

The Sentiment Trend Analysis of Twitter Based on Set Pair Contact Degree

Chunying Zhang¹, Jing Wang²

¹ College of Science, Hebei United University
Hebei, Tangshan, China

² College of Science, Hebei United University
Hebei, Tangshan, China

Abstract

Sentiment trend of twitter users have a great influence on their friends and the crowd listened. This paper directs at the user sentiment state of twitter, the unique medium, and applies set pair analysis method for trend analysis. First, we begin with set pair contact degree, then based on set pair affective computing model to make comparison with the size relationship of same degree, difference degree, opposition degree of the emotion, to build the user sentiment trend analysis model; Secondly, we analyze the influence for the user's own sentiment trend when the value changed of difference coefficient i ; thirdly, after analyze to obtain one user's sentiment orientation threshold as prerequisite for user behavior prediction. Finally, setting an example to calculate the sentiment trend of one twitter, then to get the conclusion is that the analysis of user emotion from a three-dimensional angle is more realistic than the single angle.

Keywords: *Twitter information, sentiment trend analysis, twitter form, contact degree, sentiment orientation threshold.*

1. Introduction

Accompanied by the Web2.0 era, the network became an important carrier for the users to reflect the social public opinion; more and more people choose twitter and Tencent QQ to express their views and opinions for some certain events. The twitter is of wide dissemination range has become one timely communication tool and be concerned with the characteristic of its brief and pithy. Twitter has opened multiple API enables a large number of users to instantly update their personal information by phone, network. Nowadays, the form of twitter has become more diverse, for example, the ordinary text, the new network word, emoticon, picture information, link and so on. Based on the twitter platform to study has become the first choice for most scholars, because of twitter information is of the convenience, timeliness, and multi-style. Therefore, as the research field rise in recent years^[1-3], affective

computing^[4] also chose this platform to study. For example, the work [5] is based on affective computing to study the detection method for twitter incident, to find a method to detect unexpected events; work [6] makes sentiment analysis on hot events for twitter to achieve sentiment trend analysis for hot events. The Chinese twitter topic extraction algorithm of the user's interest topic for the massive twitter information has achieved the prototype system-BTopicMiner of Chinese twitter topic mining^[7]. Thereinto, the foreign scholar Kim^[8] divided views expression into four semantic components: theme, expresser, representation and emotion. The process of sentiment analysis automatically determines the relationship among the natural language text which reflected the specific view and evaluation for the things in the text. Affective computing is the basis of text orientation analysis^[9-10], and makes sentiment analysis and mining for text in essence; the goal of sentiment analysis is to identify the subjective sentences in the text, making judgment for its sentiment trend, utilizing the existing sentiment analysis^[11-12] theory to make judgment for twitter users sentiment orientation, providing the data support for user behavior prediction is particularly important. Therefore, in consideration of the above analysis, this paper based on twitter platform for user to conduct affective computing and make trend forecast, by the data form to achieve the better purpose for predictive analysis. First of all, the first part from different levels to introduce the form and content of the twitter, And from the different effect of expression to classify the twitter form, positive emotions, uncertainties emotion, negative emotion. in the third part, according to the set pair sentiment level model that the author has proposed to calculate the sentiment state polarity of the users, Finally, based on the data, beginning with the size of the same degree, difference degree, opposition degree a, b, c in contact degree theory to obtain the trend analysis table of

I level(support), II level(neutral), III level(opposition),
Under the influence of the size relation between a, b, c to give which attitude is the main trend in the trend analysis table, Part IV calculates an instance twitter to forecast the results of trend analysis, and make a detail analysis on uncertain sentiment coefficient take the different value, the sentiment changes of the users showed. Then make the detailed description for each part, as follows.

1. The introduction of twitter form

Along with the development of the Internet era, the twitter form has also changed. Nowadays, the twitter form has five parts: Ordinary text, the new network word, emoticon, picture, and link. The following figure is one twitter intercepted from QQ client which contains the above five parts.

