Proximity based Circular Visualization for similarity analysis of UNGA voting patterns

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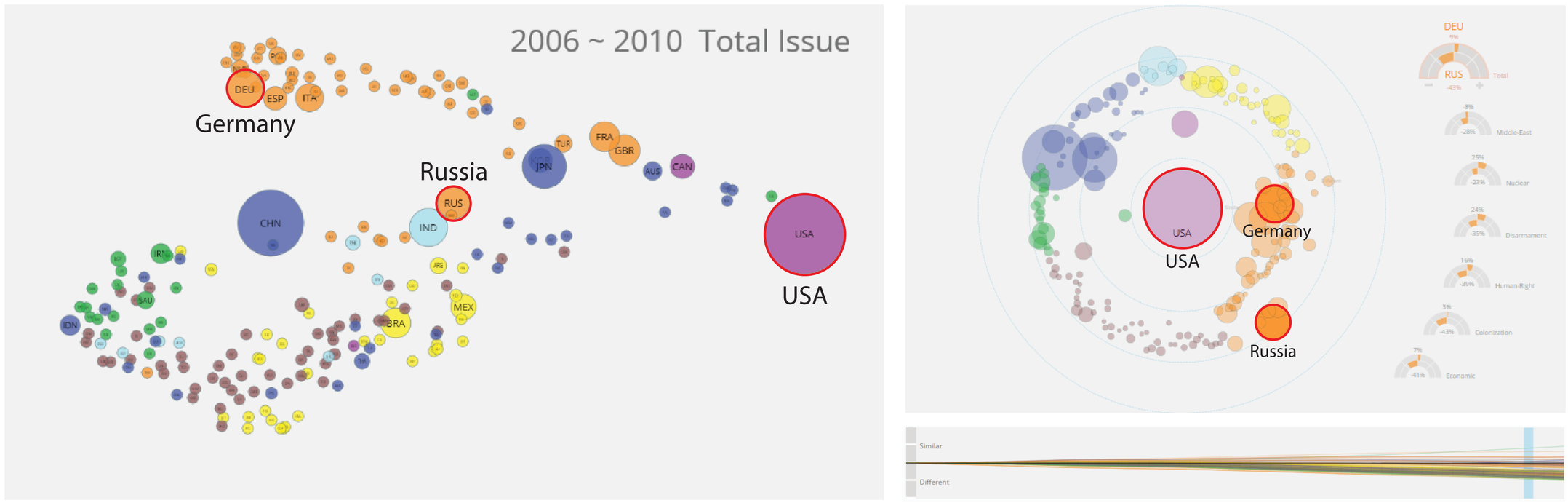

Figure 1. (a) Network Graph Visualization (b) Radial Visualzation (Demo Site URL: http://203.234.55.97/politiz/un/).

Abstract

In this paper, we present interactive visualization methods that analyze the relations between nations from UN General Assembly(UNGA) voting data.Our methods visualize the relations in several aspects such as specific issues or time period. UNGA voting data contains of 5211 resolutions. For this work, we designed a similarity , metrics between nations and developed two different visualization method-based similarity metrics. The first one is Network Graph Visualization which identifies the relations between nations, applying the voting result of annual United Nations General Assembly resolutions with Social Network Graph. Next, proximity-based circular visualization illustrates relations between the nations focusing on a specific country, or changes in the voting pattern between nations in a sequential manner.

Introduction

Social network visualization is a method of visualization in order to suggest the relations between factors formed in a certain network, based on nodes and ties. However, if a network graph has a lot of nodes, it is difficult to recognize the precise relations between nodes due to edge crossing. Moreover, there are limitations such as difficulty to understand the relations focusing on a certain country, nor in a chronological order. This study aims to create a visualization method to improve such shortcomings. We selected UN general assembly resolutions as a sample data [1], and refined such results so as to utilize for a new visualization method. Two approaches were designed, which include network graph visualization and proximity-based circular visualization.

