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Research on Accurate Information Pushing Based on Human Network

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Abstract

Based on the social network analysis methods and human network, this paper randomly selected 44 students (31 males and 13 females) as the research objects, and it used the UCINET software to analyze the friendship between them of which 43 used WeChat and 44 used QQ, and it also used the tool Netdraw to visualize the network sociogram. By mining the four aspects of density, accessibility, centrality, block model, the results demonstrated that QQ social network and WeChat social network existed the phenomenon of small world, leaders and subgroups, and the key nodes of QQ human network were more than WeChat network. Through using the key nodes, it can push the precise and efficient information and improve the accuracy of information transmission and impact among network members.

Keywords

Social Network Analysis, Human Network, Small World, Subgroup, Key Nodes: Precise and Efficient Information, Information Transmission

1. Introduction

With the development of Web 2.0 and the increasement of using self-media, people can obtain the accurate and effective information by excavating the characteristics and phenomena of social network. Many definitions of the human network have been developed. The social systems which we live with (families, schools, friendship groups, and so on) can be described as networks and analyzed using social network analysis [1]. Some scholars defined it as a relatively stable system composing with some individuals [2]. Some defined it as the social network, which was used by exchanging information to achieve a specific purpose [3]. Others defined it as a relatively stable dynamic system, which was formed by the network of information for a specific purpose [4]. In this paper, the social network is defined as the relatively stable whole network, which is formed by

certain individuals and the purpose is for formation communication and propagation.

At present, the research of social network mainly focuses on the enterprise competitive intelligence. Bao [3] thought the social network was a social capital of competitive intelligence and enterprise development. It created a new direction in researching the enterprise competitive intelligence of domestic social network. Pan [2] constructed the competitive intelligent human network research model from the quantitative and qualitative aspects, but he didn't analyze the basic characteristics of human network structure. Wang [4] introduced the relational theory of database and constructed the competitive intelligent human network relational model. Wu [5] used the network links to build virtual social relations. Rachel Isba [6] used social network analysis in medical education; it yielded significant insights that would improve experiences and outcomes for medical educators, and ultimately for patients. Andrea Fronzetti Colladon proposed a new approach to sort and map relational data and used social network metrics to find risk profiles of clients and potential criminals [7]. Wai Kin Victor Chan analyzed how hyper-network models led to the new understanding for service science. And they revealed hidden social structures and yielded accurate estimates for network performance. Finally they proved that hyper-networks enhanced ordinary random graphs [8]. The above studies have not further analyzed the network characteristics.

This paper randomly selects 44 students of certain specialty, and constructs friends adjacency matrix by EXCEL based on the relationship of QQ and WeChat. It uses Ucinet to analyze the social network and Netdraw to visualize the human network sociogram. By computing the Network density, reachability, centrality and block model, it can obtain the small world phenomena of the network, few key nodes and subgroups (small groups) with highest nodes degree dominating the whole network. Through analyzing the key nodes and the information concerned by small groups, it can improve the efficiency of information pushing and avoid the phenomenon of information overloading.

2. Methods

2.1. Research Objects

This study randomly selected 44 students (31 males and 13 females) as the research objects, and it investigated the friendship between them of which 43 used WeChat and 44 used QQ.

2.2. Related Theories and Research Tools

The social network refers to the network with complex connection relations, which formed by the social individual as nodes and the relations between the individuals as edges [9]. Social network analysis can be divided into two basic types according to the research groups: Ego-centered network analysis and whole network analysis [10]. The whole network is a comprehensive structure of role relationships in a social system [11].

The basic elements of human network include persons and the links between persons. The former can be called nodes and the latter can be called relations or ties [3]. The various phenomena of social network achieved by the social network analysis and software can improve the efficiency of human network and push the targeted precision information.

Ucinet (University of California at Irvine Network) is a comprehensive social network analysis software developed by University of Cingifornia Irvine [12]. The Netdraw of Ucinet can statistical and visual analysis 1D and 2D data [13]. Ucinet can separately process data matrix and convert data matrix to visual network map. It supports a large number of algorithms and can make accurate calculation and analysis for matrix. It can be more competent for pure data computing and more suitable for complex multi-relationship data processing [12].

In this paper, the analysis of social network uses the Ucinet 6.232 version to build two-dimensional adjacency matrix and process network data. The network sociogram is built by the NetDraw 2.118 version.

3. Network Construction and Network Analysis

3.1. Network Construction

In order to facilitate recording, this paper used numerical number instead of student's name. The relationship between the participants of the study forms a 44 × 44 two-dimensional adjacency matrix. If they are friends of each other, the corresponding element value is 1 and otherwise is 0. The results are shown in Table 1 and Table 2 as below.

Table 1. Part of friendship matrix of QQ.

	01	02	03	04	…	43	44
01	0	1	1	1	…	1	1
02	1	0	1	1	…	1	1
03	1	1	0	1	…	1	1
04	1	1	1	0	…	0	1
…	…	…	…	…	…	…	…
43	1	1	1	0	…	0	1
44	1	1	1	1	…	1	0

Table 2. Part of friendship matrix of WeChat.

	01	02	03	04	…	43	44
01	0	1	1	1	…	1	0
02	1	0	1	1	…	1	1
03	1	1	0	1	…	0	1
04	1	1	1	0	…	0	1
…	…	…	…	…	…	…	…
43	1	1	0	0	…	0	1
44	0	1	1	1	…	1	0

3.2. The Whole Human Network Analysis

3.2.1. Human Network Sociogram

Netdraw can draw the human network sociogram of QQ and WeChat between students (shown as Figure 1 and Figure 2), and on the basis of it a central visual analysis can be proceeded (shown as Figure 3 and Figure 4).

