Social Network Rumor Diffusion Predication Based on Equal Responsibility Game Model

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ABSTRACT

Because billions of mobile phones build a bridge between mobile sensor networks and social networks, the content of a rumor is diffused faster than ever. Therefore, rumor diffusion becomes an important issue in those two networks and how to predicate rumor diffusion becomes more important in handling rumors when they cause a little impact at the beginning. However, the state-of-the-art diffusion models focus on the macroscopic group impact and ignore the microcosmic individual impact. Therefore, they are not suitable to perform the rumor diffusion predication in the condition of only one rumor spreader at the beginning stage of rumor diffusion. To solve that problem and predicate the rumor diffusion process, we propose a novel game theory-based model, called Equal Responsibility Rumor Diffusion Game Model (ERRDGM), to simulate the rumor diffusion process. In this model, we first depict the diffusion process as a game between the individuals and their neighbors who choose to retweet or not according to their diffusion game revenues; second, the players will share the responsibility of diffusing a rumor in calculating their game revenues; finally, when the game reaches the Nash equilibrium state, we build the rumor diffusion predication graph which indicates the diffusion scale and network structure of rumor diffusion in a social network. According to this idea, our ERRDGM model can capture the diffusion impact of microcosmic individuals and enable us to perform the rumor diffusion process when there are only a few rumor spreaders at the beginning stage of rumor diffusion. Our experiment results indicate that our ERRDGM model can give a more accurate rumor diffusion predication results not only from the diffusion scale but also from the social network structure.

keywords : Games, Diffusion processes, Game theory, Analytical models, Fans, Twitter

1. INTRODUCTION

In the current information society, billions of mobile phones were used to speed up the information diffusion. As one kind of sensors in sensor network, mobile phones not only build a huge sensor network which carries the information but also form a virtual social network. In Wikipedia [1], a social network is defined as a social structure made up of a set of social actors (such as individuals or organizations), sets of dyadic ties, and other social interactions between actors. Based on the complicated social network structure, rumors were diffused one by one through the social links in a social network. Peterson and Gist [2] defined a rumor as a tall tale of explanations of events circulating from person to person and pertaining to an object, event, or issue in public concern. In our research work, rumors were tagged by human that means all rumors were confirmed by authorities. Although authorities sometimes make mistakes and declare that a post is a rumor, we assume that all rumors are tagged correctly and authorities are trustable to simplify the condition of rumor analysis.

From the view of rumor diffusion, although the sensor network and the social network are different in network structure and function, they closely cooperate in rumor diffusion (the sensor network carries out the rumor content transmission and the social network performs the rumor semantic diffusion impact). Therefore, by using mobile phones, rumors are diffused faster than ever both in sensor networks and social networks and it becomes one of the serious problems in social media. Vosoughi *et al.* [3] found that the falsehood information diffused much farther, faster, deeper, and more broadly than any other truth information in Twitter. In their experiment, there are about 126,000 stories were spread by 3 million people from 2006 to 2017. Although authors had not proved whether rumors are diffused faster than breaking news in the experiment, they found that false news was more novel than true news and people were more likely to share novel information. The Soroush Vosoughi's conclusion indicates that rumor will challenge the current lagging rumor analysis methods and have a huge effect from virtual social network to real society. In 2015, the New Media Blue Book [4] released by the Chinese Academy of Social Science showed that 59% of rumors came from Weibo which is the largest Microblog in China (Figure 1).

Because of the open access and huge number of users, Weibo becomes a breeding ground of rumors in China.

To effectively handle rumors, the common rumor processing procedure includes two steps, rumor detection and rumor diffusion predication. Rumor diffusion predication is necessary because it is hard to tell the impact of a rumor in the rumor detection step. Through the rumor diffusion predication, we can obtain the information diffusion scale and structure which help us to find rumors with big influences in the future. However, the state-of-the-art diffusion models focus on the macroscopic group impact and ignore the microcosmic individual impact.

Therefore, they are not suitable to perform the rumor diffusion predication in the condition of only one rumor spreader at the beginning stage of rumor diffusion. Rumor diffusion is different from shocking news diffusion. Once a rumor has been recognized, users will focus on whether it is a rumor or not. In contrast, for a shocking news, users will focus on the topic and users' sentiments. In this way, most users will not diffuse a rumor, but they will diffuse a shocking news several times in different sentiment and subtopic. The diffusion process of users' focus is similar with a game process because most people will diffuse some posts which can improve their impacts in a social network. Therefore, in this paper, we try to model the rumor diffusion process as an individual game process and predicate the diffusion lattice, diffusion scale and diffusion network structure. To simplify the game model, we assume that there is no topic excursion problem which means that we ignore the diffusion content and its changes, we model a social individual behavior according to his/her revenue and risk which are calculated according to Equal Responsibility assumption in rumor diffusion.

