Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 94 (2016) 380 – 385

Procedia Computer Science

2nd Int'l Workshop on Communication for Humans, Agents, Robots, Machines & Sensors (CHARMS 2016)

A Context-Awareness based Dynamic Personalized Hierarchical Ontology Modeling Approach

Qian Gao[a,]*, Xiangjun Dong[a]

[a]School of Information, Qilu University of Technology, #3501 Daxue Road, Changqing District, Jinan 250353, P.R.China

Abstract

This paper proposes a new approach to construct an efficient and dynamic updated ontology model. In order to capture the implicit context information and to implement the personalized scalability demands of context model for different users, this paper proposes a new approach to construct a context-awareness based dynamic personalized hierarchical ontology model which divides the ontology into 2 layers: the first layer (general context-aware ontology) is used to capture the most essential conceptual entities in the context-aware computing environment, and the second layer (personalized ontology) is used to capture the individual user's preference by considering the domain ontology, knowledge structure, the term co-occurrence frequency and the Active Degree of each device. An algorithm of Domain Classification Algorithm is used and an Improved Concept Identification Algorithm is proposed in this research. The simulation results show that the time overhead of the hierarchical ontology model is low and it provides the users with results that more accurately satisfy their specific goal and intent.

Peer-review under responsibility of the Conference Program Chairs

Keywords: Ontology, Context-Awareness, Preference, Personalized

1. Introduction

The future of the development of today`s Internet is gradually converted from a "computer-centric" to "user-centered". It is urgent to provide users with more accurate, efficient and personalized cross-media information processing and retrieval service. To solve this problem, a user preference profile approach has been utilized to offer each user personalized search results[1]. Due to the advantage of unambiguous semantic expression,

* Corresponding author. Tel.: +86-18660816065; fax: +86-0531-89631250.
E-mail address: 66772307@qq.com

Peer-review under responsibility of the Conference Program Chairs
doi:10.1016/j.procs.2016.08.058

knowledge sharing, reuse, interoperability, and a variety of effective reasoning mechanisms, the ontology is used by many researches to mode data. However, the general domain ontology is not effective to capture the implicit context information and hence fails to implement the personalized scalability demands of context model for different users. In order to solve this problem, a personalized context-based hierarchical ontology model construction method is adopted to reconstruct the ontology with weighted related terms, so as to reflect the users' preference. It is divided into 2 layers; the first layer called general context-aware ontology is used to capture the most essential conceptual entities in the context-aware computing environment, and the second layer called personalized ontology is used to capture the individual user's preference by considering the domain ontology, knowledge structure, and the document information stored on all of the smart devices that belong to the same user, so as to realize the dynamic update of the general context-aware ontology.

2. The Realization of the Proposed Method

2.1 General context-aware ontology construction model

2.1.1 Time context-aware ontology model

Context can be divided into instantaneous context and continuous context based on time sequence features. Instantaneous context requires the description of point-in-time, while continuous context requires the portrayal of time interval. In this paper, we adopt the method proposed by Xu who established the time context-awareness ontology via the description mechanism combined with point-in-time and interval, and obtained the corresponding time information by realizing the connection with time ontology by means of the object properties of "has Time"[2].

2.1.2 Location context-aware ontology model

The location information includes the position and the spatial topological relation of the users or the devices. In this paper, we integrated and simplified the SOUPA-Location ontology and the GCACO-Location ontology proposed by Chen[3] and Xu[2], classifying the location ontology information into two kinds: one is Geographic Position class, and the other one is Space Region class. The Geographic Position class corresponds to the space coordinate system, and it supports the transformation and coordination of a variety of spatial reference systems. The Space Region class is used to describe the geometric features of a certain space area. One Space Region includes a series of Geographic Positions. Furthermore, the Space Region is further divided into office places and leisure places. The office location information is associated with device ontology, which is helpful for knowledge reuse. The location context-aware ontology model is shown in fig.1.

2.1.3 User context-aware ontology model

"Users", the core concept in the computer environment perceived by the context, can exert certain influences on the tasks of administrators. This paper simplifies the ontology of GCACO users proposed by Xu[2], covering only the basic features and schedule of users. "Users" here refers to the behavioral entities in the computer context perceived by the context, including human and artificial intelligence agents. Within the model, the basic features of the user, including the personal data (such as name, status and age) and social nature (such as the acquaintances, relatives and colleagues), is described by "user profile". This kind of information does not change frequently. As regard applications excluded from the special users, all required is to generally set the "user profile" target to describe the basic information of each user, rather than getting to know their specific features. The schedule of users is a collection of events, describing the time, place, participants and what happened, with each event involving one or more tasks. When a user is performing a specific task, this task may be decomposed into one or more activities. The above concepts need to correlate with the time and position entities to obtain relevant time and position information. Fig.2 illustrates the main concepts and relations in user context-aware ontology model.