This paper constructed the undirected and unweighted network. As shown in Figure 1 and Figure 2, each node represents a student and participants of the

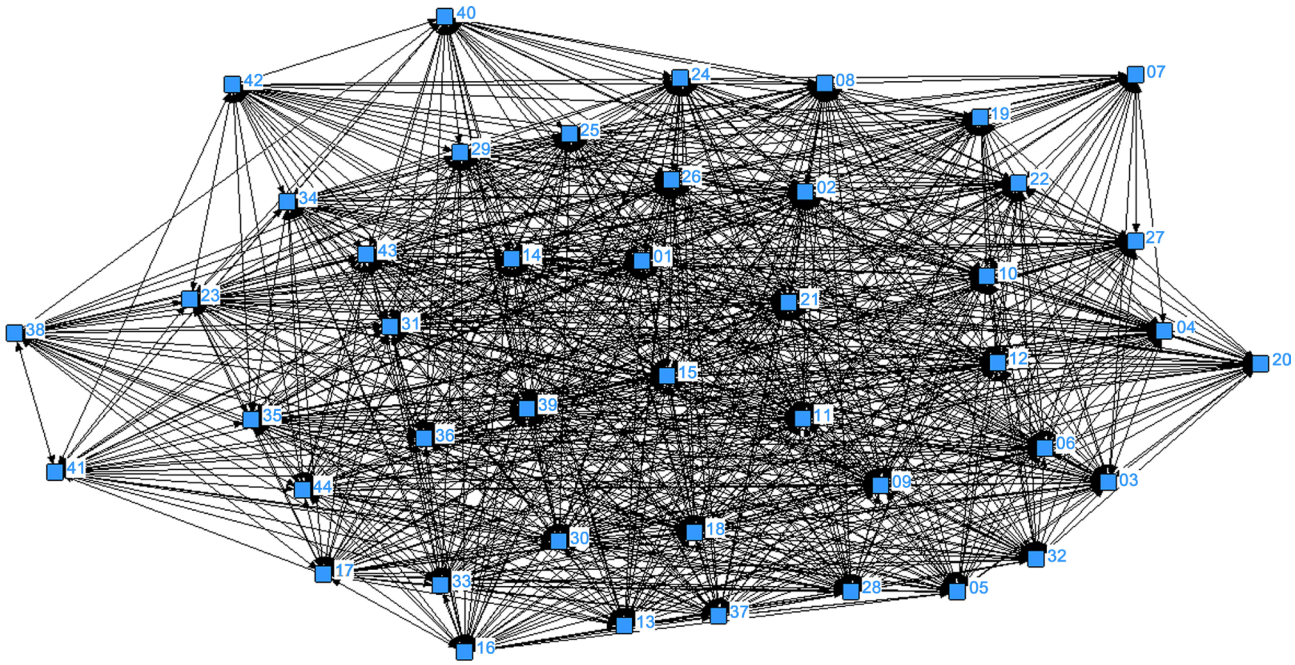

Figure 1. Human network sociogram of QQ.

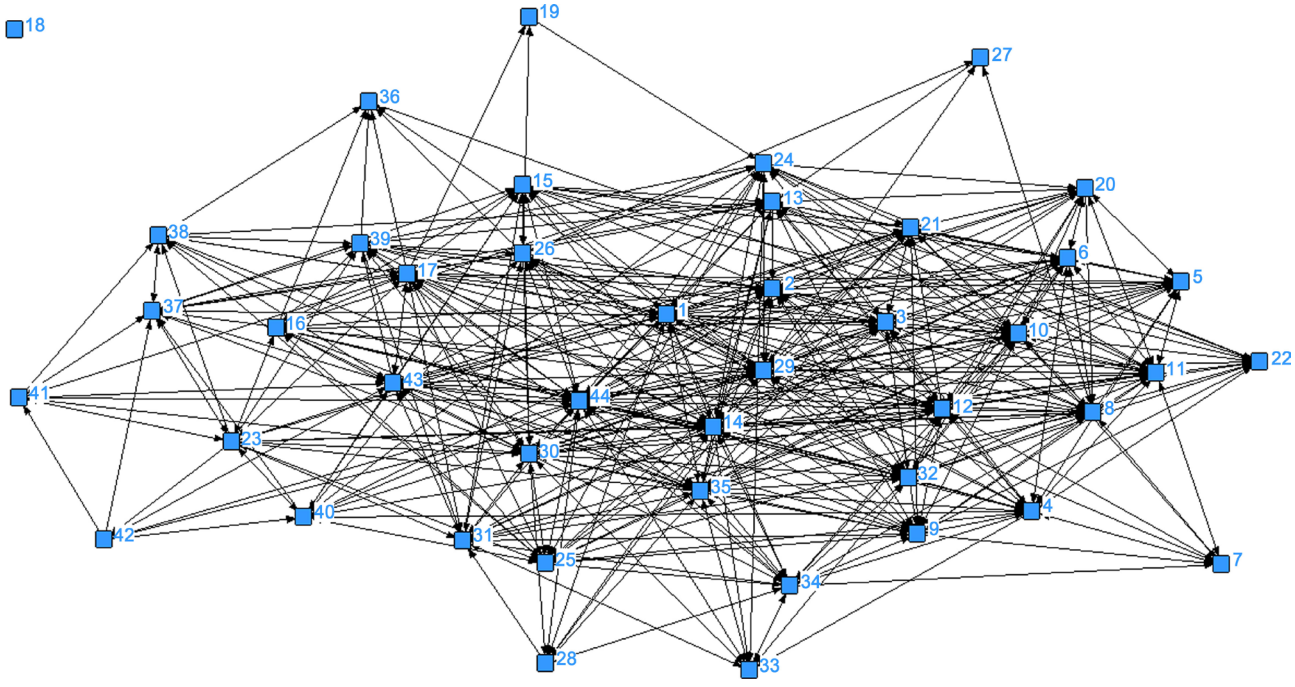

Figure 2. Human network sociogram of WeChat.

