Toward Task Ontology-based Modeling for Mobile Phone Users' Activity

Munehiko SASAJIMA[*1], Yoshinobu KITAMURA[*1], Takefumi NAGANUMA[*2], Shoji KURAKAKE[*2] and Riichiro MIZOGUCHI[*1]
[*1]I.S.I.R, Osaka University, 8-1 Mihogaoka, Ibaraki-shi, Osaka, 567-0047, Japan
{msasa, kita, miz}@ei.sanken.osaka-u.ac.jp
[*2]Network Laboratories, NTT DoCoMo, Inc.
3-5 Hikari-no-oka, Yokosuka-shi, Kanagawa, 239-8536, Japan
{naganuma, kurakake}@netlab.nttdocomo.co.jp

Abstract

As a step to realize usable mobile internet services, this paper proposes a task ontology-based description method for the model of mobile phone users. The new method supports the description of users' activity and related knowledge such as planning, prevention method for accidents and how to solve problems that occurs on the users. Such models contribute to checking, designing and improving mobile internet services.

1 Introduction

Since mobile services and their infrastructure have been developed widely, we can get many kinds of services in Japan via the mobile handsets (more than 89,000 service sites today [1]). The increase of variety of the services is good for consumers because it increases chance to meet the most appropriate service. On the other hand, too many kinds of the services cause difficulties in searching, finding and selecting suitable services for each consumer's needs.

To solve this problem this research proposes reorganization of the mobile services from the viewpoint of task [2]. Here task means consumers' activity in the real world. Menus of the current mobile services are organized from the viewpoint of the domain. Users seek for the service considering the name of the directory representing a domain. In the task oriented menu, the users seek for the service by the name of the directory which represents a task. They should be "move by car", "walk to the park", for example. Such a task-oriented structure represents semantics of the users' activity under the mobile internet services, and fits for representation and interpretation by the semantic web technology.

Since there are so many mobile services and activities in real world, the method to model users' activity should have enough scalability and generality. Furthermore, to describe such a lot of services, work by several knowledge authors is required. Modeling method should have a comprehensible guideline and common vocabulary for analysis and description in order to prevent difference of the models output.

This article proposes task ontology-based modeling to-solve this problem. The approach based on task ontology[5] enables us to describe task models in terms of generic task vocabulary which are detached from domain model. A model of the task "move", for example, can be applied to model movement in several domains: travel, commute, and so on. The effect of task ontology has been proved in the research field of problem-solving [3][5]. This research aims to apply the concept of task ontology in modeling of users' activity in real world. Furthermore, specification of modeling process based on categorization of users' activity provides the knowledge authors with guideline. This framework is inspired by ontology-based modeling in the engineering domain [6]. Based on the task ontology, our method contributes to designing and describing homogeneous and general models.

2 Framework for Modeling

Figure 1 shows the framework of our system. Rectangle objects represent knowledge. Rectangle objects with round-corner represent module. Circled objects represent people related to this framework.

Designer of the mobile services designs activity models and mobile internet services through the interface modules. Its output is the menu of the mobile internet services that is

