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A novel social network measurement and perception pattern based on a multi-agent and convolutional neural network☆

Li Zhu

School of Management, University of Chinese Academy of Sciences Youth Apartment 7, Zhongguancun East Road 80, Beijing, 100190, China

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ABSTRACT

With the rapid advancement of the social network, the total interpersonal relationships among people constitute a social network in real life and the human is the node in this network. Against this background, this paper proposes a novel social network search and perception pattern based on a multi-agent and convolutional neural network. Our research can be regarded as a parallel integration of the multi-agent and CNN. In the CNN part, we adopt prior knowledge that differs from the ordinary convolution neural network and the convolution neural network unique neuron receptive field structure. In the multi-agent part, we combine the characteristics of individual and general-community agents; the establishment and revision of its faith intention is the result of internal thought conditions and interaction with external factors. We apply the proposed model to a social network search, and perception and connection awareness analysis, respectively. The experimental result proves that the proposed method achieves a satisfactory performance.

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1. Introduction

In actual social life, everyone has their own interpersonal relationships. The sum of all interpersonal relationships among people taken together constitute a social network in real life, with the human as the node in the network, and the interpersonal relationship as the network edge. Because interpersonal relationships are closely linked with the people, and have a remarkable influence on their work and study, analysis of social networks has a vital significance and an essential meaning [1–3]. Social networks and the traditional web network have the following main difference: the traditional web network contains mainly information, relying on content information being organized and presented to the user, and the social network is the main body relying on organized relationships between people as friends [4–5]. According to the literature [6–11], the primary kinds of social networks can be summarized as listed below.

1) **Media Sharing Network (MSN).** This kind of network is mainly intended for users to publish, share and retrieve media resources, such as videos, pictures or bookmarks. These sites reduce the threshold for information dissemination, attracting a large number of users. Such sites, in addition to providing resources to publish and share services, also provide dating services. The social networks formed by the users of these sites are also generally directed networks [12]. After the peer obtains the channel advertisement through the resource search, it can create an output pipeline by using the pipeline advertisement and send the information request to the peer of the publishing resource. The re-

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E-mail address: zhulicas@126.com

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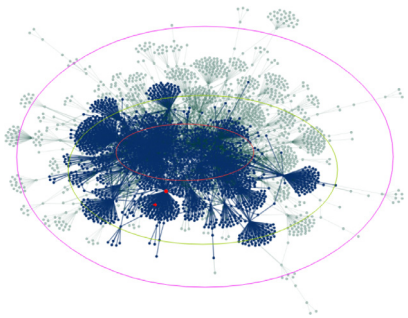

Fig. 1. Demonstration of the social network search and perception pattern.

quest message contains the requested resource name, the IP address of the requester, and the port where the media stream was received.

2) **Making Friends Network (MFN).** This kind of social network is the mapping of the realistic public relations circle, convenient property attraction of basic authentic and the relational maintenance that his friend relates the participation of massive user.
3) **Blog Network (BN).** The most basic function that the blog site provides is that the user of a blog pays attention to the service, so that the attention relations between users form the social network. The blog network differs from a general network in that user A pays attention to user B's blog, but user B does not necessarily pay attention to user A's blog, and this requires complex modeling before it can be understood [13].
4) **Instant Messaging Network (IMN).** An instant messaging system is a real-time communication tool and the system of each user has its own contact list. The social network in the instant communication system can be constructed according to the buddy relationship between the users.

In recent years, the most attractive social network form is the location-aware model [14–17]. In the structured network, the IP address, or the node name of the node, is hashed to generate a globally unique ID identifier, and a node based on the distributed hash table is used to connect the nodes satisfying specific conditions to form a DHT overlay network. In contrast, unstructured peer-to-peer networks usually choose random neighbors as random nodes. It can also be seen that the logical structure of the nodes in the current peer-to-peer network cannot reflect the geographical structure of the underlying network [18]. For general construction of the location-aware model, we should focus on the following two core challenges. (1) Choosing the network model. Choosing the peer-to-peer network model determines the overlay network topology. In order to make the node connections, the overlay network that uses the unstructured peer-to-peer network model can choose the neighbor node independently. Receives the distributional spanning tree inspiration, in the node to overlay network uses the distributional spanning tree pattern with the lamination and the grouping manages. (2) How to build an overlay network. In order to make the geographically adjacent nodes as logically close as possible, it is first necessary to define the distance between the nodes in the overlay network. Secondly, there are two problems in the process of connecting the overlay network, namely, how to select a representative node in the neighboring group as the contact node of the group and how to select the nearest group to join.

At present, online network trust takes the electronic business website and the virtual community as the object of study; although the social network is the typical relational virtual community, it has essential differences in the related trust study of affecting factors. From the weak link theoretical point of view, public relations in the social network forms are strong-connection relations, while the relations that the virtual community and electricity business websites form are weak-link relations [18]. In Fig. 1, we illustrate the social network search and perception pattern for structured data and a parallel computing environment.

Simple cross-connection relationships can be handled in accordance with the pattern of the graph where a simple ring can be connected in accordance with the model to deal with the map. Where there are cross-connections and ring connections in the network, there will be more than one ring in common. In this paper, a simplified method for network structuring is designed to solve this problem. The idea is to decompose it into many smaller ring structures (also known as subnets). Feature points to connect, common points can only exist within the subnet, and the outside is not connected. This can be achieved by maintaining the original network connection structure under the premise of the network to simplify the effect. As the network is decomposed into more subnets, fewer nodes are inside each subnet; the relationship is simpler, and it is easier to analyze and control the network.

In this paper, in order to deal with the aforementioned challenges and provide a novel efficiency analysis tool for social networks, we conduct research on a novel social network search and the perception pattern based on a multi-agent and convolutional neural network. The rest of the paper is organized as follows. In Section 2 we theoretically review the multi-agent system and propose our perspectives on the potential modification strategy. In Section 3 we introduce and modify the convolutional neural network to serve as the basis of our method. In Section 4 we propose our method regarding searching, perception and agent-based optimization. In Section 5 we conduct a numerical simulation on the proposed method to test

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