Data Processing

Two different methods were adopted to create a similarity matrix, out of UN general assembly resolution voting data to design network graph visualization and proximity-based circular visualization. Similarity level on Network Graph visualization was measured as a probability of same attitudes on the vote of both countries. Following is the voting similarity between country A and B [2].

$$Similarity(A,B) = \frac{N(A,B)}{Total(A.B) \bigcap X} \qquad (1)$$

$N(A,B)$ = The number of same votes from A and B
$Total(A,B)$ = Total number of vote by both A and B
X = If A and B are ”Yes” or ”No”

Similarity level on the proximity-based circular visualization is calculated with Proximity of Voting data. Each voting result of the two countries is compared, estimated as a value with weigh and sign, and accumulated. Illustrated below is the formation.

$$Similarity(A,B) = \frac{(WS(A,B)) + (WD(A,B))}{Total(A,B)} \qquad (2)$$

$WS(A,B)$ = w*The number of same votes from A and B
$WD(A,B)$ = w*The number of different votes from A and B
(w= weight value)

Network Visualization

Network Graph Visualization, a social graph applying force directed method shows the distribution of major countries according to the UN general assembly votes in each period, while covering the cluster of countries with similar voting patterns as the previous social network graphs have shown. Figure 1 (a) indicates the design of Network Graph Visualization.

Proximity-based Circular Vis

Proximity-based circular visualization consists of radial visualization and time series similarity visualization. Radial visualization indicates a clearer beginning point of analysis as the nodes are located in a radial form based on a specific center node. Time series similarity visualization was designed as a form of line graph to allow users to easily trace the voting pattern in a sequential manner. Proximity refers to the accumulation of weighted and signed value, based on the comparison between the attitudes of two countries [3].

A comparison between radial visualization and network graph visualization is as follows. Figure 1 (a), as a force-directed based network graph as previously mentioned, indicates the similarity relations of the overall vote result until 2011. Figure 1 (b), radial visualization, represents the international relations focusing on USA, where Germany and Russia are highlighted according to the correlation. While radial visualization on Figure 1 (b) shows higher similarity between USA and Germany than the one between USA and Russia, Network Visualization on Figure 1 (a) indicates the opposite result. This is a distorted result since the similarities between USA and Countries neighboring Russia are higher than the one between USA and Countries neighboring Germany, because all the nodes are affected by the force of attraction and repulsion.

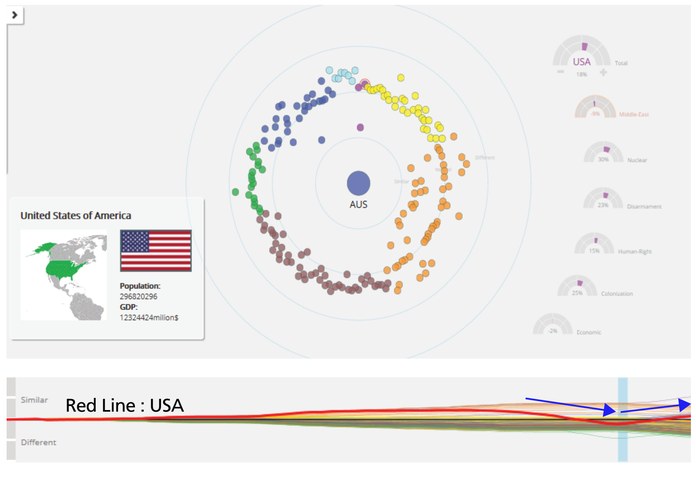

Figure 2. Proximity-based circular visualization.

A line graph below Figure 2 is a Time-series view indicating the similarity level of other countries on Middle East issue, with Australia as its center. Axis X refers to time, and axis Y refers to the similarity value as positive being similar and negative being different. Red line indicates USA. Figure 2 shows that the relation similarity between Australia and USA gradually decreases from 1991 and begins to rise again from 2003, which can be explained upon the historical factor that Australia dispatched the troops to Iraq to support the United States in 2003, and the official participation on M.D. (Missile Defense) of USA on December of 2003.

In this manner, we clarified that the incidents of a certain period bring the change on the tendency of similarity, by analyzing the data similarity trend in a chronological order.

Discussion

This chapter mainly compares the result between the existing network graph visualization and proximity-based circular visualization. The experiment was conducted in order to explain the efficiency of functions related to *pattern, details, overview, and groups* in visualization. People who have relevant major were selected as subjects to the experiment, in addition to questionnaire surveys. We thus discovered that proximity-based circular visualization allows easier interpretation on individual nodes compared to network graph visualization, while Network Graph visualization suits better to understand the relations between different countries.

Conclusion

This work aimed to understand the extensive amount of network relations, by suggesting the method to visualize and interact which enables to analyze the international relations in various viewpoints. Also, factors mutually improve based on the comparison between proximity-based circular visualization and Network Graph visualization. We therefore conclude that, when conducting the comparison and contrast between the groups with an extensive amount of data, proximity-based circular visualization should be combined with Network Graph visualization for more accurate data analysis while mutually improving the shortcomings of each visualization method.

References

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