

Conceptual ontology framework for socio-cultural aware Computer Supported Collaborative Learning environments

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Abstract: Considering the socio-cultural contexts of learners and teachers involved in a collaborative learning activity, we provide a conceptual ontology framework for socio-cultural aware CSCL environments. This framework is composed of two ontologies communicating together and sharing the socio-cultural knowledge about the user in order to perform appropriate adaptation tasks.

Background

The purpose of this paper is to describe a new approach to adapt the CSCL environment to the learner's socio-cultural profile. In fact, adapting CSCL environments to socio-cultural characteristics of its users is a challenging task (Blanchard et al., 2010). First, it is a multidisciplinary task that needs to carry studies within humanities and social sciences (anthropology, ethnology, sociology and psychology), educational sciences and computer sciences (Human Computer Interaction (HCI), user modeling, adaptation/personalization, mediated collaboration) in order to determine and define two types of knowledge: (1) knowledge about the user which consists in socio-cultural characteristics influencing his/her behavior, personality and different states (emotional, cognitive and motivational) and (2) knowledge about the CSCL domain represented by socio-culturally sensible variables. Second, in such environment, the knowledge handled by the adaptation is very specific, semantically rich and holds various relationships among them. So to consider all these issues, we propose an ontology based models of the user characteristics (1) and the domain characteristics (2).

The proposed conceptual ontology framework

The framework is composed of two ontologies: the ontology based socio-cultural profile (SOCUDO) and the Socio-Cultural Aware CSCL Ontology (SCACO) described below.

The ontology based socio-cultural profile

The goal of this ontology is to represent socio-cultural characteristics of a user, independently of the area in which it can be used. To collect and define the concepts of this ontology as well as relations between them, we conducted a multidisciplinary study (Ouamani et al., 2012) in several disciplines cited above. These works studied the impacts of socio-cultural variables on humans and the necessity to take them into account in several areas. So, this ontology was built from the scratch. Once the concepts and their relationships were defined, we realized the first conceptualization of this ontology called SOCUDO.

The SOCUDO concepts are describing as following: the user has a set of dimensions: he/she is characterized by two sub profiles (individual and cultural profile), lives in a social context, and has different states (emotional, cognitive and motivational state). He/she also belongs to an age class which is an important concept here because the dimensions mentioned above vary across age. Each dimension is composed of a set of characteristics.

The socio-cultural aware CSCL ontology

This ontology is designed to represent computer supported learning collaborative variables, influenced by the socio-cultural characteristics of the user represented by the first ontology. To build this ontology SCACO we have applied the same construction process of SOCUDO. Subsequently, we tried to compare our ontology with existing ontologies representing the same domain subject, trying to find similarities or a possibility of extension. We have found that the more appropriate one is the CSCL ontology (Barros et al, 2001).

The communication and the sharing of socio-cultural knowledge between the two ontologies:

The two ontologies are closely related. They communicate to share socio-cultural knowledge about the user in order to trigger the appropriate adaptation tasks. The SOCUDO ontology is instantiated for one user after his/her information inputs via the forms; this instance of SOCUDO triggers an instance of SCACO (see Figure 1) for this user based on adaptation rules (example: If PowerDistance= hierarchical and belonging= collective then assistanceDegree= high show wizard). Then, the adaptation process will use this instance to trigger the right adaptations tasks for this user.

The figure 1 shows an example of an instantiation part of the two ontologies based on some adaptation rules. The user "Sarah Ben Foulen" is from Tunisia and live in Tunisia then he has a cultural profile

characterized by a “collectivism” belonging, “Hierarchic” power distance, “monochronic” time attitude, “dominance” relationship with environment and “Uncomfortable” risk and uncertainty avoidance. These concepts values trigger specific concept values in the second ontology: For example “Hierarchic” power distance triggers a “pushy” assistance manner, “teacher” help initiator, “formal/structured” activity structure, “hierarchical” control type, etc.

Discussion and conclusion

This poster presentation outlines an ontology based modeling approach that aims to give a common vocabulary used to model user socio-cultural characteristics and to show how these characteristics impact the collaborative learning settings and outcomes. The knowledge modeled using ontologies as well as the adaptation rules were extracted and defined from a considerable multidisciplinary literature study effort.

