ADAPTED AND CONTEXTUAL INFORMATION IN MEDICAL INFORMATION SYSTEMS

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Abstract: Today, due to the integration of the pervasive computing to current information systems, new challenges are involved: the amount of data increases tremendously over time and users are more and more heterogeneous with different needs and roles. These challenges require systems with some adaptation capacities. The personalization and user modelling process are the key elements to propose solutions to these challenges. For that, this paper presents personalized access technique which takes into account the different requirements of personalization for different user's needs and different contextual situations.

1 INTRODUCTION

Current information systems (IS) try to improve continuously the access to data in different domains: economic, scientific, technical, etc. However, the considerable amount of data, the large spread of mobile devices (Barkhuus & Day, 2003) providing access to information anywhere and at anytime and the heterogeneity of users with different needs have finding relevant information and reducing data overload quite challenging tasks. These different challenges require systems with some adaptation capacities. Systems should be capable of adapting informations to user's needs and his environment in which he is acting (Abbas et al., 2006).

Commonly, several works are developed in the literature in order to provide help to user when research information. (Ceri et al., 2005; Fiala et al., 2003). The majority of these systems are addressed the issue of personalization by presenting suitable models based on the user (Amato & Staraccia, 1999; Razmerita, 2005). These user models consists mainly in classifying the user characteristics into a set of categories such as demographic attributes (identity, personal data), professional attributes and behaviour attributes (traces of navigation on Web), goals, preferences, skills, accessibility, activity, interest. The majority of these works is actually specific solutions suited only for predefined adaptation requirements and are hardly reusable for a new adaptive application. Moreover these techniques have focused on the user and rarely considered the context in which a user interacts with the system while user's context can be a key element to improve personalized information access process. On the other hand, the context is commonly considered in context-awareness systems. Theses systems limit the notion of context, referring to the situation in which the user is acting, to the concepts of user's location and device (Fogarty et al., 2004; Lemlouma & Layaida, 2004; Chaari et al., 2007).

So, there is a need to have a system covering all facets of personalization process. we propose a personalized data access approach based on profile management which take into account all facets characterising the user and his context of use. This approach requires two steps: the former consists in building profile model characterizing a context (for instance profile for user, role, device, etc.). The latter uses the profiles content for personalizing the exchanged data with the user.

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This article is organized as follows: Section 2 presents the general architecture of the personalization approach. Section 3 describes a profile model, a context model and services model. Section 4 shows how to use these profiles in the personalization process.

2 GENERAL ARCHITECTURE

The general framework we propose requires three notions:

- The user which uses the system in order to access information;
- The resources extracted from databases in response to the user's query;
- A software module which manages the personalization process based on profiles modelling. To exploit these profiles, a set of services is proposed for defining rules which will be executed for personalized information.

The software module is organized into two layers:

- A conceptual layer which proposes interconnected models: a profile model, a context model and a service model. This layer provides a meta-description of these models.
- A application layer which consists in instantiating these models and using it for personalizing information access. We distinguish three modules: a profile management, a service management and a exploiting profiles and services in the personalization process.

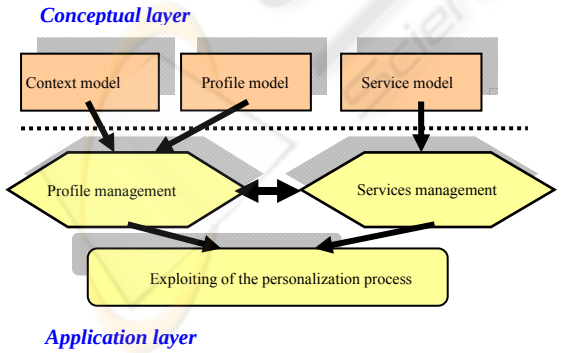

Figure 1: Composition of software module.

The personalization approach can be used independently for new applications as well as for legacy systems which involve requirements of personalization possibly not defined in advance.

3 PROFILE MANAGEMENT

Before describnbing the profile modele, we start by defining the context.

3.1 Context Modelling

In general, a context is defined by a set of external parameters (Chaari et al., 2007). An instance of these parameters characterizes a contextual situation. A change of a parameter's value defines a new contextual situation. For example, we define two contextual situations C1: {user = Smith, role = doctor, location= office} and C2: {user = Smith, role=doctor, location = patient at home}. In C1, Doctor Smith may access a health database from her office for screening patients for prevention care, while in C2, the same doctor accesses the same database at the patient home for post treatment analysis. Then in different contextual situations, users may access different data and exploit different aspects of an application.

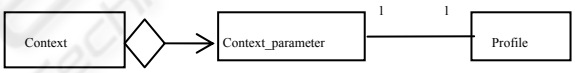

Figure 2: Description of context.

To cover all facets characterizing a context parameter, a profile can be proposed. The profile modelling is described in the section below.

3.2 Profile Modelling

In general, a profile is defined as a set of knowledge characterizing a context parameter such as a user, a role, a device, etc. To guarantee a generic and evaluative model, we present a high abstract description of profile.

Formalery, a profile is structured in a set of primitives such as:

- An owner, for who/what the profile is defined. The owner is a parameter of context such as user, role, etc.
- A profile describes the information characterized an owner. This information is structured and classified into a set of dimensions. Then a profile is related to one or more dimensions.
- A dimension represents the information that

characterizes a profile such as skills, preferences, etc. A dimension is represented by one or more attributes.

- An *complex attribute* describes information on a dimension. This attribute is composed on other (simple or complex) attributes
- A *simple attribute* is associated with a value. The simple attribute can depending on an concept which designantes a context parameter or a classe of data sources of an application.

