



A Study on the Microblog's Communication Network of Beijing Winter Olympics Based on Social Network Analysis

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Abstract. Microblog is an important platform for information dissemination and communication and discussion of the Beijing Winter Olympics, and it plays an important role in the information dissemination of the Beijing Winter Olympics. Using microblog's users who post information about the Beijing Winter Olympics as the research object, social network analysis was used to examine the microblog's communication network of the Beijing Winter Olympics by measuring overall network density, node centrality and cohesive subgroups. It was found that: the Beijing Winter Olympics microblog's communication network is loosely connected, overlapping members are the bridge of communication between cohesive subgroups, and People's Daily has the strongest communication power.

Keywords: Beijing Winter Olympics · communication network · social network analysis

1 Introduction

The Beijing Winter Olympics have attracted widespread attention and discussion worldwide, and the final report of the IOC Beijing 2022 Coordination Commission shows that the total number of social media platforms engaged in the Olympics reached 3.2 billion times [1]. As a typical social media platform, microblog is characterized by its early establishment, large user base and high level of interaction, which makes it an important platform for information dissemination and exchange of discussions about the Beijing Winter Olympics.

The flow of information depends on the communication network among microblog's users, so the structure and characteristics of the communication network should be taken into account when examining the information dissemination of the Beijing Winter Olympics. By using social network analysis to study the information dissemination network of the Beijing Winter Olympics, we can grasp the communication process from the perspective of relationship and structure, understand the role of communication subjects and identify key nodes, in order to provide some references for future sports communication.

Based on the above research background, this paper poses the following research questions: 1. What are the overall characteristics of the microblog's communication network of the Beijing Winter Olympics? 2. Is there a cohesive subgroup of the microblog's communication network of the Beijing Winter Olympics? 3. What is the role and status of the communication subjects of the Beijing Winter Olympics in the microblog's communication network?

2 Data Analysis

2.1 Data Processing

We searched for "Beijing Winter Olympics" as the keyword and searched for the trending data from February 4, 2022 to February 20, 2022, and finally got 1574 pieces of data. The top 50 microblog's users were selected as the research objects based on the sum of retweets, comments and likes in descending order, and the relationship between them was crawled and imported into UCINET as an adjacency matrix.

2.2 Network Density Analysis

In social network analysis, network density is an important index to measure the closeness of the relationship between nodes in the network [2]. The measured network density of the Beijing Winter Olympics microblog's communication network is 0.1376, which indicates that the microblog's users in the network pay less attention to each other and have more distant relationships, and there is not much communication and interaction around the Beijing Winter Olympics.

2.3 Analysis of Cohesive Subgroups

In the whole social network, certain actors have close relationships or positive interactions with each other, and they form cohesive subgroups. In this paper, we use k-clusters to analyze cohesive subgroups built on the basis of point degrees. In a k-cluster, each node is directly connected to at least one other node beyond k nodes [3]. After several attempts to take values, $k = 2$ and $n = 10$ are finally set, and the 15 subgroups obtained are analyzed.

The results show that People's Daily, Xinhua News Agency and China News are active in all cohesive subgroups, and these overlapping accounts can spread information in all cohesive subgroups, and they are the bridge to communicate with cohesive subgroups.

2.4 Centrality Analysis

Centrality quantifies the influence, position and status of nodes from the perspective of "relationship". In this paper, three indicators are used to measure centrality: point centrality, intermediate centrality and proximity centrality.

Point Centrality

Point centrality is calculated as the total number of all other nodes directly connected

to a node in a social network. The greater the point centrality of a node, the more nodes are directly connected to the node, [4] and the greater the influence of the node in the network, the more it is at the center of the network.

The results show that, in terms of point-out degree, Sina Sports has the highest point-out degree, indicating that he follows the most number of other users in the communication network and has the widest access to information. In terms of point-in, People's Daily has the highest point-in, indicating that it is in the center of the communication network, with the greatest authority and influence, and the information released is most likely to be widely followed and disseminated.

