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A diffusion mechanism for social advertising over microblogs

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ABSTRACT

Social media have increasingly become popular platforms for information dissemination. Recently, companies have attempted to take advantage of social advertising to deliver their advertisements to appropriate customers. The success of message propagation in social media depends greatly on the content relevance and the closeness of social relationships. In this paper, considering the factors of user preference, network influence, and propagation capability, we propose a diffusion mechanism to deliver advertising information over microblogging media. Our experimental results show that the proposed model could provide advertisers with suitable targets for diffusing advertisements continuously and thus efficiently enhance advertising effectiveness.

1. Introduction

In recent years, social media, such as Facebook, Twitter and Plurk, have flourished and raised much attention. Social media provide users with an excellent platform to share and receive information and give marketers a great opportunity to diffuse information through numerous populations. An overwhelming majority of marketers are using social media to market their businesses, and a significant 81% of these marketers indicate that their efforts in social media have generated effective exposure for their businesses [59]. With effective vehicles for understanding customer behavior and new hybrid elements of the promotion mix, social media allow enterprises to make timely contact with the end-consumer at relatively low cost and higher levels of efficiency [52]. Since the World Wide Web (Web) is now the primary message delivering medium between advertisers and consumers, it is a critical issue to find the best way to utilize on-line media for advertising purposes [18,29].

The effectiveness of advertisement distribution highly relies on well understanding the preference information of the targeted users. However, some implicit personal information of users, particularly the new users, may not be always obtainable to the marketers [23]. As users know more about their friends than marketers, the relations between the users become a natural medium and filter for message diffusion. Moreover, most people are willing to share their information with friends and are likely to be affected by the opinions of their friends [35,45]. Social advertising is a kind of recommendation system, of sharing information between friends. It takes advantage of the relation of users to conduct an advertising campaign. In 2010, eMarketer reported that 90% of consumers rely on recommendations from people they trust. In the same time, IDG Amplify indicated that the efficiency of social advertising is greater than the traditional advertising. It seems that social advertising has become an important advertising model for marketers. In reality, one of the most popular microblog websites, Twitter, announced an innovative advertising model, called "Promoted Tweets", in April 2010. It makes tweets as advertisements, which are distinctive from both traditional keyword based advertisements and recent social advertisements. They measure the advertising performance and payment of sponsored tweets by "resonance"—the interactions between users and sponsored tweets such as retweet, reply, or bookmarking [29].

In practice, the advertisers should disseminate advertising messages by information-sharing between people and increase the resonance so as to widen the coverage (spread of social advertisements) and keep the advertisement alive. However, currently, they still lack an appropriate advertising mechanism which helps marketers to diffuse their advertisements effectively and improve resonance among users. Besides, the existent sharing mechanisms have a problem of excess sharing between friends. For example, a broadcast-to-all approach forcing users to share information with all of their friends can be executed by the system with small cost and likely adopted by social media platforms. However, this approach will cause a negative impression if friends are not interested in the received advertisements. Although its diffusion coverage could be larger, the number of receivers unhappy with the spammed advertisements also significantly increases. As a result, social spam has become a severe problem

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confronted by users of social media. Sharing information over the network can improve people's reputation and develop their social capital [65]. However, sending too many unsolicited and irrelevant messages to friends will make them feel uncomfortable and even harm the development of social capital.

To address these issues, in this research, we design a diffusion support mechanism, which considers the factors of user preference, network influence, and propagation strength, to increase effectiveness of advertisements and support users to share information with appropriate friends. The proposed mechanism allows us to identify social advertisement endorsers with strong propagation capability in advertisement delivery and provides a suitable repost list of friends for each endorser. We validate our mechanism by conducting experiments in Plurk, one of the most popular microblog services. Our experimental results show that the proposed model could enhance the efficiency and effectiveness of advertising campaigns in terms of advertisement relevance, resonance, and coverage.

The rest of the paper is organized as follows: Section 2 reviews related works; Section 3 presents the research methodology and the framework of our system; Section 4 describes the experiments with detailed data collection and data analysis; the experimental results and evaluations are discussed in Section 5; and, finally, Section 6 concludes this study and offers suggestions for further research.