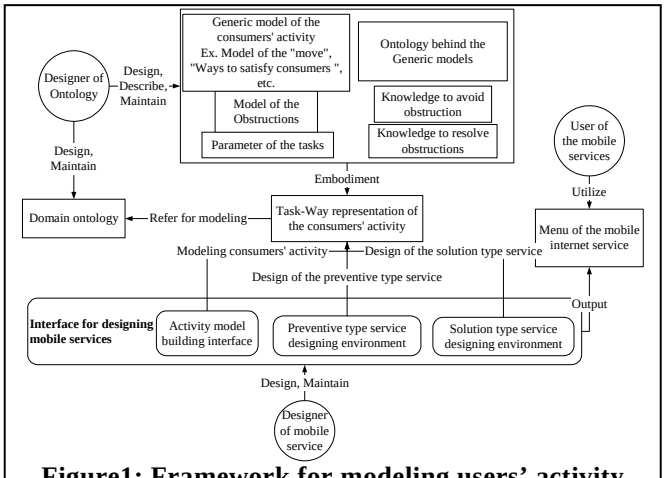


Figure1: Framework for modeling users' activity

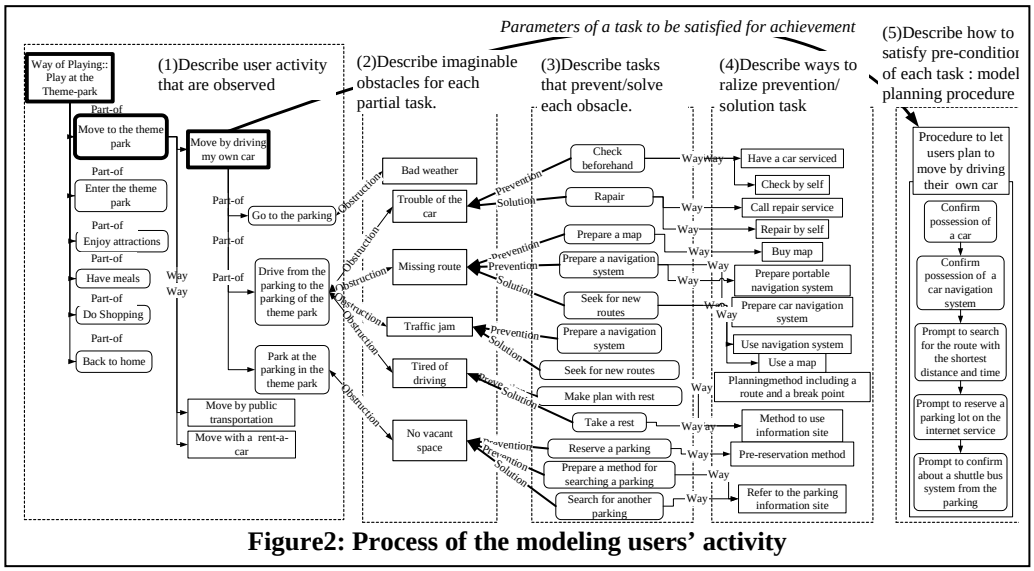


Figure2: Process of the modeling users' activity

referred by the user of the mobile services. Such services are provided on the technology of the semantic web.

On the process of the designing and building consumers' models, generic model and task/domain ontology are referred frequently. They are instantiated to be concrete models. Generic knowledge and ontology are designed and maintained by the designer of ontology.

3 Description of the Models

Our framework intends to support four types of user model. (a) Usual activity (b) How to prevent occurrence of troubles (c) How to solve troubles occurred (d) Procedure of the planning.

Figure 2 shows an example of model description process. A dotted rectangle with number (1) corresponds to the model of (a) usual activity. It is described by instantiating generic models and/or ontology. Description starts from the task at the level of large granularity. Next, ways to achieve the task are linked, and each of the ways is decomposed to a sequence of sub-tasks. Our "way" is similar to "method" of CommonKADS[3] or "how bundle" of the Business Process Handbook [4]. Through this process task of the large granularity is decomposed into ways and sub-tasks. The area with number (1) in Figure 2 represents that a task "Move to a theme park" is achieved by three ways. Among them, the way "Move by driving my own car" is decomposed to three sub-tasks.

The usual activity is described based on the observation of the activity on the spot. Other activities such as "plan to move more efficiently" and "get traffic information beforehand" are not described here. This is an important and guideline in this framework as mentioned in chapter1.

Models of the (b) and (c), how to prevent/solve problems are described in three steps. First, the designer describes imaginable obstacles for each partial task. For example, the task "Drive from the parking to the parking of the theme park" has four obstacles, including "Trouble of the car". Next, the designer describes tasks that prevent or solve each obstacle. We can prevent occurrence of the obstacle "Trouble of the car" by the task "Check beforehand", for example. Also we can solve it by the task "Repair". Lastly, the designer describes ways to realize the prevention and the solution tasks. The prevention task, "Check beforehand" can be achieved by two ways: "Have a car serviced" way and "Check by self" way.

