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An Efficient Feedback Control Mechanism for Positive/Negative Information Spread in Online Social Networks

YANAMADALA BABY SANDEEPTHI
PG Scholar, Department of M.C.A,
S.K.B.R P.G College,
Amalapuram, E.G.Dt., A.P, India.
yanamadalasandeepthi@gmail.com

Mr. NAGA. SRINIVASA RAO*
Asst. Professor, Dept of M.C.A,
S.K.B.R P.G College,
Amalapuram, E.G.Dt., A.P, India.
naagaasrinu@gmail.com

Abstract- The wide availability of online social networks (OSNs) facilitates the dissemination and sharing of positive information. However, the high degree of autonomy and openness of OSNs also allows for the rapid dissemination of negative information, such as unfounded rumors and other forms of misinformation, often causing widespread cognitive misdirection of the public and huge economic losses. Therefore, how to effectively control the spread of negative information accompanied by positive information has emerged as a challenging problem. Unfortunately, this topic is still largely unexplored to this day. To fill this gap, we propose an efficient feedback control mechanism for the simultaneous propagation of the positive and negative information in OSNs. Specifically, a new type of calculation model is first proposed to represent the temporal dynamics of positive and negative information dissemination.Furthermore, the proposed mechanism limits the spread of negative information with minimal system costs by developing and implementing three synergistic intervention strategies. Technically, this mechanism intensively assesses the number of seed users employing three intervention strategies. Also, each seed user executes the received control task independently, and then the control plan for the next time step is dynamically adjusted according to the previous feedback results. Finally, we evaluate the efficiency of the proposed mechanism based on the extensive experimental results obtained from two real networks.

Index Terms:Integrated circuit modeling, Feedback control, Biological system modeling, Social networking (online), Epidemics, Computational modeling, Mathematical model

I. Introduction

THE INCREASING popularity of online social networks (OSNs) such as Facebook,1 Twitter2 and LinkedIn3 has created a fertile environment for the dissemination of positive information [1][3]. However, the high level of openness and autonomy of OSNs also allow the spread of negative information, such as unconfirmed rumours, conspiracy theories and other forms of misinformation [4][6]. In particular, the authentic information is referred to as positive information and the false news (e.g. malicious rumours) as negative information [7]. Both positive and negative information can propagate in the OSNs if users are willing to believe and pass on the positive or negative information received. For example, misinformation about the Ebola outbreak has caused confusion among public health workers trying to fight the outbreak [8].Seriously, sowing disbelief and fear only makes the Ebola outbreak harder to control. In this case, users in the OSNs might have been misled by the received rumor, that is, they might believe and spread the received negative information and be in the state of spreading negative information. Conversely, once the authority (the positive information source) explains the rumor to the public, it turns to believing and disseminating the official information and is in the state of positive information dissemination. Additionally, when users are given both the positive and negative information and cannot decide whether to believe the positive or negative information, they are in the dual information hesitation state. Therefore, the simultaneous dissemination of the positive and negative information in OSNs presents a complicated dissemination process. Undoubtedly, how to control the spread of negative information accompanied by positive information has become a critical problem. A reasonable model for the simultaneous propagation of positive and negative information in OSNs should take into account the key factors influencing user decision-making. For example, when positive and negative information spreads in OSNs, some users may believe either the positive information, or the negative information, or neither type of information.

II. Related Work

Opinion mining involves several important tasks, including sentiment polarity and intensity attribution [18]. Polarity mapping is about determining whether a text has a positive, negative, or neutral semantic bias. Sentiment intensity assignment examines whether the positive/negative sentiments are weak or strong. Given the two phrases I don't like you and I hate you, both would be assigned a negative semantic bias, but the latter would be considered more intense. Effective classification of mood polarities and intensities requires the use of classification methods applied to linguistic features.A popular class of features used for opinion mining is n-grams [23], [25]. Various N-gram categories have achieved recent results [3], [25]. Larger n-gram feature sets require the use of feature selection techniques to extract appropriate attribute subsets. Next, we discuss these two areas: N-gram traits and trait selection techniques used for author profiling. [1], [2], [7]. Most polarity assignments involve determining whether a text has a positive, negative, or neutral semantic bias. Sentiment intensity assignment examines whether the positive/negative sentiments are weak or strong. Given the two phrases I don't like you and I hate you, both would be assigned a negative semantic bias, but the latter would be considered more intense. Effective classification of mood polarities and intensities requires the use of classification methods applied to linguistic features.

