Generic ontology based User Model: GenOUM

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Contents

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List of Figures

1   Motivation and context

In *Semantic Enrichment of Scene Graphs for Task Based Adaptation in 3D User Interfaces* [1], the Adaptation Model describes users, tasks, and representation adaptation. Our research presented here concerns more specifically a user model, designed as a generic ontology suitable for any project built around a user modeling system. A **user model** is a knowledge source that contains a set of beliefs about an individual on various aspects, and these beliefs can be decoupled from the rest of the system. [2]
A **user modelling system** is a system that shows adaptive behaviour concerning its interaction with the user. [3]

[4] introduces Generic User Models [5] as systems which have, among other aspects, two major goals: 1) generality: which would allow a model of the user to be usable in a variety of application content domains; 2) expressiveness: in that the model is able to express a wide variety of assumptions about the user.
The main goal of user modeling is to understand the users caracteristics, thus allowing a system to automatically adapt itself specifically to each user. A generic user model is the basic structure of a framework that handles information about users and a specific domain. We introduce here a first step toward a Generic Ontology based User Model that we call GenOUM [6]. Combining practical ideas and observations described in user modeling literature, but keeping a high level of abstraction, the model is domain and project independent what we call generic. Following the current standards of the semantic web, the ontology is described in OWL [7].

2   Roles of user modeling

User Models and User Modeling in Knowledge Management Systems from Liana Razmerita [8] did serve as a strong base to create the first version of GenOUM. The following roles she describes were kept in mind during our design :

- **Personalization :**improve the interactions between the user and the system with customization and/or adaptation of the functionalities and content.

- **Learning & changes :** the users learn something using the system, and on the other hand the system can change and improve the users' behaviour.

- **Networking & collaboration :** it is obviously useful to group the users in different ways. The user himself will find helpful to create a social or organizational network. The system, on his side, will do some clustering and work with stereotypes to get much better results for adaptation.

- **Expertise discovery :** it is always essential to find out who knows what. This notion can be applied to the different tools a system is teaching, the tasks some users are able to carry out, the knowledge level and skills of a
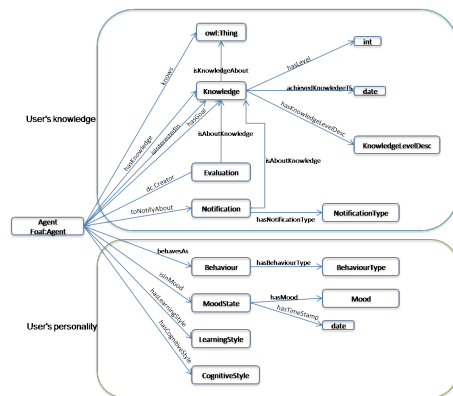
Figure 1: genOUM concepts and properties

person.

To achieve this, GenOUM fits in a larger set of ontologies part of the user modeling system :

- **A user model ontology (GenOUM) :** To provide a domain independent description and understanding of the user

- **A domain ontology :** To describe the concepts relative to the domain concerning the project.

- **A system adaptation ontology :** To adapt the look and functions of the system, i.e. adapt the user's interface

- **A content adaptation ontology :** To adapt the content of the system according to the user preferences, behaviour or knowledge, e.g. give customized answers to users actions or queries

3   User Model ontology (GenOUM)

An overview of the GenOUM user model ontology is shown in Figure 1.

GenOUM's concepts and properties can express:

1. User's profiles

   - In which context does the user do something or know something

2. User's knowledge

   - User's knowledge level - the knowledge level of a user about something (*something* is anything, it could be a concept as well as a task)

- Content's knowledge level - the knowledge level required to access or understand data
- Interests - the interest of a user about something
- Goals - the goal of a user to reach a knowledge level about something
- Notifications - to notify a user about something happening in the system
- Evaluations - the evaluation of a user about someone's knowledge level or content's knowledge level

3. User's behaviour & personality

- Behaviour - how does the user interact with the system
- MoodState, Learning style and Cognitive style influences on the user's way of using and interacting with the system

3.1   User's Description

The basic description of the user (eg name, title, email) is not defined in genOUM, and thus any suitable ontology could be used depending on the specific domain. In a generic approach, we propose the FOAF ontology [9]which is almost a standard in semantic web projects.

3.2   User's Profiles

User profiles are based on the ideas mentioned in [10] and [11] A single person should be understood differently depending on the activity he/she is currently carrying on. A person or one of its dynamic profiles (e.g. as a business man, as a student, as a mother, as a tourist) can thus be used in a same way when describing a user. This will enrich the information and allow further useful inferences.

3.3   User's Knowledge

The knowledge and skill of the user can be expressed about anything, but more specifically about the concepts described by the domain ontology. To be really useful, the knowledge is qualified with a knowledge level to specify if the user is for instance a beginner or an expert. A time stamp can be added to follow the evolution of the user's knowledge and skills.

Example:

Figure 2 states that Franck knows Vietnam, that his knowledge level about Vietnam on the 22.10.2006 is 20, an advanced knowledge level. The interpretation of the knowledge level '20' depends on the domain and is not defined by GenOUM.

Interests and goals: in the same way, it is possible to express that a user is interested in something, or that he has the goal to reach a certain knowledge level. **Content's knowledge level:** the content too should be linked to a knowledge level. It is then possible to state that some information is intended for anyone or only for experts. This could be an information, an advice, or even a prerequisite to access
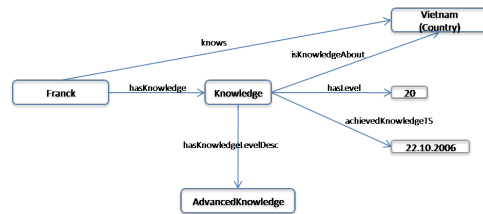
Figure 2: Example of User's knowledge level

some data. **Evaluation:** it is advantageous for social networking and clustering to allow any user to give a judgement about the knowledge level of a user or content. **Notification:** when a user is interested in something, he may want to be notified when new information is available, and customize how to be notified (e.g. email, sms)

3.4   User's behaviour & personality

As pointed out in OntobUMf [8], it is valuable to observe the user's behaviour in the system, and also to understand its personality. "Affective computing" [12] is getting popular as mood and emotions of the user have a strong impact on how he does interact with the system **Behaviour:** depending on the possible ways to interact with the system, a user could have different behaviour/activities (e.g. reader, writer), at different levels (e.g. very active, active). It is then possible to encourage the user in certain activities, thus trying to improve his way of using the system. **Mood, Learning style, Cognitive style:** take into consideration a user's personality and mood to understand and help him in the manner he interacts with the system.

4   Conclusion

Semantic web technologies and the recently designed languages open very appealing possibilities to modelize information. In the context of user modelling, data acquisition can be explicit or implicit, but the system should deduce information automatically. For this reason, adding semantic to data and using reasoners to infer new knowledge seems to be a promising future. GenOUM, as presented here, is a first version of a generic ontology based user model. As usually done with ontologies, the different concepts and properties start with a 'testing' status, and only the use of the ontology in different practical projects will allow proving what is right or wrong, what should be totally changed or just adapted, and what can be accepted with a 'stable' status. It is a nice challenge for us to make a little contribution to this flourishing field.

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