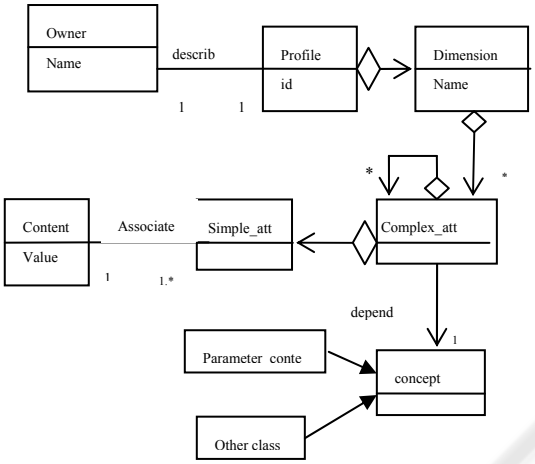

Figure 3: Meta-description of profile.

The instanciation of the profile modele allows to define the concrete elements of profile for a context parameter (user, role, etc.). these profiles are implemented in the XML documents.

```
<XML>
<Users>
      <user>U1</user>
        <profile id= 1>
            <acces right>
              <authorized>
             <action>val1</action>
              <object>O1</object> </authorized>
            </access right>
            <preferences>
             <activity> <location>home</location>
                  <object>O2</object></activity>
              <activity>  <location>hospital</location>
                 <object>O3</object> </activity>
              </preferences>
      </profile>
      </user>
      <!other users>
</Users>
```

Figure 4: A XML profile description.

Figure 4 illustrates an example of profile. The owner is *user*. The profile is composed in two dimensions: *access right* and *preferences*. The first dimension is composed on a complex attribute *authorized* and the second dimension is composed on the complex attribute *activity*.

3.3 Service Management

To guarantee a generic personalization process, services are created and associated to elements of profiles (dimension or attribute). A service is defined as an autonomous program. while a new dimension (or complex attribute) is added, a new service is created and associated with it.

A service is modelled by a set of input parameters PInput={e_1, e2, …, e_m} and a set of output parameters POutput={s1, s2, .., s_m}, phase of execution, criterion of execution. Then a service is modelled as follows:

Service = nameS(E, S, criterion, phase)

The variable Criterion designates the condition needed for execution of a service. We distinguish three criterions:

- Sequential: This criterion specifies that this service will be executed independently of other services;
- order: this criterion specifies that this service depends on other service.
- conditional: this criterion specifies that the execution of this service depends on a condition.

The criterion is defined by two attributes : (name, value) as follows :

- Name={sequential, ordre, conditional} and value
  - If name = sequential, then value = ";"
  - If name = ordre then value = nameS1→nameS2
  - If name = condition then valeur = "if" <condition> "then" operation ["else" operation] "end if" ;

A service is composed on a set of functions. Then, when a service is invoked, these functions will be executed.

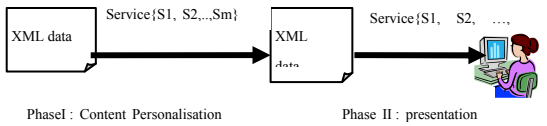

Figure 5: Services organized in two phases.

The personalization process is applied on xml data extracted from various databases in response to user query. The process requires two phases (as illustrated in figure 5). At each phase, a set of

services are executed. The first phase is concerned by the content personalisation and the second phase concern to adapt the data presentation at the user interface.

4 USING PROFILES FOR PERSONALIZATION PROCESS

The personalization approach requires two steps: The former selects the profiles which correspond to user and his current context from profiles database. The latter uses the profiles for personalizing XML data by executing services associated to the profiles.

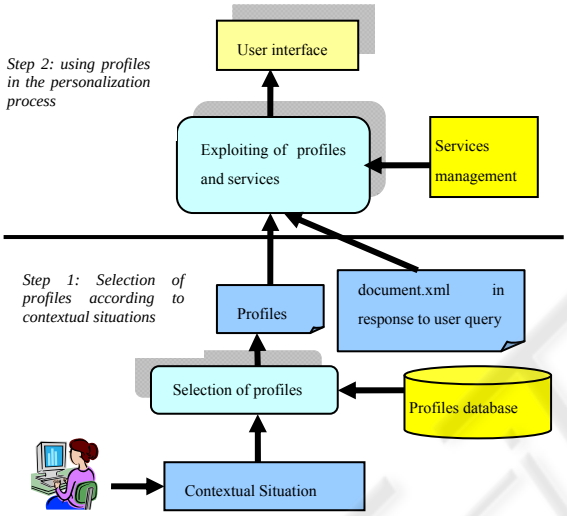

Figure 6: Different steps of personalization process.

The first step of personalization process consists in selecting the profiles that are valid with regard to the user's current context. This selection is performed by comparing the available profiles with the contextual situation.

Once the profiles have been selected, the second step consists in finding the services associated with elements of the found profiles. For that, we extract the structure of each profile. Then, for each element of a structure, we search the service associated with it from the services database.

Once the services are found, we must separate them in two groups: a group which belong to phase I (content personalisation) and a other group for services belonged to phase II (presentation personalisation).

Finally, services of phase I are executed followed by services of phase II.

5 CONCLUSIONS

In this paper, we have proposed a personalization approach based on the profile modeling for information systems. The approach takes into account different context situations in order to cover all facets of personalisation needs.

Actually, we are planning to implement this approach in the I2MS project (Sassi et al., 2007) in order to adapt the user interface.

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