

早稲田大学審査学位論文
博士（人間科学）
概要書

Analysis of Users' Social Roles in Cyberspace
and Application to Information
Behavior Support
サイバースペースにおけるユーザの
ソーシャルロール解析と情報行動支援への適用

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With the increasing popularity of social network services (SNS), a tremendous amount of information has been produced. And with more and more users involving in the SNS environment, their relationships may be built in cyberspace the same as in real-world. Therefore, their relationships become more complex. In these relationships, users may have different positions such as the opinion leader and follower. By this mean, the users' social roles exist and exert an important influence. According to Leyssen et al.'s study, social roles are defined as the part people play as members of a social group. Therefore, social roles have become crucial to better understand users and further support their information behaviors. Especially in the group activities it becomes easier if their social roles can be identified.

Previous research works have been tried to analyze and identify the users' social roles, but most of them only focused on the roles in cyberspace without considering the roles in real-world. With the development of related technologies, the identification of social roles can be more accurate by combining the data from real-world, such as the GPS data and users' profiles.

In this study, to facilitate the construction of relationship networks and further benefit information behavior support, we concentrate on the computational approaches to modeling and analyzing of users' social roles not only in cyberspace, but also in real-world. Users' social roles are systematically analyzed, identified and classified to form the related information for the descriptions of users' relationships. In addition, the influence factors are analyzed to facilitate the social roles identification process. We use the identified social roles data to support a variety of information behaviors varying from participatory information search, recommendation, and collective decision-making support. Moreover, we propose a framework of participatory information search and recommendation based on the analysis and identification of users' social roles and their connection networks. We further propose a hierarchical model of social roles, and develop a mechanism to utilize the identification of social roles to support the collective decision-making process.

In this thesis, firstly, a model of social roles with a set of role attributes, including the profile data, context data, location data and situation data, etc., is proposed. Then, a set of factors including the location factors, situation factors and context factors, etc., is proposed to describe and detect the dynamical switching of social roles. Based on these, a basic model of social role identification is introduced, and a mechanism is developed for real-world situations mapping and synthesizing and role attributes analyzing as well.

Based on these basic models and methods, the user connection networks which can be built by using the

social roles are discussed. Furthermore, by using the social roles and connection networks, a framework of participatory information search and recommendation is proposed, and the design and implementation issues of the system's functional modules are addressed. Simulation result based on the prototyping of core functional modules an application scenario shows our proposed approach can support the participatory search and recommendation process in a more efficient way.

Moreover, a model of collective decision-making processes corresponding to functional modules that take into account social roles is presented based on the social choice theory. Then, a three-layer model of social roles is introduced and the issues of collective decision-making support are discussed. Based on these, an integrated mechanism is proposed and developed to support the collective decision-making process by analyzing users' social roles in both real-world and cyberspace. As a case study, we apply our proposed models to the Course Offering Determination (COD) system, which is practically used in a Canadian university. A NetLogo based tool is developed to demonstrate the negotiation process, which is a core process for collective decision-making, using our proposed method and the Delphi method respectively. The evaluation experiments show the effectiveness of our method comparing with the traditional baseline.

This study has focused on analysis identification and utilization of users' social roles not only in cyberspace but also in real-world. Comparing to the traditional methods with considering users' social roles in cyberspace only, the important factors in real-world are also considered in our model. We model the social roles with a set of attributes and factors to represent the time-changing dynamics in different situations and contexts. The mechanism that we develop to identify the roles is twofold: mapping of real-world situations to cyberspace, and analyzing social role attributes based on the mapping and synthesizing. Furthermore, based on the proposed framework and developed mechanisms, we introduce and build a relationship schema to represent users' roles and connections, and further confirm users' positions, which can support the search and recommendation process in a more efficient way. On the other hand, with a three-layer model and integrated mechanism to analyze users' social roles in a hierarchical way, our proposed approach has been demonstrated to help users achieve the decision consensus in a more efficient way.

The modeling and analyzing approach presented in this study can facilitate the precision rate of information selection from chaotic data, and support users' information search and decision-making in an effective way.