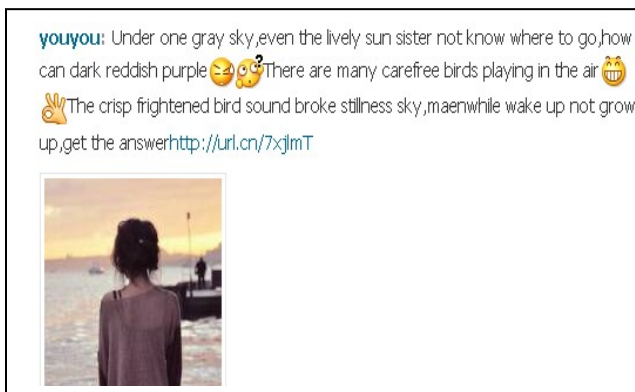


Fig. 1 An entry microblog.

1.1 The introduction of twitter text

With the constitute form of twitter constantly enrich, the type of text information has become diverse, from the initial form of ordinary text to the emergence of new network word text. work [13] construct the polarity dictionary to have sentiment analysis for the existing problems of the prior sentiment dictionary, including: a basic dictionary, the domain dictionary, network word dictionary, and the polarity dictionary of modifying word dictionary, and gives the polar strength formula to get the emotion polarity of the text, also mentioned the relative degree size of some adverbs, but in this process do not discuss the polarity of a single word; work [14] gives the definition of twitter text and summed the content of twitter is extremely unique, not only has the characteristics of "short", "colloquial", "network", "icon" the network text has, also have significant dialogue characteristics in the first post and follow-up, for these characteristics to

analyze in the level of linguistic analysis and semantic analysis level, and make a research on the twitter text processing. In this article, starting with each sentiment vocabulary, then dividing into three categories: positive emotion vocabulary, negative sentiment vocabulary, uncertainty sentiment vocabulary.

As in Fig. 1, the text contains the new network words: dark reddish purple, porridge, drops, and me. The dark reddish purple means like this, the porridge means like. And they all belonging to the positive sentiment vocabulary; drop is yes; pair is me. In the calculation of this text, we will convert the new network word into ordinary word to analyze calculation.

1.2 The introduction of twitter text

On September 19, 1982, the Scott - Fireman Professor of American Carnegie - Mellon University inputted such a string of ASCII characters: "-:-)" in the electronic bulletin board for the first time. The first computer smiley was born in the history of mankind. Since then, the network emoticons are popular on the Internet world, and widely accepted in society. The new vocabulary to describe these emoticons in the English language in the late 20th century, that is skillfully merge emotion and icon to become the new word "Emoticon". The appearance of emoticons can express more for twitter user's sentiment state at the time in graphical, from the initial simple sentiment symbol to the animation style, during the crawl process, such emoticons will shows the different meanings of this expression in the form of the text, Through the integration of emoticons can get the expression of a complete language, for example:

< (- ^ -)> means angry, I'm angry!! Knock it off me, you know?

Foreign scholar Jonathon Read utilized the Twitter API to obtain a large number of emoticons, and then pointed out smile as the active text and frown as the negative text, so as to achieve the emotion classification in work [15], this paper will divide emoticons into three categories: positive sentiment symbol, negative sentiment symbol and uncertain sentiment symbol. We take into account the sentiment polarity expressed by some sentiment symbol is not all certain, for example, 🙄 carried with the text message as a "pinched face", for this type of emoticons polarity is not obvious, setting them as uncertain sentiment emoticon in the actual analysis. That is, the attitude of author is to remain neutral, in other words, these emoticon can be converted into support or oppose which due to some certain factors. In Fig. 1, for example 🙌 the text of it is OK; it can be classified into the positive emoticon that represents an willingness to agree; emoticons ☹️ from the appearance point of view is a sweating state, combined with the text meaning

represents a negative sentiment emoticon, integrating with text interpretation of the symbol itself is judged as one negative sentiment emoticon.

