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HIGHLIGHTS

- Information dissemination feedback mechanism is introduced into information dissemination model.
- We define the feedback function for describing the information feedback mechanism.
- We establish a differential equation of propagation dynamics.
- We propose a novel information dissemination mathematical model (NFSIR).
- Information attenuation coefficient and information noise coefficient is introduced to the proposed model in order to measure the characteristics of the information dissemination process. The effects of propagation attenuation loss, information noise interference, and feedback mechanism are quantitative analyzed on information dissemination.

ABSTRACT

Due to the existing social network information dissemination model does not consider the influencing factors of node feedback information. The characteristics of social networks and the social attributes of the disseminators are analyzed; we propose a new social network information dissemination with negative feedback NFSIR (negative feedback susceptible infected removed) model combined with traditional epidemiological models. The model first introduces attenuation coefficients and noise coefficients to describe the different effects of information transmission among different users. The feedback function is defined in order to describe the information feedback mechanism. Then, according to the mechanism of information interaction evolution, an information dissemination tree is constructed, and a differential equation of propagation dynamics is established. It reveals the complex interactions and interactions between user relationships, social communities, and cyberspace information in social networks. Finally, the model is applied to two typical real social networks to carry out simulation experiments and compared with the traditional model. Experimental results show that, the intensity of information feedback has a significant impact on the process of information dissemination. It can be seen that the Twitter and Sina microblog networks are significantly different through the analysis of the transmission time and propagation life cycle indicators. The comparison of experimental results shows that the proposed NFSIR model can better reflect the characteristics of real social networks. It proves that the proposed mathematical propagation model is objective, reasonable, and effective. The proposed model not only has strong scalability, but also has application value. It also provides theoretical support for research in related fields.

Keywords: Online social network, Information dissemination, Negative feedback, Life cycle

1. Introduction

Online social network(OSN) is a social structure that consists of the collection of social individuals and the connections between individuals on the information network. The study of OSN is a discipline that explores and reveals the nature and laws of information dissemination based on computer networks [1-3]. With the development of the mobile Internet and the advent of the 5G, OSN is rapidly developing and various applications are emerging. It becomes a new information sharing and exchange platforms for people. It not only plays an important role in transmitting information, promoting communication, etc. It also penetrates people's daily production and life, such as convenient shopping, mobile payment, and sharing economy [4-6].

The social network serves as a mapping and extension of the traditional interpersonal relationship network on the mobile Internet. Infiltrate every aspect of people's online life. Moreover, online communication and mass unidirectional communication and interpersonal two-way communication are intertwined and synergistic. It has a profound influence on people's social life. Therefore, the current research on social networks has become a hot topic at home and abroad. It mainly includes aspects of network structure characteristics, information dissemination mechanism,

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