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Analysis on Social Cognitive Network from the Perspective of Multi-dimensional Association

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Abstract: To study the composition of the social cognitive network system in the state of multi-dimensional association, this article proposes a path to analyze the multi-dimensional association of the cognitive network through the analysis of literature and theoretical research methods. The research content sufficiently explains the organization and management of the problems related to the research.

Keywords: Multi-dimensional association; Social cognitive network; Collaborative interaction

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1 Introduction

Huang Tangsen et al[1] pointed out that the detection performance of radio signals with noise fluctuations needs to be improved in the article of Research on Intelligent Sensing Methods of Radio Signal of Cognitive Network. Hence, they proposed a method that the user of cognitive network can automatically change the threshold according to the radio environment. The method of adjusting the threshold can increase the detection rate by changing the algorithm. Started from the macro and micro point of view, Zhou Peiyuan et al[2] provided a new and transdisciplinary idea for the study of social cognitive networks from the perspective of balance of public opinion. In the research paper, Study on the Evolution Mechanism of the Social Cognitive Network of the Community in the Knowledge Forum, Qian Xuan applied the method of empirical analysis that collects a large amount of data[3]. By verification, it was concluded that the learning community can promote the exchange between people to intensify the communication in network and thereby learn corresponding knowledge from it. In the current research on computer-assisted collaborative learning, researchers often analyze the interaction from two perspectives: the horizontal component dimension and the vertical evolution process. In the horizontal structure, researches focus on the social interaction between participants and the cognitive interaction of the cooperative knowledge structure. As far as the interaction between participants is concerned, the interaction process is unstable. That being said, the core of collaborative learning interaction research is to analyze the interaction between team members from a horizontal and vertical perspective, and to conduct an analysis of collaborative interaction in multi-dimensional associations. However, there are still many challenges in the analysis of multi-dimensional and related collaborative interactions. From the perspective of the interactive dimension, the existing research tends to simplify the interaction relationship to the association of interaction behavior, and to decompose the interaction relationship from the angles of behavior category, behavior path, and understanding of specific interaction behavior and interaction methods. Therefore, this research introduces social cognitive network analysis into the interactive research of cooperative learning, focusing on the relationship between interactive behaviors and interactive events in social cognitive network analysis.

2 The concept of social cognitive network

Cognitive network is a new network technology. The

key idea is that the network system can detect changes in the internal and external environment, and adjust the setting of the network system simultaneously. Thereby, it dynamically and intelligently adapts to the environment, and acts as the guidance for autonomous decision-making in the future. Generally, cognitive networks are networks with cognitive processes that know the current state of the network, and can make strategies and take actions based on these conditions. The network learns from these adjustments which are used to consider end-to-end goals to make future decisions. This kind of network embodies the characteristics of cognitive ability and artificial intelligence, which is mainly applied in the computer field[2].

From the perspective of the education, the social cognitive network is based on the popular and applicable information technology and the development and transformation of student learning theory. The popularization of information technology provides students with more space for learning and situational support. Web-based informal learning environments are becoming more and more viral. The development of learning theory from behaviorism to cognitivism and to constructivism has led to the transformation of students' learning from the construction of personal knowledge to that of social knowledge. Among them, the development epistemology of distributed perception emphasizes that perception is distributed. Cognition exists in a dynamic and complex system between people, people and technology, and medias, with multiple topics, tools, and environments. Therefore, it is necessary to explain cognitive phenomena through the interaction of individuals and others and various resources of complex systems.

Therefore, a social cognitive network can be defined as: in an environment of a specific situation, the interactions between different learners, learners and resources, different resources, and various tools and environments have formed a complex network structure. In this network, learners use various material resources of the network to consult and communicate with their peers to realize the social construction of knowledge. The knowledge itself is constantly updated, reorganized and generated. According to the research theme of this article, we can notice from the knowledge forum that the social cognitive network of the learning community refers to the network of learners and knowledge. The social cognitive network has three basic characteristics: multidimension, relevance and dynamics[3].

2.1 Multidimension

It means that social cognitive networks can represent the basic characteristics of collaborative interaction from the dimensions of cognition and social interaction. Specifically, the social cognitive network can consider social and cognitive interaction in collaborative interaction. It focuses on the relationship between "person to person", "human cognitive elements" and "cognitive elements to cognitive elements".

2.2 Relevance

It means that social cognitive networks can reflect the relationship between social interaction and cognitive interaction. Its main connotations are of three aspects: the interaction between participants can represent the mutual relationship between participants and nodes, thereby reflecting the role of individuals in the process of collaborative interaction and their status in the group; the interaction between participants of cognitive elements, that is, the relationship between participants and cognitive elements in the process of cognitive cooperation interaction. It reflects the collaborative relationship between participants and cognitive elements.

