A Construction of the Adapted Ontology Server in EC

Hanhyuk Chung[1], Joong-min Choi[2], Jun-ho Yi[1], Junghyun Han[1], Eun-seok Lee[1]

[1] School of Electrical and Computer Engineering, SungKyunKwan Univ.(SKKU)
300 Chunchun-dong Jangahn-gu Suwon-si Kunggi-do South Korea
bellows@seopo.skku.ac.kr
jhyi@yurim.skku.ac.kr
han@ece.skku.ac.kr
eslee@seopo.skku.ac.kr
[2] Department of Computer Science and Engineering, HanYang Univ.
1271 Sa-1 Dong, Ansan-si, Kyunggi-do, South Korea
Department of Computer
jmchoi@cse.hanyang.ac.kr

Abstract. Ontology is an essential element for the agent system. The agent can share its knowledge and communicate with each other with it. As the agent system is more widely applied, the importance of ontology is increasing. Though there were some approaches to construct ontology, it was too far to satisfy practical needs. In this paper we have constructed an Ontology Server, which provides ontology adapted in electronic commerce (EC), and have applied it to comparative shopping system.

1. Introduction

Ontology[5,6,7] is essential for the agent system[4,5]. The explicit specification about Knowledge can be represented by the ontology. Not only among agents, but also between user and system, ontology is crucial for communication and interoperation. Though there were some approaches to the construction of ontology[8,9,10,11], it was too far to be applied to a real field. Their ontology was too general and independent of any specific domain, so it only described very abstract concept. Therefore we propose some characters, which should be held by the ontology adapted in EC[1,2,3].

- Ontology can be translated. In EC, there are many shopping sites. To communicate and to execute a role, it needs that agent can translate its knowledge into another ontology especially in EC. So we decide to construct standard ontology, which can be translated into local terms. Of course, inversion is also possible.
- Ontology should be practical. In EC, it is very important how ontology details. If ontology presents only abstract concept, then it is not possible for agent to perform its part exactly. On the contrary, if its description is too detailed, it is hard to gain fully efficiency for the real use

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2. Ontology feature

Our goal for an ontology adapted in EC, makes the ontology have some particular feature.

2.1 Domain specific

First we have tried to build generous ontology, which is independent of domain. But Generality hinders expressing fully. It cannot satisfy practical and useful needs. We hope that ontology have the power enough to be used in real field, so we determine that our ontology is dependent on domain.

2.2 Ontology type

We classify ontology by its type on behalf of the use and the convenience. Its applying field changes slightly with its types. Types are divided with two axes. One of them is about the time of use. it divides into analysis time and search time. When searching, ontology is mainly used to build the interface, which can communicate between user and agent. In analyzing, agent gathers data and analyzes it. Of course, some ontology is used in both times. The other is about how to use. As you noticed, there are mainly two input types on Web. One is the subjective input type like text, and the other is the selective input type like combo. Fig. 1.depicts the type classification and distribution. There are also some ontology lying cross the axis of the time of use.

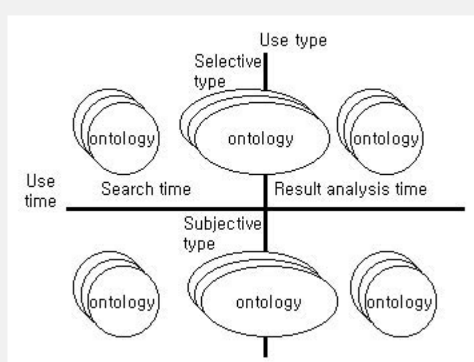

Fig. 1. Two axes for classifying ontology

2.3 Ontology relation

There are many synonyms on the Web. But it is hard for agent to understand its meaning. To communicate with each other, translation is necessary. We reach a conclusion to construct the standard ontology for translation facility. Because it is better building central point to connect than giving each terms an ability to change into each other. We designate this as a relation. The relation determines the power of performance and expression, so it is requested careful choosing the strategy about it. The most important factor of the strategy is the values, included in selective type's ontology. Because the diversity of value is too extreme, it raises a serious problem about making a relation. So it has n:n relation. On the other hand, in the same domain, ontologies are similar, so it can easily have 1:1 relation. Fig. 2 shows one case in which there is a relation between site A and site B, and the relation of values is more complex than ontology

