A Uniform Integrated Reasoning Approach Based on User, Context and Service Models for Context-Aware Service

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With the development of wireless network, especially the advancement of sensor technology, more and more context information is captured. Context-awareness has been a key enabler for providing users with customized services in mobile commerce. The context-aware computing, in essence, is a process to support decision-making. A key capability of a proactive context-aware system is to infer the user’s needs by constantly capturing and interpreting his/her context. From the last century, researchers have done a lot of researches about context aware services, but most of the researches are targeted at specific services domain, not brought forward a uniform reasoning process.

Based on the previous context-aware researches, first we introduce a uniform context aware service user model which is made up of three representational levels: the cognitive level, the computational level and the domain level. The cognitive level relates the capability of perceiving, individual learning and developing through individual or social interaction with the environment. The computational level is the set of data structures, attributes, its relations, mathematical formulations and methods that allow representing the cognitive information of the user into readable and comprehensible meta-data for a software information system; The domain level is the particular environment in the real world in which the user is modeled. It is marked by specific characteristics and organization according to design goals of the software applications. Secondly we propose a context model, which is composed with three layers: bottom layer, medium layer and top layer. Each layer uses specific data of different abstract level. Thirdly, we use features or attributes to represent context aware services in vector form. Every service can be abstracted into classes.

Based on the three models, we propose a context-aware service reasoning mechanism framework. It is divided into 3 phases which are Needs Discovery, Service Looking-Up and Solution Selecting.

1) Needs Discovery: system discovers user’s needs, according to the current context of user;
2) Service Looking-Up: system looks up relevant services type which can satisfy the user’s needs;
3) Solution Selecting: system makes a cost-and-benefit analysis between candidates of each service type based on user model, context model and service model;

During the reasoning processes, we brought forward a case-based and rule-based integrated approach, which makes use of advantages of both the existing domain knowledge and the past experiences. When a new case enters the system, first the rule-based reasoning module will using some rules to filter the case classes from the pool of case candidates. Then case-based module calculates the similarity between the new case and each case candidate retrieved from case base. If the best matching case is not found, the rule-based reasoning module continues using some rules to adapt the new case. Then the second matching is triggered until a best matching is found. We believe this hybrid reasoning method will greatly facilitate the discovery of human needs in an open and dynamic environment to provide users with customized services in mobile commerce.