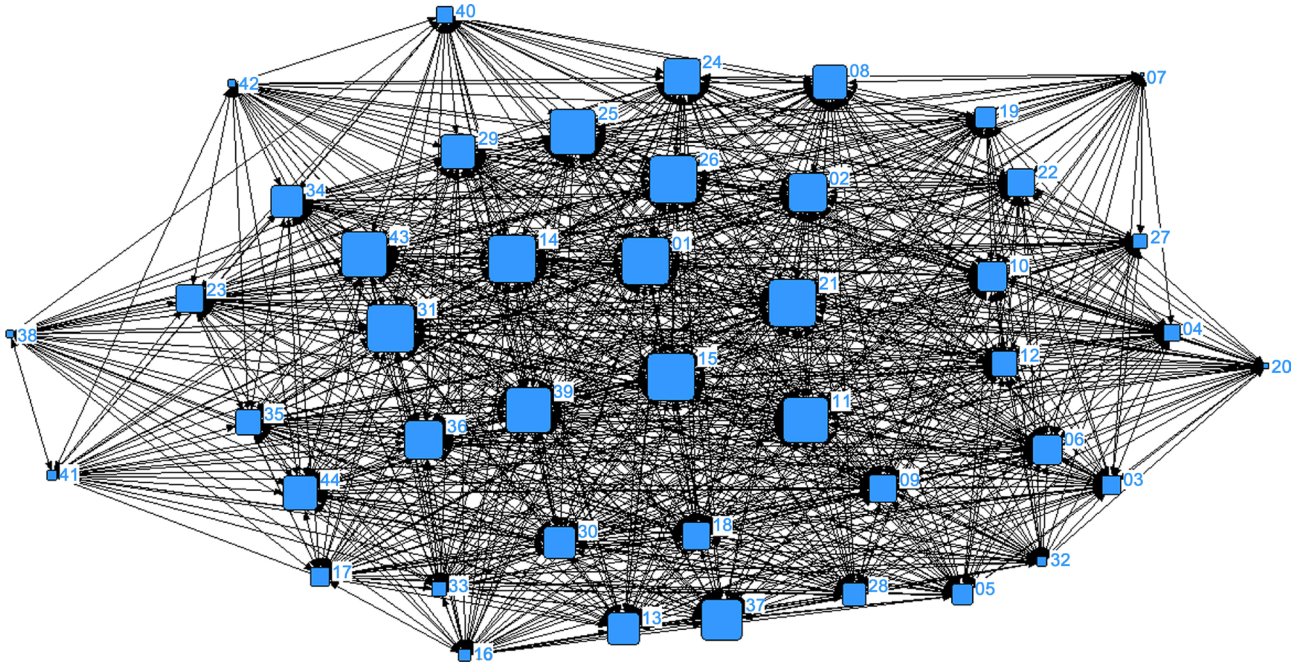

Figure 3. Central visual analysis sociogram of QQ.

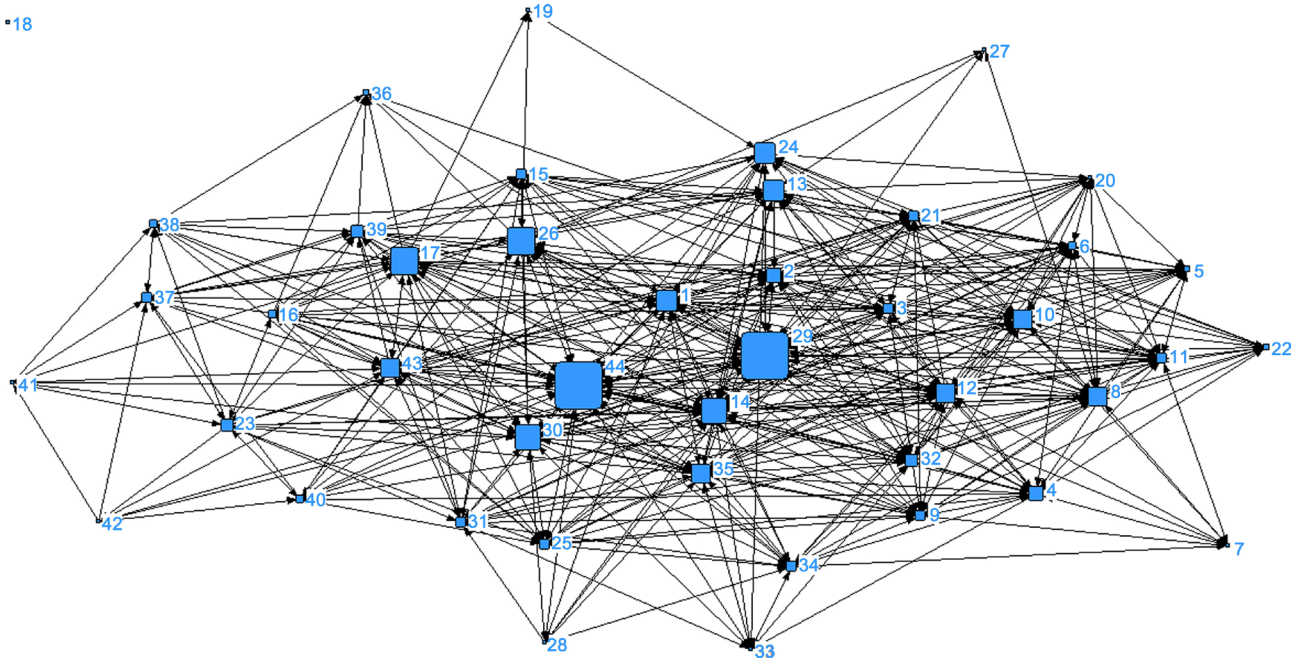

Figure 4. Central visual analysis sociogram of Wechat.