1.3 The introduction of twitter picture information

The constitute of twitter in addition to ordinary text, new network words, emoticons also have some pictures, and the picture attached after the 140 word bear the role of transmitting the information to express emotions and the beauty^[16], sometimes even these pictures convey richer information than the text, and also can be used as an annotation of text content. In “7·23”Yongwen line major railway accident, the "grassroots" photographer push the twitter picture onto the stage again. This incident highlights the widely used of twitter picture in news dissemination. The work states that the coexistence formats of the picture is professional and grassroots in future, and the trend of the hot network picture is faster and faster, more and more, it has entered the fast food era of picture [17]. This shows that the twitter picture has occupied a very important position in the information expression. As a result, it is very important for the picture analysis. According to the sentiment orientation of the picture content, dividing the pictures into three categories: positive emotion picture information, negative sentiment picture information, uncertainty sentiment picture information.

1.4 The introduction of twitter link

The link also known as the hyperlink, the hyperlink is the connection relation of one page point to an object, and used as object hyperlink in a Web page, it maybe a piece of text, an image or an emoticon. When viewers click the link, the target of the link will be displayed in the browser, and depending on the type of target to open or run. There are some articles has mentioned the link as a new form of twitter in our vision among the existing twitter content analysis, This paper regards the link as one twitter form to detailed analyze, According to polarity of the object of twitter link, dividing into positive sentiment link, negative sentiment link, uncertainties sentiment link.

With the brief introduction above four parts of twitter content, next, this paper utilizes the contact number for users' sentiment attitude to expand trend analysis.

2. The contact number and trend

2.1 The contact number theory

The contact number^[18] was first proposed by Professor Zhao Keqin in 1989, it is the mathematical analysis tool of

set pair analysis, which is based on the set pair and the contact degree as the basic concept, depicting and studying one analysis techniques of the certainty, uncertainty and its conversion rule of widely exiting in systems^[19-20]. The key thought is: the certain relations and uncertain relations of any system is a unity of opposite body, known as the “certain- uncertain systems”. Contact number puts same degree, difference degree, and opposition degree of the research object and given reference set into one mathematical expression, its general form is:

$$U = A + Bi + Cj \quad (1)$$

Thereinto A 、 B 、 C are non-negative real number, $j = -1, i \in [-1,1]$ depending on the situation to have value in the range, commanding $N = A + B + C$, N is the contact norm, let N divided the two sides of formulas (1), then taking

$$u = \frac{U}{N}, a = \frac{A}{N}, b = \frac{B}{N}, c = \frac{C}{N} \quad (2)$$

So

$$u = a + bi + cj \quad (3)$$

Therefore, the formulas (3) is Called the contact number expression, a is the same degree, b is the difference degree, c is the confrontation degree, i is the difference coefficient, j is the confrontation coefficient. Therefore, putting positive, negative, uncertain together to estimate the state and trend of the object being studied.

2.2 The trend posture

The trend^[21] is the concept that reflecting the size relations order of the same degree (a), the difference degree (b), the confrontation degree (c), and can be divided into the same potential, the balance potential and the anti-potential. In addition, each potential can also be subdivided by the degree of size. In contact degree $u = a + bi + cj$, if $a/c > 1$, that is $a > c$ called the same potential, if $a/c = 1$, that is $a = c$ called the balance potential, if $a/c < 1$, that is $a < c$ called the anti-potential.

In view of this, for twitter form to conduct trend analysis based on contact number, thereby obtaining the orientation threshold of user sentiment state.

3. The sentiment trend and analysis of twitter

3.1 The set pair affective computing model

First, this part gives the set pair sentiment computing model that proposed by the authors in the study of sentiment orientation threshold.

$$\begin{aligned}
 A &= \alpha A_1 + \beta A_2 + \gamma A_3 \\
 &= \alpha(a_1 + b_1i + c_1j) + \beta(a_2 + b_2i + c_2j) + \lambda(a_3 + b_3i + c_3j) \\
 &= (\alpha a_1 + \beta a_2 + \lambda a_3) + (\alpha b_1 + \beta b_2 + \lambda b_3)i + (\alpha c_1 + \beta c_2 + \lambda c_3)j \quad (4)
 \end{aligned}$$

On this basis, utilizing the contact degree to conduct sentiment trend analysis for the single twitter, in this process can get one detailed explanation of the user' attitude.