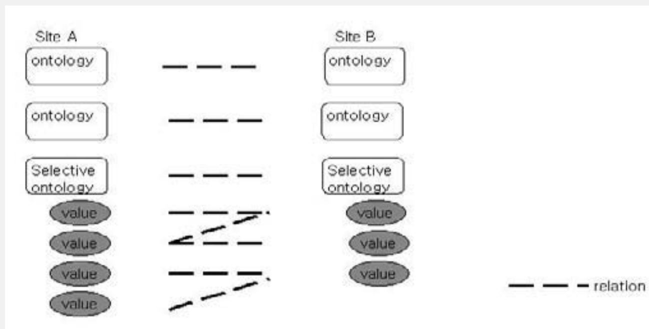

Fig. 2. The relation of ontology between Site A and Site B

3 Ontology Server

In Ontology Server, a standard ontology was built. And that must be based on the Web site to be applied in the real field and to get the usefulness and practicality. So it is necessary the standard ontology has the objective and concrete property. Ontology Server provides a manager with the editor. The detailed explanation follows

1 *Gathering from Web*

First of all, we need the local terms used in site. The standard ontology can be built based-on that. Gathering Agents are in charge of this process. They collect local terms as well as other information, and classify the ontology type. Once this process is done, all information is stored in the database.

2 *Making a relation*

As referred previously, making a relation is not only an important job, but also a substantial and challenging problem like many other ontology projects. Ontology Server provides an editor, which browses the stored information and makes a relation.

3 *Modifying or rebuilding the standard ontology*

On making a relation, it may occur that a need of modifying or rebuilding standard ontology. Because a standard ontology may have some faults, or new ontology may appear.

4 Servicing the standard ontology
After all process is done, the standard ontology is serviced to other agents. And the translator is automatically generated for translation.

4 Implement

4.1 System architecture

All system(in Fig. 3) is developed with JAVA, and MySQL is used as a database. Ontology Server on Linux machine performs a role of constructing standard ontology and servicing it. Fig. 4 shows an editor with two panels. On the left the current standard ontology is displayed and on the other panel local terms is presented. With that a manager builds a relation. All information are stored in Ontology Server. User Agent executes a search by user's request. Gathering Agent residing in server-side gathers the relevant information from Web, and analyzes it. Fig. 5 presents Gathering Agent, which analyzes one game site.

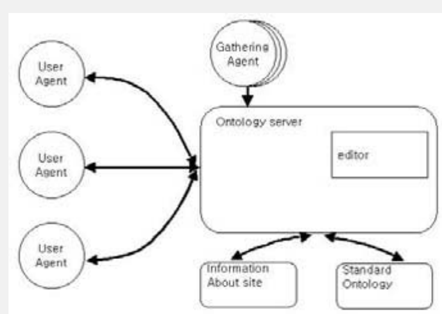

Fig. 3. System architecture

Fig. 4. An example of editor in Ontology Server

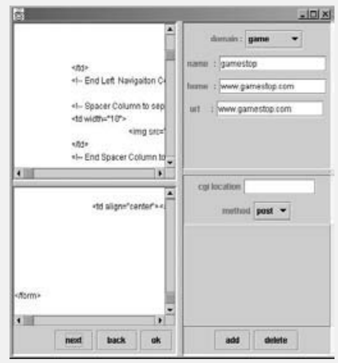

Fig. 5. An example of Gathering Agent’s view

4.2 Search process

The search process is similar with the traditional real-time comparative shopping[2,3]. But the interface changes dynamically with user’s choice. So a user can have a lot of search functions like selection. But the ordinary system only provides a keyword search. A user can not only search more conveniently and precisely but also get more abundant result. Because the description of site’s product attribute is stored in the ontology server, a user agent can analyze search result with it Traditional system only shows minimum result like name and cost. When user’s choice is determined, User agent converts it into local forms fitted in each site with translator. And adversely the result of site is transformed into standard ontology. User agent shows this result to the user. So user can get it more fluently. This process is described in Fig. 6,