study constitute a node set. If every two students are friends of each other, there is a link that represents their relations. The node 18 of **Figure 2** is an acnode because it doesn't use WeChat. The nodes 1, 21, 15, 14 of **Figure 3** are the intermediary nodes of human network (that is the nodes in the middle of the human network), The nodes 44, 29 of **Figure 4** are the intermediary nodes.

3.2.2. Human Network Density

Network density is the most common social network analysis indicator, which

reflects the close degree of associations between points [11]. Using the function "network-cohesion-density" in the Ucinet can calculate the network density of QQ and WeChat. The results are shown in Table 3.

In the social network, the greater of the network density, the closer connection of the network members, the higher frequency of interactions between members, and it is more conducive to disseminate and share the knowledge. The greater of the whole network density, the greater the impact on member internal behavior, attitudes, and it can obtain better teamwork. Coleman thought that the higher the degree of interaction between members, which leaded to a more positive impact on the group operation [14].

Table 3 shows that the average of QQ human network density is 0.8578 which is greater than 0.5. It illustrates that the relation among the members is closer, and the communication is more interactive. The compat human network can effectively push and disseminate the accurate information. The average density of WeChat is 0.3552 and the network density is low. It shows that the connection of human network members in WeChat is not close enough and the communication or the interaction is weak. The whole human network has less influence on the inner behaviors and attitudes of members.

3.2.3. Human Network Accessibility

The function "network-cohesion-distance" in Ucinet can analyze the network accessibility, which can verify whether the network is a small world or not [15]. The small-world effect has an important significance of researching the convenience among members in human network and the speed of information flow [15]. The results are shown in the following table.

Table 4 shows that the average distance among human network nodes of QQ, which is 1.142 and that of WeChat is 1.652. The average distances of the two networks are less than 2, which means every two nodes can connect with each other within two students. The fast spreading has a significant small world effect and it also shows that the information exchanging among members of the network quickly and fluently.

Table 4 also shows that cohesiveness index of based on distance of QQ is 0.929 and that of WeChat is 0.639. The greater cohesion index means the stronger cohesion of members in the network [15]. The higher cohesion indexes of the

Table 3. The human network density of QQ and WeChat.

	QQ	WeChat
Network Density	0.8578	0.3552
Standard Deviation	0.3492	0.4786

Table 4. The average distance among human network nodes of QQ and WeChat.

	QQ	WeChat
Average Distance among Nodes	1.142	1.652
Cohesiveness Index	0.929	0.639

two human networks indicate the better cohesion among the human network members, which promote the information dissemination and sharing among human network members, and it also promotes the accurate information pushing in. human network.

3.3. Human Network Centricity

Centricity is one of the important contents of social network analysis, and it is an important index of measuring rights or central position. The central position individual of social network has strong influence on others and owns a high social prestige. Degree centrality, closeness centrality and betweenness centrality are the three most common forms to describe the network centricity.

3.3.1. Degree Centrality

Degree centrality refers to the number of connections between some node and other nodes in the network [16]. It contains node indegree and node outdegree.

Node indegree is the degree to which one node is concerned by other nodes. Node outdegree is the degree to which one node pays attention to other nodes. The nodes with higher node indegree indicate that they are followed by other

	1 OutDegree	2 InDegree	3 NrmOutDeg	4 NrmInDeg
1 01	43.000	43.000	100.000	100.000
2 02	42.000	42.000	97.674	97.674
3 03	38.000	38.000	88.372	88.372
4 04	35.000	35.000	81.395	81.395
5 05	36.000	33.000	83.721	76.744
6 06	39.000	39.000	90.698	90.698
7 07	25.000	25.000	58.140	58.140
8 08	39.000	39.000	90.698	90.698
9 09	40.000	38.000	93.023	88.372
10 10	38.000	40.000	88.372	93.023
11 11	42.000	42.000	97.674	97.674
12 12	37.000	39.000	86.047	90.698
13 13	40.000	40.000	93.023	93.023
14 14	43.000	43.000	100.000	100.000
15 15	43.000	43.000	100.000	100.000
16 16	29.000	33.000	67.442	76.744
17 17	37.000	34.000	86.047	79.070
18 18	40.000	40.000	93.023	93.023
19 19	35.000	36.000	81.395	83.721
20 20	29.000	29.000	67.442	67.442
21 21	43.000	43.000	100.000	100.000
22 22	26.000	37.000	60.465	86.047
23 23	37.000	37.000	86.047	86.047
24 24	40.000	40.000	93.023	93.023
25 25	41.000	39.000	95.349	90.698
26 26	43.000	43.000	100.000	100.000
27 27	35.000	34.000	81.395	79.070
28 28	38.000	38.000	88.372	88.372
29 29	41.000	39.000	95.349	90.698
30 30	40.000	38.000	93.023	88.372
31 31	43.000	43.000	100.000	100.000
32 32	36.000	36.000	83.721	83.721
33 33	36.000	36.000	83.721	83.721
34 34	27.000	38.000	62.791	88.372
35 35	35.000	36.000	81.395	83.721
36 36	42.000	39.000	97.674	90.698
37 37	40.000	36.000	93.023	83.721
38 38	25.000	24.000	58.140	55.814
39 39	42.000	41.000	97.674	95.349
40 40	28.000	28.000	65.116	65.116
41 41	26.000	26.000	60.465	60.465
42 42	27.000	26.000	62.791	60.465
43 43	42.000	37.000	97.674	86.047

Figure 5. Degree centrality of QQ human network.