Intermediate Centrality

The degree of intermediate centrality measures the extent to which actors control the flow of resources and information [5]. If a node is on the shortest path connected by multiple pairs of points, then the value of intermediate centrality of the node is larger, and it has a higher intermediate centrality.

The results show that the intermediate centrality degrees of seven microblog's users, namely, Sina Sports, Out of Bounds Editorial, People's Daily, Mangguolao Zhiduoqing, China News, Xinhua News Agency, and China Film Report, are greater than 100, and their intermediary role is much stronger than that of other microblog's users, with Sina Sports having the most prominent intermediary role. When these microblog's users with high intermediate centrality actively promote the exchange and circulation of information, they can effectively promote the dissemination of information related to the Beijing Winter Olympics and expand the scope of communication.

Proximity Centrality

Proximity to the center measures the degree to which a node in the network is not controlled by or dependent on other nodes, that is, the degree of independence of a node. The node's distance from the center is inversely proportional to the node's proximity to the center. The smaller the value of distance from the center, the higher the node's proximity to the center, the closer it is to other nodes, the shorter the path through which information is transmitted and received, and the stronger the independence.

The results show that Liang Jingkang's in-degree away degree is the lowest, indicating that he has the highest proximity to the center, the strongest independence, and the least likely to be controlled by other microblog's users, while the information posted by Liang Jingkang can reach other microblog's users through the shortest path, so that the information can spread out at the fastest speed. Ping Lin has the lowest out-degree away degree in Japan, indicating that he can easily receive information from other microblog's users, relies less on intermediate nodes in the process of obtaining information, and has higher independence.

3 Conclusion and Discussion

In this paper, we quantified and analyzed the microblog's communication network of Beijing Winter Olympics, and explored the characteristics of the communication network at three levels: macro, meso and micro.

3.1 Macro: Loose Communication Network

At the macro level, the microblog's communication network of the Beijing Winter Olympics has a low density and is a loose, not tight and less cohesive communication network. The uncertainty and temporary nature of the microblog's relationship network of the Beijing Winter Olympics is one of the important reasons for the loose structure of its communication network. In microblog, the users involved in the dissemination of information about the Beijing Winter Olympics are not fixed. Microblog's users from different fields only temporarily form a communication network because they are concerned about the same issue, and it is not a permanent network that relies on the relationship between members. [6] The diversity of information channels is another reason for the loose structure of the microblog's communication network of the Beijing Winter Olympics. The nature of the platform makes microblog's users' following relationships not the only source of information, as they can access a large amount of information through rich and convenient channels such as hot search, discovery, recommendation and search. Therefore, when building a microblog's communication network for the Beijing Winter Olympics, the network structure formed by connecting multiple types of microblog's users with their following relationships is relatively sparse.

3.2 Medium View: Overlapping Members Are the Bridge of Communication

The analysis of cohesive subgroups reveals that there are many cohesive subgroups in the microblog's communication network of the Beijing Winter Olympics. Several overlapping accounts such as People's Daily and Xinhua News Agency are active in all subgroups, implying that members have a high degree of recognition and trust in them, which has a lot to do with the advantages that central-level media have in many aspects such as credibility and authority. These overlapping accounts are at the core of the Beijing Winter Olympics microblogging communication network, and are the key nodes to communicate with the subgroups and connect the network. They can make the information of Beijing Winter Olympics spread within different subgroups and further widen the scope of information dissemination.

3.3 Microscopic: People's Daily Has the Strongest Communication Power

From the analysis results of node centrality, only People's Daily ranks in the top three in all three measures. In the microblog's network of the Beijing Winter Olympics, People's Daily not only occupies a central position and has great influence on the overall network and other actors in the network, but also has a strong independence and will not be easily influenced or controlled by other actors; at the same time, it also plays the role of "information bridge" and controls the information circulation channels. The information released by him and reproduced by him can be spread to the largest extent with the fastest speed.

Overall, the social network analysis method is used to outline a clear, three-dimensional and comprehensive microblog's communication network of the Beijing Winter Olympics through a series of index measurements. The analysis of the microblog's communication network of the Beijing Winter Olympics can provide some ideas to promote the future development of sports communication.

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