2. Related literature

2.1. Social media

Social media are Internet platforms designed to disseminate information or messages through social interactions, using highly accessible and scalable publishing techniques. Social media is composed of content (information) and social interaction interface (intimate community engagement and social viral activity). With its emerging trend and promising popularity, researchers have put academic efforts into analyzing the characteristics and functionalities of social media. Social media provide an unprecedented study opportunity for researchers [43]. For example, Krishnamurthy et al. [42] identify distinct characteristics of social media by users' behavior and relationships between users to explore miscellaneous insights into social media. Kaplan and Haenlein [31] examine the challenges and opportunities of social media and recommend a set of ten rules that companies should follow when developing their own social media strategy. Mangold et al. [52] derive hybrid elements of the promotion mix for marketing managers with a better understanding of social media, and propose a framework for incorporating it into their strategies.

Furthermore, to communicate effectively with customers, researchers analyzed marketing trends and social relations. For example, Gilbert and Karahalios [22] develop a predictive model that maps the data of social activity to tie strength so as to improve design elements of social media. Kim et al. [37] analyze the factors influencing the adoption of social media from the perspective of information needs in order to understand each user's behavior regarding information adoption. To better assess users' behavior, many researchers examine social influence, social interactions, and information diffusion in social media [17]. For example, Sun et al. [61] propose a recommendation framework to extract relevant emergency news feeds for user-based information diffusion. Kwak et al. [43] study the topological characteristics and analyze the state of information dissemination. In this paper, we study the design of diffusion mechanism for realizing social advertising in microblogs, which is an emerging research avenue for exploiting social media in the context of online advertising.

2.2. Online advertising

The issue of online advertising has aroused much academic interest and has been spotlighted for decades. Online advertising can usually be categorized into two types: 1) targeted advertising, which delivers advertisements to a recipient based on the user's preference profiles; and 2) social advertising, which delivers the advertisements to influential users determined by social relationship [47]. Targeted advertising also can be considered as a kind of applications of recommender systems, which utilizes two main techniques: the content-based approach, and the collaborative-based approach to discover users' personal preferences [53]. The content-based approach uses users' previous preference profiles [2,44], while the collaborative-based approach uses general tastes of similar users' profiles [44,71]. However, both filtering approaches rely heavily on subject user ratings, making it hard to recommend new items to users when there are no related comments or rating records [23].

Customers' purchasing decisions likely be affected by buying experiences shared by other users [35,45]. Compared with traditional online advertising, social advertising is a form of advertising that addresses people as part of a social network and uses social relations and social influences between people to sell products or services [64,66]. In other words, social advertising use an indirect method, such as the word-of-mouth approach or an endorsement process, to disseminate advertisements [46]. An endorser is any individual with established recognition to represent with and a product [6,58]. To realize social advertising, we need to identify influential endorsers by using social network data and distributes appropriate advertisements in a social way (e.g. sharing between endorsers and their friends). Specifically, the social "distance" between users is measured and appropriate advertisements are distributed through users according to their social distance [28].

As electronic networks became more complex and dense, social network analysis was introduced to analyze complex networks such as inter-organizational systems (IOS) [10]. Social relationships and social interaction are powerful because they can act as trusted referrals and reinforce the fact that people influence people and have become the crucial components in social advertising [3]. Some researchers measure the influential strength by analyzing the number of network links and users' relationships and interaction in the network to identify the influential nodes for social advertising [48,66]. Therefore, studying social influence can help us better understand why certain information is transmitted faster than others and how we could help advertisers and marketers design more effective campaigns [8]. In this paper, considering the factors of user preference, network influence, and propagation capability, we propose a social diffusion mechanism to identify the appropriate endorsers with high prior propagation from the social network to deliver relevant advertisements widely.

2.3. Information diffusion

Many of the earliest ideas and models about information diffusion come from epidemiology. Research into the spread of epidemics has been conducted extensively over past years. Most of the proposed models suppose that populations are fully mixed: everyone has the same probability to be infected with the disease by any infected person. Nevertheless, the epidemic spreading concept may not completely suit the information diffusion on the social network. Xia et al. [70] indicate that spreading behavior is a non-uniform transmission. Different users' characteristics, preference, relationships, and actions on the network lead to individuals' various infection probability. Researchers analyze information diffusion in the social network based on the individual's characteristics. Some of their works are based on bond percolation, graph theory or a probabilistic model to extract the influential nodes, considering the aspect of dynamic characteristics, such as distance, time, and interactions [14,34,38,39]. Others exploit social network analysis techniques, to evaluate the influential nodes from the aspect of the node's structural position or a temporal notion of "node's distance", such as degree centrality, and closeness