Referring to the model of prevention and solution, the designer can check whether the current mobile service is enough or not. If there's no way or internet service for an imaginable obstacle, it means another service is needed to solve it for users now. In that sense, the model works as a finder of the new business opportunity.

The model of (d) Procedure for planning is described in two steps (Fig.2, (5)). First, parameters of a task that must be satisfied for its achievement are selected according to the purpose of the planning. For the plan to drive easily, parameters related to easy-driving (possession of the car navigation system, for example) are selected. Next, build a procedure to let users fill the selected parameters. The order of the parameter can be decided according to the dependency, efficiency for making decisions, and so on.

Model of the trouble is a unique feature compared to [3] [4]. The most valuable mobile service is to solve such problems that occurred on the spot.

4 Research Status

The authors are designing and developing the proposed framework with related ontology. Design of the evaluation method is also going.

References

[1] http://www.nttdocomo.com/

[2] T.Naganuma and S. Kurakake. Task Knowledge Based Retrieval for Services Relevant to Mobile User's Activity. In *Proceedings of the ISWC2005*, 2005(to appear).

[3] G.Schreiber, et al., *Knowledge Engineering and Management*, the MIT Press, 2000.

[4]Thomas W. Malone, et al., *Organizing Business Knowledge*, the MIT Press, 2003.

[5] Mizoguchi, R., Vanwelkenhuysen, J., and Ikeda, M., Task Ontology for Reuse of Problem Solving Knowledge, In *Proc. of KB&KS '95*, The Netherlands, pp.46-59. 1995.

[6] Y.Kitamura and R. Mizoguchi. Ontology-based Functional Knowledge Modeling Methodology and its Deployment. In *Proc. of the EKAW 2004*, pp. 99-115, October 2004.

Brief explanation of the demonstration

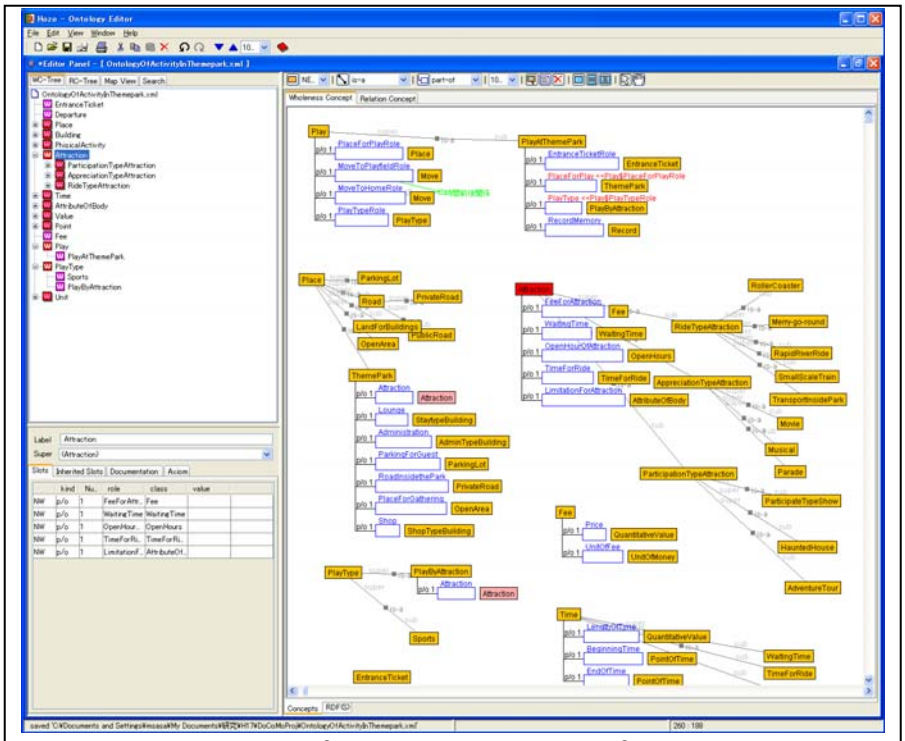
We will show the process of describing models mentioned in the paper, especially model of consumer's activity and ontology that justifies it.

