

Using Shared Ontologies for Communication and Personalization

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1 Framework Architecture

The e-MATE¹ research project aims at realizing a framework and an execution environment allowing the deployment of services and their dynamic composition. Its main characteristics are the personalization of rendered information, the use of geo-referenced data, and the accessibility through several different devices. The basic services are independent but have to provide information usable by other ones.

A composite service involves several basic services and is based on a scenario. The same service may be used for various scenarios. The model of service composition is consistently done, both in syntax and semantics and services remain strictly decoupled from the point of view of code and implementation of data-types.

Designing such an architecture, the problem of interoperability between services arises. Services must share a representation of concepts in order to be able to communicate meaningfully. That leads to the adoption of an ontology, used as a reference schema for common concepts, and an ontology language, used as a lingua franca for communication purposes.

2 Communication between Services

Ontologies can be used to address three kind of problems: communication between people, interoperability between systems and system engineering. This reflects how ontologies are used in the e-MATE context.

We built a main ontology whose concepts are shared by all services. They are basic concepts, for example for service and user profile, that may be extended. The designer of a scenario involving several services adds to the main ontology, concepts in a domain of interest, as for instance, travel and leisure.

Service developers define their own data-structures according to their needs and a data mapping document that gives relations between object oriented programming concepts and ontology concepts.

A specific parser uses this document to either build on the fly a RDF representation of objects or conversely instantiation of Java objects from RDF instances. Thus semantic compatibility is guaranteed by the e-MATE infrastructure, and syntactic issues are no more a matter.

To test and evolve our architecture we developed a scenario of travel agency (t-MATE) involving several services to plan a trip in all its phases, from the booking of flights to the organization of tourist routes and the filling of agendas with interesting cultural events.

T-MATE scenario involves first component services that deliver information on cultural events and flight timetables. Then it involves a planning service capable to organize this information and to propose a journey to a tourist.

This scenario involves also services supplied by the e-MATE infrastructure as the personalization service and the ontology service, which deals with system ontology and RDF-Java translation strategy.

3 Personalization

All knowledge about the user, such as age or gender and above all preferences, i.e. the *user profile*, is indispensable to bring information really adapted to the user characteristics. Personalization can be achieved collecting user choices and filtering available information.

The user profile is built using two main information sources. At the beginning the user fixes some parameter values like age, gender and so on. Then services update user preferences. That may be the modification of frequentation rates when a user asks information in relation with a concept. In the user profile, it is possible to add declarations of concepts and definitions of instances that the main ontology doesn't contain. The reunion, under a common form like RDFS, of elements coming from various sources (domain ontology, user profile and object data transformation) forms a knowledge base. From inferences upon this base, emerges the personalization of deliverable information.

For this purpose, the system defines first basic rules and axioms. For instance, facts resulting of transitive predicates are automatically added. Then, logic rules select, filter and order facts according to values coming from user preferences. Thus, it is possible to advise the visit of a museum or a football match during a travel.

¹E-MATE stands for Multi-modal Architecture for Telematic Environment. See <http://www.crs4.it/nda/e-mate/>