		1 OutDegree	2 InDegree	3 NrmOutDeg	4 NrmInDeg
1	1	22.000	27.000	51.163	62.791
2	2	19.000	25.000	44.186	58.140
3	3	23.000	24.000	53.488	55.814
4	4	15.000	18.000	34.884	41.860
5	5	14.000	13.000	32.558	30.233
6	6	19.000	18.000	44.186	41.860
7	7	6.000	8.000	13.953	18.605
8	8	18.000	20.000	41.860	46.512
9	9	20.000	17.000	46.512	39.535
10	10	24.000	21.000	55.814	48.837
11	11	17.000	20.000	39.535	46.512
12	12	25.000	23.000	58.140	53.488
13	13	20.000	20.000	46.512	46.512
14	14	29.000	23.000	67.442	53.488
15	15	9.000	17.000	20.930	39.535
16	16	16.000	14.000	37.209	32.558
17	17	22.000	15.000	51.163	34.884
18	18	0.000	0.000	0.000	0.000
19	19	2.000	2.000	4.651	4.651
20	20	15.000	13.000	34.884	30.233
21	21	16.000	17.000	37.209	39.535
22	22	6.000	11.000	13.953	25.581
23	23	13.000	11.000	30.233	25.581
24	24	17.000	12.000	39.535	27.907
25	25	14.000	15.000	32.558	34.884
26	26	17.000	14.000	39.535	32.558
27	27	4.000	3.000	9.302	6.977
28	28	8.000	6.000	18.605	13.953
29	29	29.000	22.000	67.442	51.163
30	30	27.000	24.000	62.791	55.814
31	31	13.000	17.000	30.233	39.535
32	32	22.000	22.000	51.163	51.163
33	33	6.000	9.000	13.953	20.930
34	34	17.000	15.000	39.535	34.884
35	35	21.000	20.000	48.837	46.512
36	36	0.000	7.000	0.000	16.279
37	37	11.000	13.000	25.581	30.233
38	38	9.000	9.000	20.930	20.930
39	39	14.000	13.000	32.558	30.233
40	40	12.000	10.000	27.907	23.256
41	41	6.000	6.000	13.953	13.953
42	42	6.000	5.000	13.953	11.628
43	43	17.000	21.000	39.535	48.837

Figure 6. Degree centrality of WeChat human network.

nodes. The nodes with higher node outdegree indicate that they should pay attention to other nodes. One node with higher node indegree and node outdegree menas that it is located in the center of the human network and they have more power and greate impacts on the small groups of information dissemination and exchanging [17]. As shown in **Figure 5** & **Figure 6**, the nodes with higher node indegree and outdegree of QQ human network are 1, 14, 15, 21, 26, and 31. These nodes are in the core position of the QQ human network. The nodes with higher node indegree of WeChat human network are 44, 1, 2, 3, 30, 14, and the nodes with higher node outdegree of WeChat human network are 44, 14, 30, 29, 12, and 10. So the nodes of 44, 30, and 14 are in the core position of the WeChat human network.

3.3.2. Betweenness Centrality

Betweenness centrality refers to the times of a node lying on the shortest path of any other two nodes [18]. Other nodes communicate with each other must depend on these nodes. The nodes with higher betweenness centrality mastering rich resources can control or distort the transmission of the netwok information. These nodes play a very important role in the exchange of information. The indicator can describe the degree of the nodes with higher betweenness centrality

in the network controls other nodes in the process of information exchanging [15].

As shown in **Figure 7** & **Figure 8**, the nodes with higher betweenness centrality of QQ human network are 1, 14, 15, 21, 26, 31 and that of WeChat human network are 44, 29, 30. This means that other nodes of the human network are dependent on these core nodes in the process of communication [15] and these nodes can control the flow of information to a large extent.

The network centralization index of QQ is 0.28% and that of WeChat is 7.21%. The lower value indicates that the most nodes in the network can get information without other nodes as an intermediary [17].

3.3.3. Closeness Centrality

Closeness centrality is different to the degree centrality and betweenness centrality. It refers to the extent of the node not controlled by other nodes. The smaller value illustrates that the node is in the core position of the human network, and it is not easily controlled by other nodes on the process of information dissemination [16]. Otherwise, the bigger value illustrates that the node is on the edge of the human network, and it is easier controlled by other nodes on the process of

		1 Betweenness	2 nBetweenness
1	01	11.013	0.610
26	26	11.013	0.610
14	14	11.013	0.610
15	15	11.013	0.610
21	21	11.013	0.610
31	31	11.013	0.610
11	11	10.092	0.559
39	39	9.959	0.551
2	02	9.430	0.522
25	25	8.949	0.496
24	24	8.719	0.483
36	36	7.981	0.442
8	08	7.867	0.436
13	13	7.763	0.430
6	06	7.343	0.407
29	29	7.216	0.400
23	23	7.154	0.396
43	43	7.111	0.394
37	37	7.064	0.391
44	44	6.862	0.380
18	18	6.633	0.367
10	10	6.616	0.366
30	30	6.469	0.358
9	09	5.979	0.331
12	12	5.338	0.296
28	28	5.261	0.291
19	19	5.101	0.282
35	35	4.482	0.248
3	03	4.387	0.243
4	04	4.201	0.233
5	05	4.160	0.230
34	34	3.637	0.201
33	33	3.447	0.191
17	17	3.365	0.186
27	27	3.357	0.186
32	32	3.209	0.178
22	22	2.795	0.155
41	41	2.111	0.117
40	40	2.068	0.115
16	16	1.884	0.104
42	42	1.776	0.098
20	20	1.289	0.071
38	38	1.006	0.056
7	07	0.845	0.047

Network Centralization Index = 0.28%

Figure 7. Betweenness centrality of QQ.