2.3 Dynamics

From the angle of space, social cognitive networks can reflect the role and position of participants in the process of cooperative interaction and the relative changes of cognitive factors in cyberspace. In the time dimension, it represents the changes in the nodes, relationships and network structure of the social cognitive network over time.

3 Theoretical base of social cognitive network

After the initial definition of cognitive social network, we will pay more attention to its intrinsic characteristics and psychological mechanism motivation. By answering the above two questions, this article discusses the theoretical basis of cognitive social networks. Traditional social network research is mainly based on the objective observation of the interaction between individuals [4].

Table 1. Comparison between Cognitive Social Network and Traditional Social Network

Differences	Cognitive social network	Traditional social network
Research basis	The subjective cognition of individuals to the social network	Social network based on the objective description
Research perspective	It emphasizes on the cognition of the third party between two parties. Ultimately, it creates the cognitive social network of every individual	Focusing on the mutual relationship and finally forms a objective social network
The amount of information	Observers of three parties recognize more information	2D data represents 2D relations
Characteristics of network	More interrogative; more subjective to the understanding of the public; more tightly connected to the intermedia	The characteristics of the small world are not obvious; the aggregation of the real friendship network map is weak; the public's understanding is more objective

The difference between cognitive social network and traditional social network is mainly in four aspects: research basis, research perspective, information content and network characteristics (Table 1). The main difference between the two is that cognitive social networks introduce observers on the basis of the analysis of traditional social network, so the research on specific two-dimensional relationships has three perspectives (relation sender, relation receiver and observers). Diversified information content is the basis of multi-dimensional research. Researchers must fully understand the connotation of social cognitive network and its value in collaborative interaction analysis, and they must master the analytical framework and specific indicators of social cognitive networks. Generally speaking, social cognitive network can be divided into three levels: node level, relationship level and network level[5].

4 Analytical methods of multi-dimensional collaborative interaction of social cognitive network

Social cognitive network enables you to analyze the process of collaborative interaction in collaborative debates, and explores ideas and methods for improving social cognitive network analysis. The basic process of collaborative argumentation is a process in which learners share opinions on problems, propose questions, refute them and finally arrive at a group argumentation plan. The specific steps of collaborative viewpoint argumentation can be divided into four sub-steps: propose viewpoint, supplement new viewpoint, analyse viewpoint, feedback and classify viewpoint. The basic process of data analysis is as follows.

4.1 Determining analysis goals and coding framework

First of all, the purpose of this research is to explore the structural characteristics and evolutionary process of a group's social cognitive network by analyzing the interactive process of cooperative discussion. In terms of cognitive interaction, a cognitive network code is formed based on the type of argument and the basic elements of the argument process. Social interaction encrypts the sender and receiver of the interaction. Social cognitive network analysis should merge the first two code tables, forming a coding framework for social cognitive network analysis[6].

4.2 Data collecting and coding

After data collection is completed, the texts and records of discussion formed in the collaborative activities for opinion presentation should be screened, organized, and coded. The discussion text and the record of the discussion process are scattered and matched according to the order of the online learning list.

4.3 Establishing a social cognitive network

First, we use ENA Web Suite and ucinet 6.0 software to process the cognitive network code and social network code obtained from the discussion text, then to record the code to rank the cognitive interaction level and social interaction level of the group, and then divide the group. For other categories, this method is useful for subsequent analysis. Then we put these two codes into ucinet 6.0 respectively to get the social cognitive network graph and the corresponding index value, and construct the entire social cognitive network graph in different steps.

4.4 Structural analysis of social cognitive network

In order to deeply analyze the displayed social cognitive network structure from the perspective of group cooperation, the whole analytical idea is as follows. First, we classify each group based on social network and cognitive network data at the node level, and then classify the different groups in the spatial dimension (structure). The type of group and the time dimension (evolutionary process) are to be characterized. According to the density of the

node layer, degree centrality, average degree and eigenvector value, the social interaction of each group is arranged horizontally.

5 Conclusion

Social cognitive network analysis combines the advantages of social network and cognitive network analysis, and it can present the relationship between social interaction and cognitive interaction in the process of collaborative interaction, as well as the multi-dimensional association and dynamics of the collaborative interaction process. It helps to achieve analysis. However, the method of cognitive social network still has certain limitations that it is difficult to apply to larger networks. For example, it is for utmost importance to draw a real network map by summarizing each cognitive map, and it is almost impossible to achieve this goal in a large network. Therefore, social cognitive network technology still needs continuous development to realize the dynamic expression of social cognitive network.

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