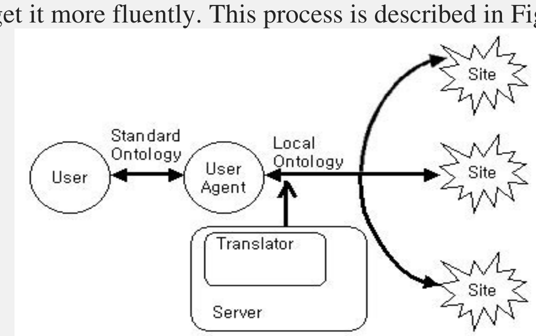

Fig. 6. The execution of User Agent

5. Result and related Work

We show that the adapted ontology in EC, is applied usefully. User interface is changed dynamically as domain changes, therefore the search can be achieved more precisely, and result has more attribute than that of ordinary comparative shopping system with information in ontology server. A user gains more profit and, reduces time and effort to search. While our system proves that ontology's performance and application in EC is remarkably successful, there are also revealed a number of limitations. The ontology relation and standard ontology needs hand-coding, and it is a chronic problem as other ontology projects have. It may be short from objectivity. Needless to say, WWW is less agent-friendly, so Gathering Agent has a trouble in the analysis.

Acknowledgement

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References

1. R.Kalakota and A. B. Whinston.: Reading in Electronic Commerce. Addison Wesley Publishing Company. (1997)
2. Robert B.Doorenbos, Oren Etzioni, and Daniel S.Weld.: A Scalable Comparison-Shopping Agent for the World-Wide Web. Proceedings of the first international conference on Autonomous agents. (1997) 39-48
3. H. S. Nwana, J. Rosenschein, T. Sandholm, C. Sierra, O. Maes, and R. Guttman.: Agent-mediated electronic commerce: Issues, challenges and some view points. In Proceedings of the Second International Conference on Autonomous Agents. ACM Press. New York (1998) 189-196
4. P. Maes, R. H. Guttman, and A. G. Moukas.: Agents that buy and sell. Communication of the ACM, (1999)
5. Alper Caglayan, Colin Harrison.: Agent sourcebook. WILEY & sons,Inc. (1997)
6. Munindar P. Singh.: Agent Communication Languages: Rethinking the Principles. IEEE Computer, Vol.31, No12. (1998) 40-47
7. Tim Finin, Jay Weber.: DRAFT Specification of the KQML Agent-Communication Language. The DARPA Knowledge Sharing Initiative External Interfaces Working Group,. June. (1993)
8. Kuhanandha Mahalingam, Dr.Michael N.Huhns.: An Ontology Tool for Query Formulation in an Agent-Based Context. Proceedings of the Second IFCIS International Conference on Cooperative Information Systems. (1997) 170-178
9. Adam Farquhar, Ricard Fikes.: The Ontolingua Server: a Tool for Collaborative Ontology Construction. Proceeding on KAW '96 http://ksi.cpsc.ucalgary.ca/KAW/KAW96/farquhar/farquha r .html. (1996)
10. Kilian stoffel, Merwyn Taylor and Jum Hendler.: Efficient Management of Very Large Ontologies. AAAI Fourteenth National Conference on Artificial Intelligence. (1997)
11. Natalya Fridman Noy and Mark A.Musen.: SMART : Automated Support for Ontology Merging and Alignment. KAW '99 Twelfth Workshop on Knowledge Acquisition, Modeling and Managemen. (1999)
12. J.Ben Schafer, Joseph Konstan, John Riedl.: Recommender Systems in E-Commerce. Proceedings of the ACM Conference on Electronic Commerce (1999)