SS1 is a snapshot of the description process of ontology on theme park. The authors have been designing and developing an ontology editor named "Hozo" (http://www.hozo.jp/). Hozo supports designing and editing ontology, and SS1 is a screenshot of it. Concepts such as "Theme park" or "attraction" are modeled here.

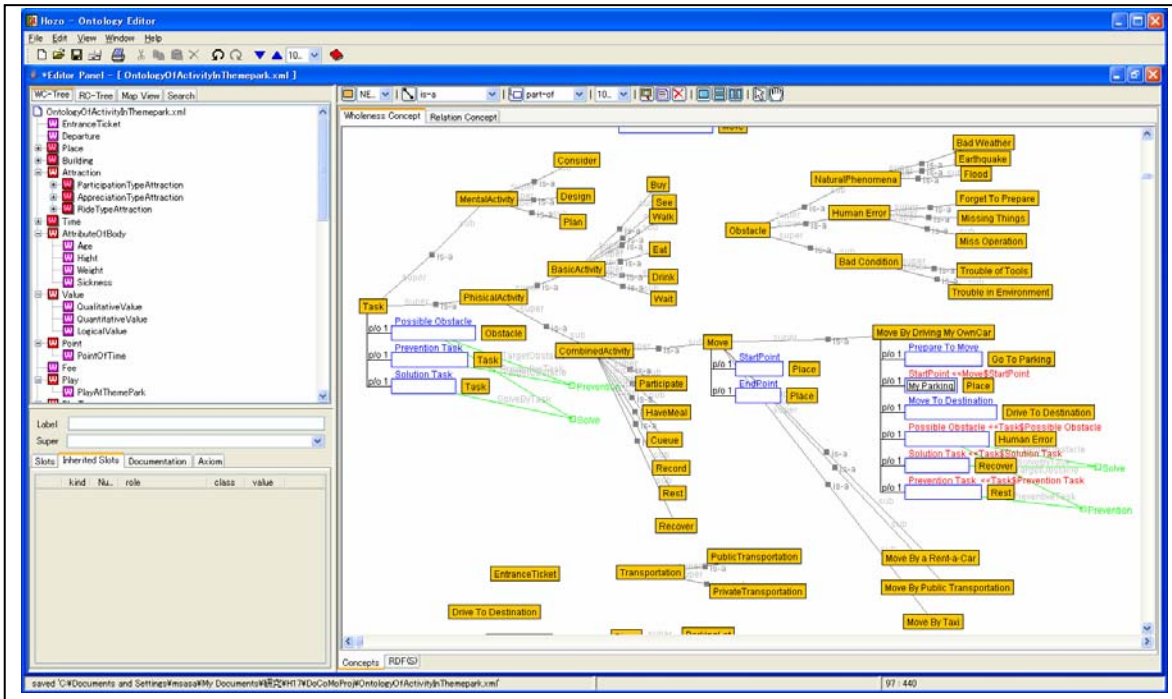
SS2 is a snapshot of the description process about the consumers' activity. On Hozo, model of the task "move by driving my own car" is described (the center of the SS2).

Referring to the description process and the model, we would like to discuss about (1) how to model "consumers' activity" which is different from artificial things (2) how to utilize models for mobile services since I could not explain enough in the submitted paper (3) what kind of knowledge should be added.

The demonstration will be done on single PC. As we mentioned in the paper, design and development of the tools are on their way and may change before the poster/demonstration session.



SS1: Process of describing ontology of theme park



SS2: Process of describing consumers' model in the theme park