N-GRAM FEATURES FOR AUTHOR PROFILING

N-gram features can be classified into two categories: fixed and variable. Fixed n-grams

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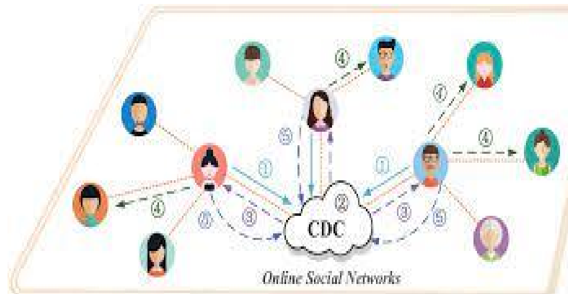
are exact sequences occurring at either the character or token level. Variable n-grams are extraction patterns capable of representing more sophisticated linguistic phenomena. A plethora of fixed and variable n-grams have been used for opinion mining, including word, part-of-speech (POS), character, legomena, syntactic, and semantic n-grams. Word n-grams include bag-of-words (BOWs) and higher order word n-grams (e.g., bigrams, trigrams). Word n-grams have been used effectively in several studies [25]. Typically, unigrams to trigrams are used [3], though 4-grams have also been employed [25]. Word n-grams often provide a feature set foundation, with additional feature categories added to them [4], [25]. Given the pervasiveness of adjectives and adverbs in opinion-rich text, POS tag, n-grams are very useful for sentiment classification [10], [12]. Additionally, some studies have employed word plus part-of-speech (POS Word) n-grams. These n-grams consider a word along with its POS tag in order to overcome word-sense disambiguation in situations where a word may otherwise have several senses [25]. For example, the phrase "quality of the" can be represented with the POS Word trigram "quality-noun of prep the-det." Character n-grams are letter sequences. For example, the word "like" can be represented with the following two and three letter sequences "li, ik, ke, lik, ike." While character n-grams were previously used mostly for style classification, they have recently been shown to be useful in related affect classification research attempting to identify emotions in text [2]. Legomena n-grams are collocations that replace once (hapax legomena) and twice occurring words (dis legomena) with "HAPAX" and "DIS" tags [2], [25].

Architecture



III. EXISTING SYSTEM

- Researchers have studied the temporal dynamics of a single type of information such as rumors, viruses, etc. [12], [18], [19]. Recently, there has been increasing interest in developing efficient methods to minimize information dissemination by using biological epidemic models. Che et al. [18] used the epidemic model to describe the collective dynamics of information disseminated over networks. They provided an analytical model for information propagation to determine the optimal control signal propagation time to minimize overall network costs through dynamic programming. He et al. [19] developed a heterogeneous network-based epidemic model incorporating rumor-blocking and truth-spreading strategies to characterize rumor-spreading in mobile social networks (MSNs). The rumor blocking strategy has been performed by optimally combining various rumor suppression methods so that a rumor can be erased within an expected period of time. The truth spreading strategy was implemented by periodically spreading the truth.

i et al. [24] studied the problem of identifying multiple rumor or infection sources that can spread at different times under the susceptible infected (SI) model [25]. They introduced a quasi-regular tree and a heavy center to design an algorithmic framework that can transform an abstract estimator into a two-source joint estimator. Jiang et al. [25] identified rumor sources from time-varying social networks. They simplified the time-varying networks as a series of static networks and employed a reverse propagation strategy to uncover a number of suspects of the true rumor source. In addition, they introduced a novel rumor-spreading model to calculate the maximum probability for each suspect to use the suspects to determine the true source. On the other hand, Wang et al. [25] presented a model for dynamically minimizing the impact of rumors with a user experience that accounts for both global popularity and individual appeal of the rumor.