2. EXISTING SYSTEM

In rumor diffusion feature analysis, many related features were studied and showed the essence of rumor diffusion. Arif *et al.* [16] studied the rumor dynamics from three complementary factors: volume, exposure and content production. This fused approach is able to find the relevance between message content and rumor diffusion process in social media during crisis event. Mendoza *et al.* [17] analyzed rumors in 2010 Chile earthquake. Their

results showed that the rumor diffusion differed from news diffusion because rumors tended to be questioned more than news by the Twitter community. Tripathy *et al.* [18] simulated two anti-rumor methods in Twitter social network and found that coupling the detection and anti-rumor strategy by embedding agents in the network was an effective way of fighting against rumor. Andrews *et al.* [19] studied the function of official accounts in correcting the rumor and slowing the rumor diffusion. The results showed that a rumor-crisis processing organization played an important role by posting a denial and supported post in slowing the rumor diffusion speed. Collard *et al.* [20] focused on two antagonistic properties of spreader: profusion and scarcity. The results showed that scarcity was more important than profusion in rumor diffusion. Lin *et al.* [21] proposed two social content attributes which can show the diffusion purposes of rumors. In rumor diffusion predication, some state-of-the-art diffusion models were proposed to simulate the rumor diffusion process. Inspired by SIR epidemic model, Bao *et al.* [22] proposed a new SPNR model and identified the concrete propagation relationships to study the rumor diffusion. In

this model, there are two kinds of people. One is the person who believe rumor, the other is the person who don't believe rumor. In this SPNR model, four diffusion states are defined which are infectious state, positive infection state, negative infection state and immune state. Those four states can be transformed by certain probability. Kurihara [23] proposed a multi-agent information diffusion model based SIR model to focus false rumor diffusion analysis. Lim *et al.* [24] discussed a sharp characterization of networks in which games admitted Pure Strategy Nash Equilibria (PSNE) in a simple two rms competition in rumor diffusion. Zinoviev and Duong [25] proposed a game model which only dealt with a one-way information diffusion in a star-shaped social network. Serrano *et al.* [26] proposed a novel agent based social simulation model to model rumors diffusion in Twitter. In this work, authors supposed that the recovered user would not influence others in social network.

2.1 Disadvantages

The system doesn't provide Rumor diffusion since the techniques are less effective. In the existing system, Rumor diffusion is a complex problem which

involves sociology, information science and computer science, etc. The reasons of rumor diffusion are the high level of uncertainty, anxiety and lacking ofofficial news.

3. PROPOSED SYSTEM

The proposed system developed the model in which rumor diffusion process as an individual game process and predicates the diffusion lattice, diffusion scale and diffusion network structure. To simplify the game model, we assume that there is no topic excursion problem which means that we ignore the diffusion content and its changes, we model a social individual behavior according to his/her revenue and risk which are calculated according to Equal Responsibility assumption in rumor diffusion.

The main contributions of proposed systems are the followings:

The system proposes a game theory based Chinese Microblog rumor diffusion analysis approach which models the social individual behavior to predicate the rumor diffusion scale and diffusion network structure at the beginning stage of rumor diffusion. The system uses breadth first and depth first

method to build a diffusion lattice and model the diffusion path.

3.1 Advantages

The proposed system can obtain the information diffusion scale and structure which help us to find rumors with big ininfluences in the future.. The system is more effective since use the cover degree to measure the similarity between the simulated rumor diffusion network and true rumor diffusion network

4. IMPLEMENTATION
4.1 Admin

In this module, admin has to login with valid username and password. After login successful he can do some operations such as view all user, their details, list all friends request and response status, List all users and authorize and user location in geomap, List all Friends Req and Res, Add Category, Select Category Add Products (subcategory, pname, puses, pdesc(enc) ,pprice ,pmanufacturer, pimage) ,View all products with ranks and all user product tweets details with all features and tweet geo location,View all friends recommended tweets from one to

another,View all similar products tweets with all features,View Products ranks in chart,View number of tweets of specified country in charts,View number of users in the same country in chart, View All SN Rumor Diffusion,View Products ranks results ,View Tweet Rumor Ranks in result

4.2 User

In this module, there are n numbers of users are present. User should register before doing some. After registration successful he can login by using valid user name and password. Login successful he will do some operations like search friends and send request and view requests, View your Profile and search friends,req / res friends, View your friends ,View your friends based on your country and view users based your country and request friend ,Search products By Keyword ---- Search products by keywords, based on contents desc and display all products and ,Tweet content and recommend to your friends. , View all your friends recommended products and tweet with all features, View all friends products Tweets with all features.

5. OUTPUT RESULTS
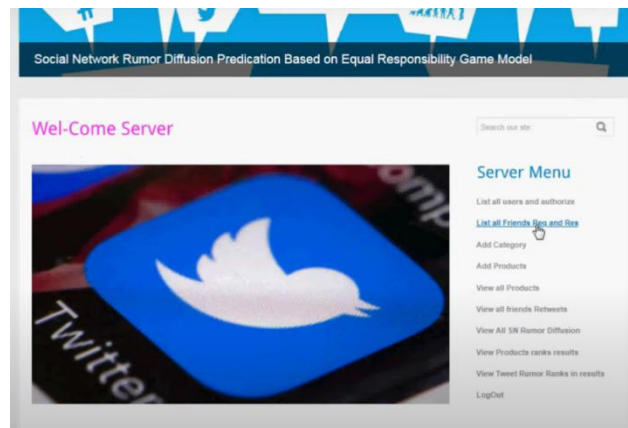
6. CONCLUSION

Rumor diffusion predication is a challenge work because of the complicated social network structures and individual diffusion purposes. To simulate the rumor diffusion process at the beginning stage of rumor diffusion, we use game theory to model the diffusion revenue and propose an ERRDGM model which is based on the assumption that the spreaders will share the responsibility of diffusing a rumor. The experiment results show that our model can effectively simulate the rumor diffusion process in social networks and the simulated results are

similar to the true diffusion networks. However, in our model, the attribute of individual is not considered. Therefore, in our future work, we will use the users' posts to build users' profiles which help us to deeply consider why an individual will diffuse a rumor.

7. REFERENCES

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