3.2 The sentiment trend analysis

The main purpose of twitter text analysis [22] is to dig out attitude and their sentiment polarity of the user. The significance of mining not only can identify the potential users of online shopping to help businesses make decisions; but also make predictions on some of the major decisions of the election for the relevant departments to offer data support. Therefore, after the judgment of the polarity of the twitter constitutes form, at the end, we give the sentiment orientation of the users utilizing the set pair trend table.

In actual emotion analysis , Each vocabulary is not the same degree of sentiment orientation, For example, positive affect vocabulary , In the theory of basic emotions , Human emotion is divided into many basic types. Such as joy, sadness, anger, etc. To describe sad can use disappointment, regret, sadness, grief even despair with a variety of different strength level, Similar, joy can also be described by pleasant, happy, joy as well as carnival. Thus need more than strength of sentiment words to describe each class of emotions. The degree of a person's sentiment is indistinguishable from the point of view of knowledge representation. Even more refined classification of each emotion will be similar results. Then leading sentiment orientation that something expressed will be different, So this is due to the system inherent uncertainty leads to uncertainty of the sentiment elements , In this article, we divided sentiment polarity into positive emotions, uncertain emotions, negative emotions, Inductive analysis of the polarity of the emotions expressed by the plain text, the new word, emoticons, pictures. Thus, single twitter user sentiment orientation Contact is defined as follows:

$$\begin{aligned}
 U &= A + BI + CJ \\
 &= (\alpha a_1 + \beta a_2 + \gamma a_3) + (\alpha b_1 + \beta b_2 + \gamma b_3)I + (\alpha c_1 + \beta c_2 + \gamma c_3)J \quad (5)
 \end{aligned}$$

In the above formula, indicates all the positive emotions of user twitter supportive, including positive sentiment vocabulary, positive emoticons, and positive sentiment pictures. Indicating that all uncertainty sentiment part of twitter neutral attitude, including uncertainty sentiment vocabulary, uncertain emoticons signal and uncertain sentiment pictures. It indicates negative sentiment part of user twitter opposed. Including the negative sentiment vocabulary, negative emotions, and

negative affective pictures. Integration by twitter constitutes different parts work together to analyze the attitudes of the orientation of users in twitter.

On Contact degrees analysis of the Relationship of A, B, C and I, J different values to analysis, Can be grading consider based on the size of the relationship between user attitude, According to the value of I , at the time of $I = -1$, Uncertainties B will be completely converted to C , thus we can accord the change of I to carried grasp on the sentiment tendencies relationship trend, we carry on trend analysis use the definition of the potential degree of personal sentiment orientation. The expression of potential as follows:

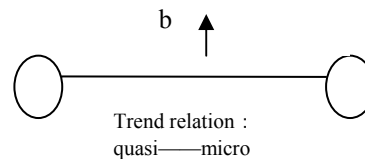
$$trend = A / C \quad (6)$$

We stipulated, if $A / C > 1$, then personal feelings tend to belong to a supportive attitude; if $A / C = 1$, then personal feelings tend to belong to a neutral attitude; if $A / C < 1$, then personal feelings tend to belong to the opposed attitude.

Therefore, according to the three cases of personal sentiment attitude, then we define three different relations level, such as: Level I (support), II level (neutral), III level (against), which shows the relationship trends change of the personal sentiment orientation, the incremental of relationship level which make the degree of user sentiment orientation changed, the trend of the sentiment orientation grading analysis, as shown in following table1:

Based on the above analysis, among the three factors of affecting user sentiment orientation, the strength relation of a, b, c will change due to the value of i changes in uncertain sentiment part, finally, leading to the trend of certain part of support, neutral, opposition that the users hold. Therefore, under the effect of uncertainty, the attitude of opposition and support that the users hold will be affected in some certain extent. Thus it can be seen; the uncertain affecting factors occupy a very important position in the entire relation metrics.

In sentiment trend analysis table, for the relation class I level, II level, IIIlevel respectively, with the growing of the uncertain factor b , the relation strength from quasi-relation to strong relation, weak relation and has been degraded to the micro-relation.



