Construction of the Local Knowledge Domain with Ontology and GIS

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Although various interdisciplinary data often need to be unified for a specific purpose, the standardization of data of humanities and social science is usually difficult. Unification of statistics data in economics and sociology is relatively easy, whereas that of qualitative data in cultural anthropology is difficult because their formats are different according to researchers. This study uses ontology, which has been attracting attention in information science and engineering, for standardizing qualitative data in cultural anthropology. The totemic operator, proposed by a French cultural anthropologist Levi-Strauss for classifying totems all over the world, is taken into account for the unification of various classification systems, and the concept is developed into a new tool linked with ontology. Input data are arranged using an ontology editor and their interrelations are illustrated with visualization software. The obtained group of unified data is called the Local Knowledge Domain, because of its conceptual similarity to the Local Knowledge defined by an American cultural anthropologist Geertz. A data group of this domain includes spatial information and can be operated using GIS software.

Levi-Strauss's totemic operator aims at comprehensive understanding of many classification systems based on various local belief and knowledge. This conceptual tool consists of multi-dimensional and hierarchical tree structure. From a contemporary viewpoint, it can be regarded as a combined set of ontology. However, cultural representation has many forms and it may not fit to a certain classification system. In cultural anthropology, researchers tend to collect raw data without any abstraction. An academic field based on this approach is called ethnography. It encourages researchers to stay in a field site to make observations and descriptions for about two years, and then write articles or books in text format. Such characteristics of ethnography lead to difficulties in making cross-references and unifying data. To solve this problem, a data format suitable for unification needs to be developed. It is also important to avoid losing richness of the original polysemic data, and ontology based on the totemic operator may be useful for integrating various ethnographic data in such a way.

Ontology acts not only as metadata connecting each data set, but also as a knowledge expression showing mutual relations of data. Although it is still very difficult to unify heterogeneous and polysemic ethnographic data, it seems possible to develop data formats for the conceptualization and classification of knowledge. In the Local Knowledge Domain, various knowledge systems are expressed with ontology. Because there are so many knowledge systems, it is necessary to check whether each of them can be handled using ontology. For example, image, audio and video data are difficult to conceptualize, so ontological metadata need to be added to these data. Collected data are organized using the ontology editor Protege, developed by Stanford University. The hierarchical network structure of ontology is visualized using 3D ontology visualization software Ontosphere, developed by Alessio.

Each data set in the constructed Local Knowledge Domain has spatial information, and can be handled by GIS software. A theoretical trial like this, the ODGIS (Ontology-driven GIS) developed by Fonseca, indicates the possibility of putting the idea of the Local Knowledge Domain into practice. The domain will be linked to information about cities and regions within GIS software to enable easy data browsing.