論 文 の 内 容 の 要 旨

論文題目「Knowledge Intensive Organization Model in Virtual Environment based on CommonKADS Methodology」

（CommonKADSに基づいたバーチャル環境における知識集約型組織モデル）

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This doctoral thesis presents a knowledge intensive organization model in virtual space based on CommonKADS methodology. One of challenges in knowledge engineering is analysis and organization of knowledge finding with an appropriate empirical methodology. Although some methodologies are powerful, many of them are passive, in the sense that only a few suggestions are made by the environment. From the survey, most of system lack of explain how an organization uses it knowledge is built up, collaborative work supportability and interface understandable manner. To compare with other techniques, it has complicated models and most of frameworks are non-standardization. In this thesis, I propose a novel knowledge intensive organization model in a virtual space based on knowledge model and organization model in CommonKADS framework, which by developing knowledge schema as a part of analysis process covering knowledge management level and knowledge object level. The benefit of the proposed method is useful and practical guidelines for knowledge intensive organization. It provides the methods to obtain a thorough understanding of the structures and processes used by knowledge workers. This method is not only to support knowledge methodology with its environment, but also encourage a groupware by participating in geographically-distributed development that contributes to knowledge exchange and sharing.

Chapter 1 explains research overview and knowledge management concept. Knowledge management consists of many mechanisms that encourage a system with SECI concept. To realize mechanisms, knowledge engineers need to explore the existing knowledge and recreate knowledge intensive task for solving encounter situation. The problem is lack of suggestion and environment-driven convergence in the real world for an intellective-insight. An involvement of knowledge development environment is related to the concept of computer-supported cooperative work assist communicating, collaborating, and coordinating activities. The critical success factor of knowledge-developing is an environmental supportability that encourages development process for creation and usage of existing knowledge. Finally is an overview of research methodology and positioning.

Chapter 2 contains background concepts, including CommonKADS framework, architectural views and UML extension, Google™ APIs, and Keyhole markup language (KML). CommonKADS methodology is a technique helps knowledge engineers to clarify the structure of a knowledge-intensive task and specification of knowledge data. Unfortunately, its framework has an ambiguous in model perspective and symbol-notation. To fix the problem, I apply an architectural model and UML extension mechanisms to modify the knowledge schema for identification. By the way, the Google™ APIs provide an interface to the provided services, and generate a virtual space by loading the necessary components

onto display space. These open services APIs allow customization of the virtual space output, including ability to add application specific data on the space and integration to the third-party components. Keyhole markup language (KML) is a descriptive markup language based on the syntax and file format of XML. KML is used for describing and storing geographical information that is associated with two and three-dimensional coordinates system.

Chapter 3 elaborates knowledge systematic schemas, which is recreated from CommonKADS by using an architectural model. In this study, I develop three schemas on knowledge discipline name: knowledge landscape, knowledge atlas, and knowledge systematic schema. The knowledge landscape describes knowledge model in knowledge management level, on the other hand, knowledge atlas defines organization model in knowledge object level. I conclude both schemas in one schema: knowledge systematic schema. It was implemented three levels of architectural views: physical view, logical view, and functional view and used UML extension for describe model and elements.

Chapter 4 explains knowledge realization. I propose a general scene-graph to implement the knowledge systematic schema regimen for the virtual environment. About the element description, I explain via tag-based schema by separate geographical information in KML and knowledge informatics in XML with encapsulation. The system extracts the information using DOM-parser and manipulates knowledge informatics with AJAX implemented module. I demonstrate this study by developing a prototype system using Google™ Earth APIs environment as virtual environment.

Chapter 5 contains evaluation and discussion. For experiment the proposed schema, I provide three strategies evaluation: feature comparison, questionnaire user response, and experimental process task. In feature comparison, the results shows that the strength point of proposed system is interface-wise guidance in knowledge-developing supportability dimension and collaborative work in interoperability dimension. For the questionnaire user response, the experimental results show the proposed method satisfies on supportability, usability, and utility in knowledge-developing process. Additionally, its convergent design improves knowledge methodological suggestion for wider user with various experiences. About the process of experimental task experiment, the result can be shown that learning does not take too much time, so that can easily learn in proposed system. Moreover, user can learn by themselves without material suggestion and learning with experience from environment suggestion satisfies same as material guideline.

Chapter 6 is conclusions and future works. In this study, I present a knowledge intensive organization model in virtual environment based on CommonKADS methodology. The new propose of this thesis are the three knowledge schemas: (1) knowledge landscape schema for knowledge concept in abstract space, (2) knowledge atlas schema for organization aspect in real world space, and (3) knowledge systematic schema for knowledge management system. Finally, I demonstrated the prototype application that developed with knowledge systematic schema in virtual environment. I demonstrate the proposed approach by prototyping a system developed in Google™ Earth APIs environment as virtual environment. Experimental results show that its convergent design improves knowledge methodological suggestion for wider user with various experiences and the proposed method satisfies on supportability, usability, and utility in knowledge-developing process. Based on this study, the proposed system can be further improved by including schema that provides more complicated knowledge system and strategies for complex explanation in virtual space. Furthermore, implementation in portable device may provide flexibility in access and collaboration at diverse location.