Property 1: The value of i takes two boundary values:

Table 1: The trend of sentiment orientation

Relation level	The size of A.B.C	Intension of relation	Meaning Description	Sentiment orientation threshold
level I (support)	$A > C, B = 0$	standard	determined trend of supporting	positive
	$A > C > B, B \neq 0$	strong	Mainly to the trend of supporting	
	$A > B > C$	weak	the trend of supporting is weak	
	$A > C, B > A$	tiny	the trend of supporting is very weak	
level II (neutral)	$A = C, B = 0$	standard	the trend of supporting and opposing head-to-head	neutral
	$A = C, A > B > 0$	strong	the trend of supporting and opposing are equal	
	$A = B = C$	weak	the trend of supporting and opposing are equal, but uncertain	
	$A = C, B > A$	tiny	the trend of supporting and opposing are equal, due to the uncertainty is very weak	
level III (against)	$A < C, B = 0$	standard	determined trend of opposing	Negative
	$A < C, A > B > 0$	strong	Mainly to the trend of opposing	
	$A < C, B > A$	weak	the trend of opposing is weak	
	$A < C < B$	tiny	due to the uncertainty the against trend is very weak	

When $i = -1$, uncertainties b will be fully converted to c , at this time, there is only exists the positive sentiment part and negative sentiment part (b and c) expressed as the quasi relation of the relation strength;

When $i = 1$, uncertainties b will be fully converted to a , at this time, there is only exists the positive sentiment part and negative sentiment part (b and a), expressed as the quasi relation of the relation strength;

Property 2: The value of i takes among the threshold range:

When $i \in [-1, 0)$, at this time, the uncertain sentiment expression tends to the negative emotion;

When $i \in [0, 1)$, at this time, the uncertain sentiment expression tends to the positive emotion;

When $i = 0$, at this time, there is only exists the positive sentiment part and negative sentiment part.

Thus it can be seen, the value i plays a decisive role in the analysis process of sentiment polarity.

The above table has given relation of a, b, c , we can get a certain kind of attitude the user hold and can be get the relation strength of this attitude from the table, and thus well divided into different sentiment orientation

threshold, to make the results more intuitive and clear. Next, by an instance to verify the effectiveness of the method.

4. Instance of verification

We set the Fig. 1 as an example to analyze and discuss the trend of user sentiment state, which is the twitter that contains the text, emoticons, picture and link. The vocabulary is divided into the general vocabulary and sentiment vocabulary, to summarize the sentiment vocabulary according to the number and the weight belongs to the class of such vocabulary, for the emoticons and pictures to summary are also based on the number and weight, The link is based on its specific expression and polarity of an object after clicks the link, making summarization on the basis of the number and weight. The specific data are indicated in following table2:

For the data and weight in table II to calculate, from the perspective of the effect of the expression to give the size relation of α, β, γ is $\beta = 0.4 > \gamma = 0.3 > \alpha = 0.2$, that is

Table 2: The summarization of vocabulary, emoticon and picture information

Polarity Weight Range	Positive			Uncertain			Negative		
	v	e	p	v	e	p	v	e	p
(0-0.2]	3	1		1					
(0.2-0.4]	1		2	3	1	1	3		
(0.4-0.6]	1	1						1	

(In the above table v= vocabulary, e= emoticons, p= picture information)

the effect of twitter is different, from the intuitive effect to analyze, the effect of emoticons expression is stronger than the picture, the picture is stronger than ordinary text. According to the formula (5) to get the size of a, b, c ,

$$a = \frac{14}{75}, b = \frac{31}{300}, c = \frac{2}{25}, \text{ that is } a > b > c, \text{ the sentiment contact degree is } u = \frac{14}{75} + \frac{31}{300}i + \frac{2}{25}j.$$

