	0
S8	0	1	0	1	0	1	0	0
S9	0	1	0	1	0	1	1	0

Table.6. The location-location relationship matrix

		1 A	2 A	3 A	4 A	5 A	6 A	7 A
1	A01	1	0	0	0	1	1	0
2	A02	0						
3	A03	0						
4	A04	0						
5	A05	1						
6	A06	1						
7	A07	0						

Event Visualization and Result Analysis

Based on the data obtained above, network diagram is drawn with NetDraw, and the results shown in Figure 1, Figure 2 and Figure 3 are obtained.

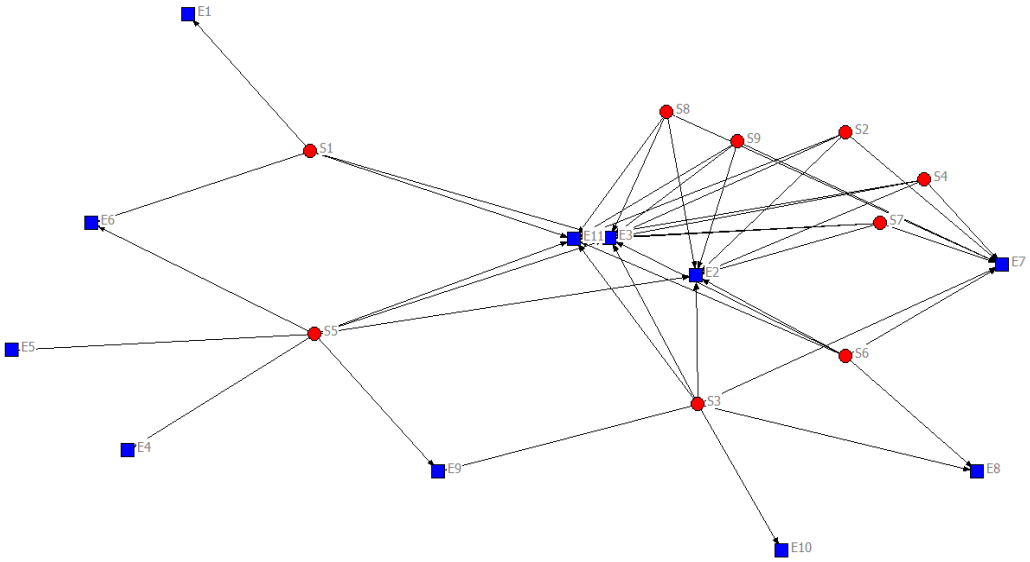

Fig.1. Location-methods relationship

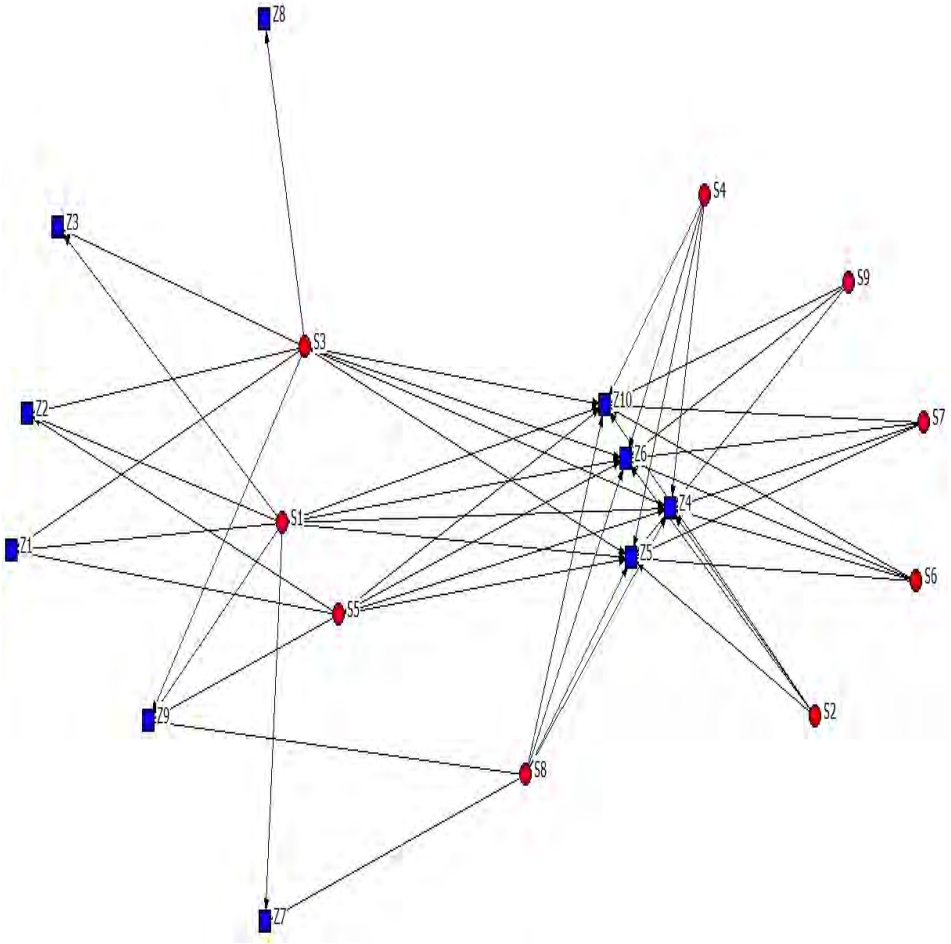

Fig.2. Location-figures relationship

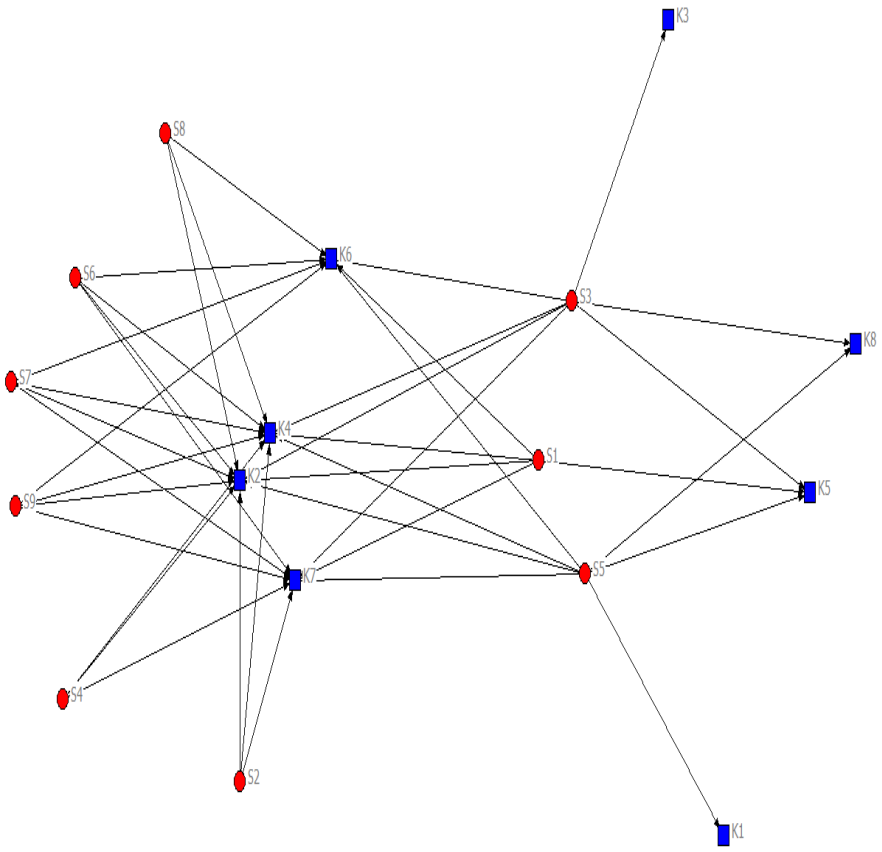

Fig.3. Figure-methods relationship

From these network diagrams we can observe directly where the elements are. In order to extract more information from these network graphs, this paper measured these network graphs with density and centrality as the measurement index. The results are shown in Figure 4 and Figure 5.

```
Relation: 1

Density (matrix average) = 0.6190
Standard deviation = 0.4856

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
```

Fig.4. Density calculation results

	1 Degree	2 NrmDegree	3 Share
6 A06	6.000	100.000	0.231
4 A04	4.000	66.667	0.154
2 A02	4.000	66.667	0.154
7 A07	4.000	66.667	0.154
3 A03	4.000	66.667	0.154
5 A05	2.000	33.333	0.077
1 A01	2.000	33.333	0.077

DESCRIPTIVE STATISTICS

		1 Degree	2 NrmDegree	3 Share
1	Mean	3.714	61.905	0.143

Fig.5. Centrality calculation results

As can be seen from Figure 4, the network density of the location-location relationship is 1. It is stated that all the locations involved in the "11.13" terrorist incident are linked, so control should be carried out according to the locations in the fight against terrorists. To strike the terrorists, the centrality of the network must be measured. As can be seen from Figure 5, the location with the highest ranking of point degree center and intermediary degree is A06, indicating that the location is in the key in the relationship network. From the actual situation of the incident, the site was the scene of three explosions in the Paris terrorist attacks. Analysis of other relational network diagrams in the same way can yield valuable information.

Summary

After the “9.11”, terrorist activities have attracted the attention of the international community, and many countries have put the fight against terrorism in an important strategic position. Social network analysis provides a visual quantitative analysis method for terrorist organizations and their operations. Next, the relationship between events will be studied in depth to provide technical support for counter-terrorism operations.

Acknowledgement

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