		1 Betweenness	2 nBetweenness
44	44	153.429	8.496
29	29	104.885	5.808
30	30	69.357	3.840
26	26	62.423	3.456
1	1	57.853	3.203
14	14	47.231	2.615
10	10	45.589	2.524
17	17	45.534	2.521
12	12	43.843	2.428
43	43	41.897	2.320
8	8	41.272	2.285
13	13	40.683	2.253
24	24	31.968	1.770
32	32	30.023	1.662
35	35	29.736	1.646
3	3	27.363	1.515
2	2	24.558	1.360
4	4	21.995	1.218
9	9	21.959	1.216
34	34	19.755	1.094
11	11	18.502	1.024
25	25	16.700	0.925
21	21	15.789	0.874
37	37	15.771	0.873
23	23	15.192	0.841
16	16	14.201	0.786
6	6	14.124	0.782
31	31	14.041	0.777
40	40	13.962	0.773
39	39	12.965	0.718
15	15	11.947	0.662
38	38	6.789	0.376
5	5	4.815	0.267
20	20	4.321	0.239
22	22	3.179	0.176
42	42	1.575	0.087
41	41	1.452	0.080
33	33	1.127	0.062
27	27	0.735	0.041
7	7	0.584	0.032
28	28	0.572	0.032
19	19	0.305	0.017
36	36	0.000	0.000
18	18	0.000	0.000

Network Centralization Index = 7.21%

Figure 8. Betweenness centrality of WeChat.

information dissemination [16].

From **Figure 9** & **Figure 10**, it shows that the nodes 1, 14, 15, 21, 26, 31 are not easier controlled by other nodes in QQ human network on the process of information dissemination and that in WeChat are the nodes 36, 44, 1, 2.These nodes are in the core position of the human network.

Degree centrality shows that the nodes 1, 14, 15, 21, 26 are in the absolute core position of QQ human network. Betweenness centrality shows that the ability of the five nodes controlling other nodes is strong and Closeness centrality shows that the five nodes are difficultly controlled by other nodes. The five nodes grasp the information dissemination and communication of the whole network. The network information can be accurately pushed through them.

Degree centrality shows that the nodes 44, 30, 14 are in the absolute core position of WeChat human network. Betweenness centrality shows that the ability of the nodes 44, 29, 30, controlling other nodes are strong and Closeness centrality shows that the nodes 36, 44, 1, are difficultly be controlled by other nodes. The node 44 grasps the information dissemination and communication of the whole network. The network information can be accurately pushed through it.

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
1	01	43.000	43.000	100.000	100.000
26	26	43.000	43.000	100.000	100.000
14	14	43.000	43.000	100.000	100.000
15	15	43.000	43.000	100.000	100.000
21	21	43.000	43.000	100.000	100.000
31	31	43.000	43.000	100.000	100.000
2	02	44.000	44.000	97.727	97.727
11	11	44.000	44.000	97.727	97.727
39	39	45.000	44.000	95.556	97.727
13	13	46.000	46.000	93.478	93.478
18	18	46.000	46.000	93.478	93.478
24	24	46.000	46.000	93.478	93.478
10	10	46.000	48.000	93.478	89.583
8	08	47.000	47.000	91.489	91.489
36	36	47.000	44.000	91.489	97.727
12	12	47.000	49.000	91.489	87.755
6	06	47.000	47.000	91.489	91.489
29	29	47.000	45.000	91.489	95.556
25	25	47.000	45.000	91.489	95.556
9	09	48.000	46.000	89.583	93.478
3	03	48.000	48.000	89.583	89.583
44	44	48.000	46.000	89.583	93.478
34	34	48.000	59.000	89.583	72.881
30	30	48.000	46.000	89.583	93.478
28	28	48.000	48.000	89.583	89.583
43	43	49.000	44.000	87.755	97.727
23	23	49.000	49.000	87.755	87.755
22	22	49.000	60.000	87.755	71.667
37	37	50.000	46.000	86.000	93.478
35	35	50.000	51.000	86.000	84.314
19	19	50.000	51.000	86.000	84.314
33	33	50.000	50.000	86.000	86.000
32	32	50.000	50.000	86.000	86.000
4	04	51.000	51.000	84.314	84.314
27	27	52.000	51.000	82.692	84.314
17	17	52.000	49.000	82.692	87.755
16	16	53.000	57.000	81.132	75.439
5	05	53.000	50.000	81.132	86.000
20	20	57.000	57.000	75.439	75.439
40	40	58.000	58.000	74.138	74.138
41	41	60.000	60.000	71.667	71.667
42	42	60.000	59.000	71.667	72.881
7	07	61.000	61.000	70.492	70.492
38	38	62.000	61.000	69.355	70.492

Figure 9. Closeness centrality of QQ.