By the existing set pair affective computing model we can see the sentiment orientation of the user is positive, from the number of the form data in table II, we can obviously see that, among the form of three polarity orientation, the number of positive occupy majority, Which shows the user sentiment state is positive, that is the user for their own pleasure state; Combination with table one according to the trend analysis table, we can see the result of twitter analysis belongs to level I (support), that is the attitude of the twitter hold is support, it belongs to the positive sentiment orientation threshold. Making comparison with the size relation of a, b, c , the relation among them is weak relation, the trend of supporting is weak. By the further analyzing, that is the uncertain sentiment expression plays a regulatory role in this twitter. The specific analysis is as follows:

(1) When $i = -1$, at this moment, the uncertain sentiment portion is converted to a negative emotion sentiment portion, the expression of sentiment contact degree has converted to $u = \frac{14}{75} + (\frac{31}{300} + \frac{2}{25})j$. the relation is $a = \frac{56}{300} > (b+c) = \frac{55}{300}$, As can be seen from the data, at this time the positive and negative feelings is flat, that is, due to the change of the uncertain sentiment part, finally, making the positive emotion converts to neutral emotion.

(2) When $i = 0$, at this time, there is no uncertain sentiment in sentiment performance part, the expression of sentiment contact degree has converted to $u = \frac{14}{75} + \frac{2}{25}j$.

the relation is $a = \frac{56}{300} > c = \frac{24}{300}$, That is, at this time, there

is no uncertain emotion and the sentiment orientation of the user shows positive emotion.

(3) When $i = 1$, at this moment, the uncertain sentiment portion is converted to a positive emotion sentiment portion, the expression of sentiment contact

degree has converted to $u = (\frac{14}{75} + \frac{31}{300}) + \frac{2}{25}j$. the relation

$$\text{is } a+b = \frac{87}{300} > c = \frac{24}{300}, \text{ Comparing the calculated data}$$

with the original data, we can see that the degree of sentiment expression of positive emotions is more significant.

From the above analysis, for our subsequent judgment for sentiment polarity classification, about the uncertain emotion also should be taken into account, that is, when i takes different value, it will affect the uncertain emotion, and the relation strength of a, b, c will affect the trend of all the sentiment state.

5. Conclusion and the next step

First, this article introduces four form of twitter; Secondly, on the basis of the set pair affective computing model for trend analysis based on the contact degree. According to the size relation of same degree, difference degree and opposition degree to give the trend of user sentiment change in certain sentiment threshold. Finally, discussing the different value of i in the case, the user sentiment state will show the different sentiment orientation, it demonstrates that the uncertain sentiment occupy an important position in user's sentiment state analysis. In addition, this paper is based on one single twitter to discuss, to make analysis on the specific form, to give the sentiment polarity. The next step is based on the multiple twitter to analyze, considering the report, comments, and replies of users on the twitter will be affected by the users of social association, and analyzes the branch problem among the users' sentiment state of multiple twitter, including the discussion of the transition probability.

Acknowledgments

This paper is supported by Hebei province natural science fund. (F2012209019)