Disadvantages

- ❖ the existing work, the system is very less effective due to the dissemination of negative information.
- ❖ The system cannot resist the spreading of rumors in the OSN.

IV. PROPOSED SYSTEM

❖ The system proposes an efficient feedback control mechanism for the simultaneous propagation of positive and negative information in OSNs. In particular, we present a novel computational model to describe the temporal dynamics of the dissemination of positive and negative information. Then, three synergistic intervention strategies are developed for users in the unknown state, the negative information dissemination state, and the dual information hesitation state respectively. Furthermore, the proposed mechanism limits the spread of negative information by performing three synergistic intervention strategies with minimal system costs, characterized by centralized computation, distributed execution, and dynamic optimization. The main contributions of this article are summarized as follows.

❖ The system analyzes the trust relationships between users and quantifies the transmission probability between user behavior states (i.e. unknown state, positive information propagation state, negative information propagation state and dual information hesitation state in the OSNs with positive and negative information propagation). . Then a novel computational model based on the differential equations is created to characterize the temporal dynamics under the coexistence of the positive and negative information.

❖ To ensure that the negative information can be controlled more efficiently, we develop three synergistic intervention strategies (i.e., warning, correction, and guidance) for users in the unknown state, the negative information dissemination state, and the two information hesitation state, respectively. Then the minimization of the total system costs is modeled as an optimal control problem. Furthermore, we use Pontryagin's maximum principle to obtain the dynamic distribution of the three synergistic intervention strategies over time.

❖ The system evolves a nonlinear feedback control mechanism (NFCM) to perform three synergistic intervention strategies with minimal system cost. In particular, NFCM first evaluates the number of seed users that intensively execute three strategies at each time step. Then each seed user runs the control task independently. Third, NFCM dynamically adjusts the control plan for the next time step based on the previous feedback results. The main originality of this article is to develop an efficient feedback control mechanism for the simultaneous dissemination of positive and negative information in OSNs.

❖ The system evaluates the performance of the proposed feedback control mechanism based on two real data sets. The experimental results show that the proposed

❖ NFCM can curb the spread of negative information and reduce the overall system cost by 73% compared to the case without the control mechanism proposed in this article. In addition, further experimental results indicate that overall system costs are reduced when the proposed mechanism executes intervention strategies earlier.

Advantages

❖ An efficient feedback control mechanism for the simultaneous propagation of positive and negative information in OSNs.

❖ The system evolves a nonlinear feedback control mechanism (NFCM) to perform three synergistic intervention strategies with minimal system cost.

V.IMPLEMENTATION

- **Admin** In this module, the Admin has to login by using valid user name and password. After login successful he can perform some operations such as View All Users and Authorize, Add Filters, View All Posts, View Friend Request and Response,View All Positive Feedback,View All Negative Feedback,View All Feedback Results.
- **Friend Request & Response**

In this module, the admin can view all the friend requests and responses. Here all the requests and responses will be displayed with their tags such as Id, requested user photo, requested user name, user name request to, status and time & date. If the user accepts the request then the status will be changed to accepted or else the status will remains as waiting.

Social Network Friends

In this module, the admin can see all the friends who are all belongs to the same site. The details such as, Request From, Requested user's site, Request To Name, Request To user's site.

VI.CONCLUSION

In this article, we addressed the issue of coupling the propagation of positive and negative information in OSNs. First, we created a pegging spread model of positive and negative information to describe the dynamic pegging spread process. Furthermore, we proposed three synergistic control strategies to control the coupling-propagation process of positive and negative information. We then developed an NFCM to perform three synergistic control strategies with minimal system cost. The experimental results show that our proposed NFCM can effectively reduce the spread of negative information.

Future directions include studying network topology and node property on the propagation process of positive and negative information. Then we intend to use the crowdsourcing idea to design a distributed control algorithm that intervenes in the coupling of the dissemination of the positive and negative information.

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