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
36	36	123.000	1892.000	34.959	2.273
44	44	138.000	96.000	31.159	44.792
1	1	143.000	106.000	30.070	40.566
2	2	145.000	109.000	29.655	39.450
3	3	146.000	105.000	29.452	40.952
30	30	146.000	101.000	29.452	42.574
14	14	147.000	99.000	29.252	43.434
12	12	147.000	103.000	29.252	41.748
32	32	148.000	106.000	29.054	40.566
29	29	148.000	99.000	29.054	43.434
10	10	149.000	105.000	28.859	40.952
8	8	150.000	111.000	28.667	38.739
11	11	150.000	112.000	28.667	38.393
43	43	150.000	111.000	28.667	38.739
13	13	151.000	109.000	28.477	39.450
35	35	151.000	107.000	28.477	40.187
4	4	152.000	116.000	28.289	37.069
21	21	153.000	113.000	28.105	38.053
31	31	153.000	115.000	28.105	37.391
9	9	153.000	108.000	28.105	39.815
6	6	154.000	110.000	27.922	39.091
15	15	154.000	121.000	27.922	35.537
34	34	155.000	111.000	27.742	38.739
26	26	156.000	111.000	27.564	38.739
25	25	156.000	116.000	27.564	37.069
16	16	157.000	112.000	27.389	38.393
17	17	157.000	106.000	27.389	40.566
37	37	157.000	119.000	27.389	36.134
20	20	157.000	114.000	27.389	37.719
5	5	158.000	115.000	27.215	37.391
39	39	159.000	114.000	27.044	37.719
24	24	159.000	111.000	27.044	38.739
40	40	160.000	116.000	26.875	37.069
22	22	160.000	125.000	26.875	34.400
23	23	162.000	115.000	26.543	37.391
33	33	162.000	125.000	26.543	34.400
38	38	163.000	121.000	26.380	35.537
7	7	165.000	131.000	26.061	32.824
28	28	166.000	121.000	25.904	35.537
42	42	167.000	123.000	25.749	34.959
41	41	168.000	127.000	25.595	33.858
27	27	176.000	129.000	24.432	33.333
19	19	183.000	138.000	23.497	31.159

Figure 10. Closeness centrality of WeChat.

Table 5. The three Centralities of QQ Human Network (Top 6).

Degree Centrality	Betweenness Centrality	Closeness Centrality
1	1	1
14	14	14
15	15	15
21	21	21
26	26	26
31	31	31

Table 6. The three Centralities of WeChat Human Network (Top 3).

Degree Centrality	Betweenness Centrality	Closeness Centrality
44	44	36
30	29	44
14	30	1

3.4. Block Model Analysis Based on CONCOR

Block model method can partition each point based on structural information and simplify the information. Block model method can classify the nodes using structural equivalence [19]. The function "Network-Role-Structure-CONCOR" in the Ucinet can calculate the number of subgroups in the "buddy relationship". The results are shown below.

From **Figure 11** & **Figure 12**, the QQ human network is devided into 7 "buddy relationship" subgroups, and the WeChat is divided into 5. The tree diagram can express the members of each subgroup and their internal network structure. Each subgroup constitutes a small group and the inner members of the group are closely linked. There is no association between groups. By excavating the common concerning information of each group, it can push the accurate information and share the information frequently, which can also improve the accuracy and efficiency of the information pushing.

4. Results

4.1. Analysis of the Whole Human Network

By constructing the human network sociogram, it can get the high impact nodes of the human network, which can be the opinion leaders because of the great ability to acquire the information resource. By analyzing the network density it can conclude that the members of QQ human network are communicating closely. The frequency of interaction among members of the network is high, which facilitates the dissemination and sharing the knowledge among members. But the WeChat is less tightly linked. Through analyzing the human network accessibility, it shows that the two human networks have a small world phenomenon, and the network has strong internal cohesion. By analyzing the network and its internal member nodes, it can push the precise information and improve