This research has several practical and theoretical implications (1) concerning its significance for theory development, the study contribute to previous attempt to understand the socio-cultural impacts on user (behavior, communication, cognition) by trying to gather, unravel and model all the socio-cultural influences on human beings and its impacts on collaborative learning. (2) Concerning its significance for educational practices, the adaptation of CSCL systems to the socio-cultural characteristics of the learners may enhance the learners’ satisfaction with the collaborative learning tools and in an intercultural collaboration, the system will be able to resolve cultural conflicts and make the intercultural collaborative experience more effective. (3) Concerning its significance for design and development practices, the use of ontologies may enhance the sharing, the usability, the structuring of the knowledge handled by the system, the interoperability of ontology based model and the reasoning about knowledge.

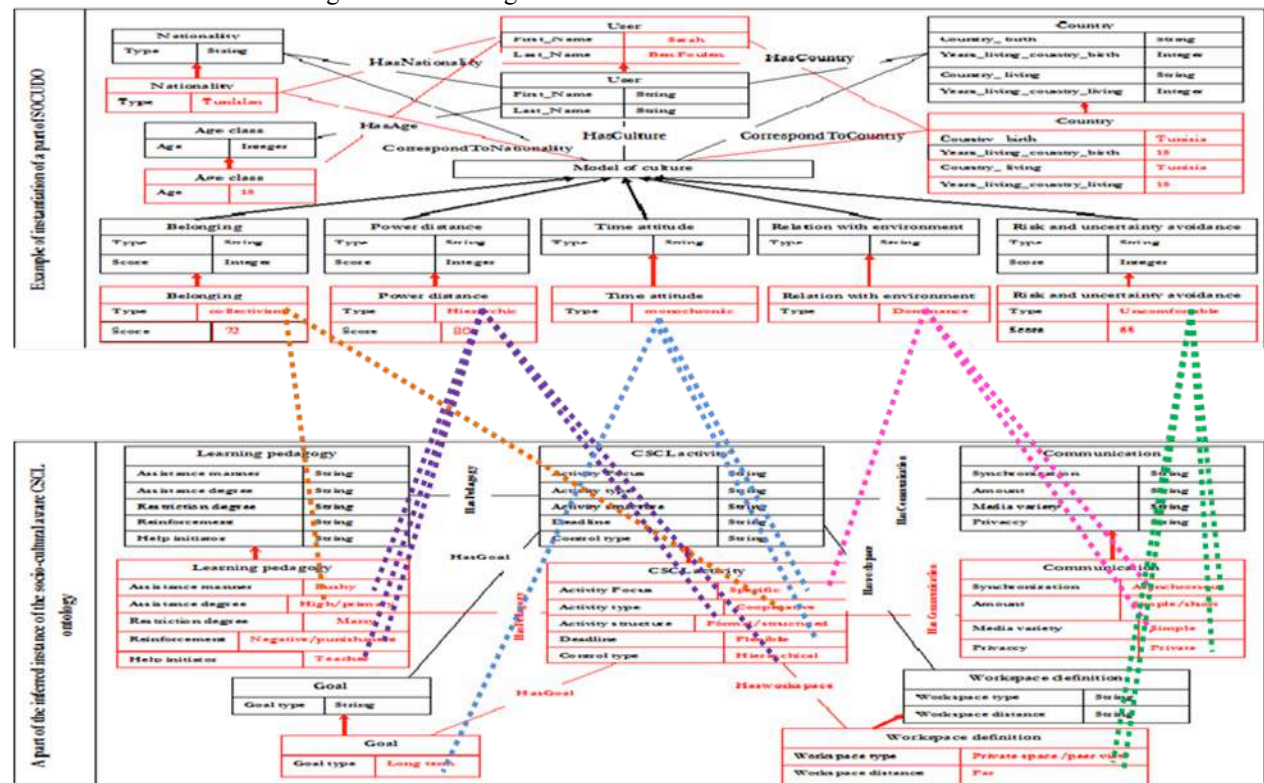


Figure 1. Excerpt of an example of instantiation of SOCUDO and SCACO ontologies and their relationships

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