References

- [1] Johan Bollen, Huina Mao, Xiaojun, Zeng. Twitter mood predicts the stock market. *Journal of Computational Science*, Vol.2, 2011, pp.1-8.
- [2] L.Barbosa, J.Feng. "Robust Sentiment Detection on Twitter from Biased and Noisy Data". *COLING 2010*, pp.36-44.
- [3] Qiang YanLianren Wu, Lan Zheng. Social network based twitter user behavior analysis. *Physica A: Statistical Mechanics and its Applications*. 2012.
- [4] Pizard R W. *Perceptual Computing Technical Report. Affective Computing [R]*. Cambridge: MIT Media Lab, 1995.
- [5] Zhang Lumin, Jia Yan, Zhou Bin. Bursty event detection in twitter based on sentiment computing. *Netinfo Security*. Vol.8, 2012, pp.143-145.
- [6] Song Shuangyong, Li Qiudan, Lu Dongyuan. Hot event sentiment analysis method in microbolg. *Computer science*. Vol.39, No. (6A), 2012, pp.226-228,260.
- [7] Li Jin, Zhang Hua, Wu Haoxiong, Xiang Jun. BTopicMiner: domain-specific topic mining system for Chinese twitter. *Journal of Computer Applications*. Vol.32, No.8, 2012, pp.2346 – 2349.
- [8] Kim S M, Hovy E. Determining the Sentiment of Opinions [A]//*Proceedings of COLING-04[C]*.Geneva, Switzerland, 2004,pp.1367-1373.
- [9] Tian Shengli, Xiong Delan. Research on Emotion Attitude Orientation classification of Chinese Web Page Author. *Journal of Xinyang Normal University Natural Science Edition*. Vol.22, No.2, 2009, pp, 307-309.
- [10] Zhu Jian. Text sentiment analysis based on ensemble learning method. *Computer Engineering and Applications*. 2012.
- [11] Akshi Kumar, Teeja Mary Sebastian. Sentiment Analysis on Twitter. *IJCSI International Journal of Computer Science Issues*. Vol.9, No.3, 2012, pp, 372-378.
- [12] A.Agarwal, B.Xie, L.Vovsha, O.Rambow, R.Passonneau, "Sentiment Analysis of Twitter Data". In *Proceedings of the ACL2011 Workshop on Languages in Social Media*, 2011, pp.30-38.
- [13] Zhang Chenggong, Liu Peiyu, Zhu Zhenfang, Fang Ming. A sentiment analysis method based on a polarity lexicon. *Journal of Shandong University (Natural Science)*. Vol.47, No.3, 2010, pp. 47-50.
- [14] Zhang Jianfeng, Xia Yunqing, Yao Jianmin. A review towards microtext processing. *Journal of Chinese information processing*. Vol.26, No.4, 2012, pp.21-27.
- [15] Jonathon Read. Using emoticons to reduce dependency in machine learning techniques for sentiment classification[C]// *Proceedings of the ACL Student Research Workshop*. Association for Computational Linguistics, Morristown, NJ, 2005.
- [16] He Xi. The comparison analysis of spreading of microbolg and newspaper picture. *Business and culture*. Vol.5, 2012, pp.236-240.
- [17] Zhai Zhengxuan. The trend of picture format and the strategies of paper media in the twitter era. *Chinese journalist*. No.8, 2011, pp.119-120.
- [18] Zhao Keqin. Set pair analysis and its application. Hang Zhou: Zhejiang Science and Technology Press, Vol.13, No.47, 1994, pp.67-72.
- [19] Zhang, Chunying, Guo, Jingfeng, Liang, Ruitao, 2011, Set pair community situation analysis and dynamic mining algorithms of web social network, *ICIC Express Letters*, Vol.5, No.12, 2011, pp.4519-4524.
- [20] Zhang, Chunying, Liang, Ruitao, Liu, Lu, Wang, Jing, 2011, Set pair community mining and situation analysis based on web social network, 2011 International Conference on Advanced in Control Engineering and Information Science, CEIS 2011, 2011/8/18-2011/8/19, pp. 3456-3460, Dali, Yunnan, China(EI)
- [21] Zhao Surui. Evaluation of Situation Analysis Model and Application Based on the Connection Number. *Journal of Gansu Lianhe University (natural Sciences)*. Vol.21, No.6, 2007, pp.57-59.
- [22] Xing Xinyan. The motional analysis research based on sequence model. *Dalian University of Technology*. 2010.

Chunying Zhang is a PhD in computer application technology of Yanshan University, Master and Bachelor of computer science and technology. She is currently working as a university professor in department of computer science at Hebei United University, and also as the master tutor. She is the members of the experts working group of specialty instruction guidance Committee Sub-Committee of the ministry education college and computer science and technology, a member of the steering committee of computer teaching in Hebei Province; an executive director of the Machine Learning institute in Hebei Province, a director of computer educational research association in Hebei Province, an member of China Computer Federation and other society duties. Her major research directions are: social network analysis, intelligent information processing, and Web mining and other fields. In recent years, she has published more than 50 papers on important domestic, international journals and international conferences, and more than 30 articles are retrieved by the three retrieves.

Jing Wang is doing Master of Science in Applied mathematics from Hebei United University, she has done her bachelor in applied mathematics, and she is currently working in the field of social network analysis.