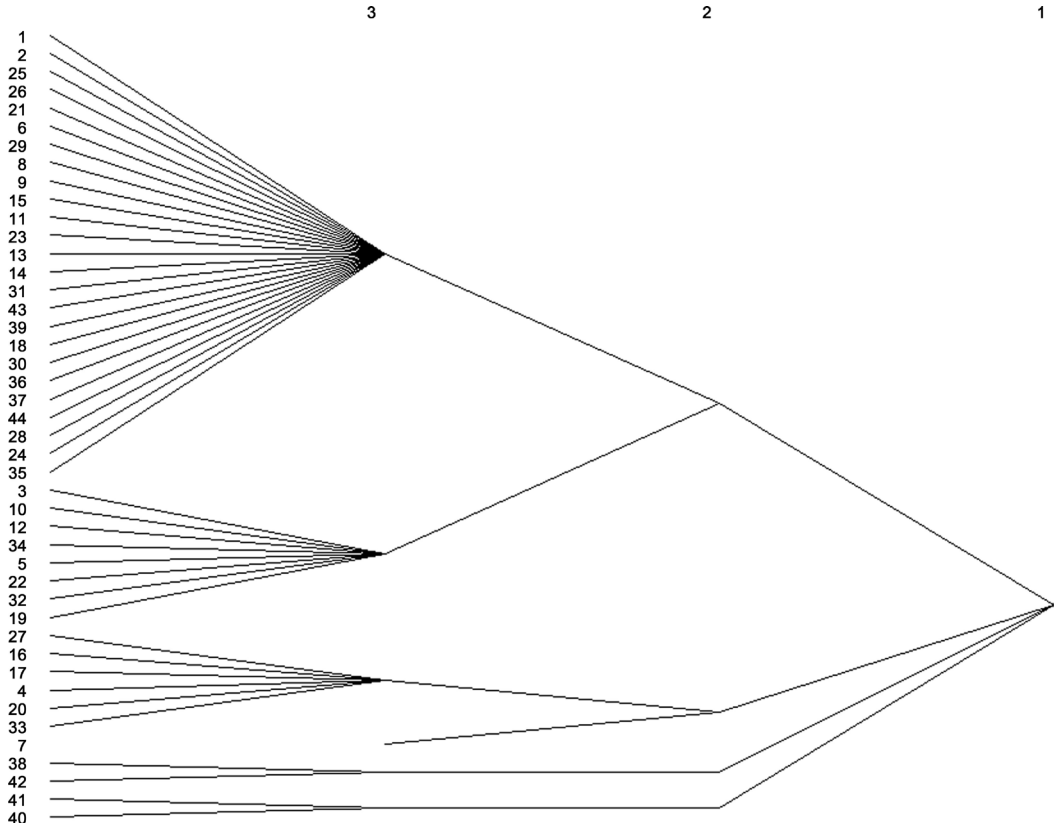

Figure 11. Block model analysis of QQ.

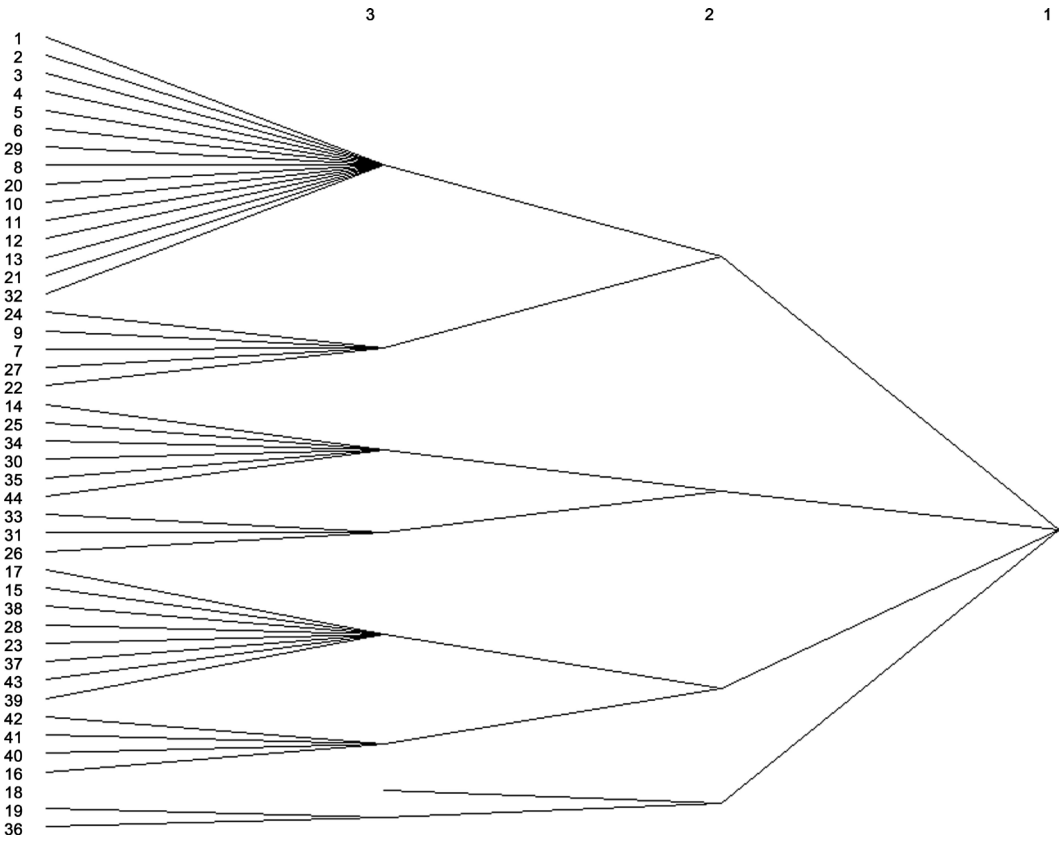

Figure 12. Block model analysis of WeChat.

the frequency of interaction among network members.

4.2. Analysis of Human Network Centricity

Analyzing the degree centrality can get the central nodes of the human network, which have great power in the process of information transmission and great influence on the communication between the members of the human network [17]. The betweenness centrality can get the nodes located in many communication networks. This kind of nodes can describe the degree of controlling other members during the process of information exchanging [15]. Analyzing the closeness centrality can get the nodes which not easily controlled by other nodes of human network [16].

By analyzing the nodes 1, 14, 15, 21, 26, 31 of QQ human network and the node 44 of WeChat, it can find that these nodes occupy the most important position in the entire interpersonal network and master the trends of information dissemination and communication. It can improve the accuracy of information transmission of the whole network.

4.3. Analysis of Block Model

The analysis of block model can caculate the number of interpersonal subgroups and the closeness degree within the group members. Mining the common concerned information of each group can improve the accuracy and efficiency of information pushing.

5. Conclusion

This paper analyzes the whole human network, human network centricity and block model of the QQ human network and WeChat human network. It analyzes the characteristics of the human network from multiple measurement dimensions. By analyzing the whole human network, it can obtain the higher impact nodes, opinion leaders and it finds that the two human networks emerge the small word phenomenon. These nodes can push the precise information and improve the frequency of interaction among network members. By analyzing the human network centricity, it obtains the central nodes. These nodes occupy the most important position in the entire interpersonal network. They master the trends of information dissemination and communication. They can improve the accuracy of information transmission of the whole network. By analyzing the block model, it can obtain the subgroups of human network and the closeness degree within the group members. It can improve the efficiency of information pushing, and frequency of information sharing through each subgroup. We hope to provide a new direction for the research of human network precise information pushing.

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