ABSTRACT

Dynamic Cultural Contextualisation of Intelligent Learning Environments

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Globalisation coupled with expansions in Internet and mobile communication infrastructure have facilitated greater knowledge access and transfer across the world. Mobile and adaptive educational software, virtual classrooms, gaming environments, and Massive Open Online Courses (MOOCs) are altering the traditional landscape of education. As these software interventions, largely created by Western developers, filter down to students in developing world contexts there is growing interest in features related to cultural diversity and awareness. Intelligent Learning Environments (ILEs) have the most realistic potential for culturally aware design due to years of research on adaptive and intelligent techniques for changing the content, presentation, and support delivered to students.

Before automated culturally-aware ILE solutions emerge on a large scale, a computational representation of a student's cultural background is necessary for altering ILE behaviour and presentations in familiar and culturally appropriate ways. The cultural context expressed in language and concepts needs to be explicitly available and most importantly, a student's preferences for culturally aware features should be at the forefront in deciding how cultural adaptations are applied to ILEs. The thesis aims to model a student's cultural background and focuses on automating two major types of adaptations: situated educational content and language into more colloquial and culturally familiar forms. These adaptations facilitate individualised ILE presentations and encourage emotive interaction with ILEs which may lead to productive learning outcomes and attitudes.

The thesis contributes to the advancement of knowledge through the development of culturally aware models and techniques. Firstly, the cultural background of a student was modelled in detail using socio-cultural and personal demographic data, and classified according to five major areas of cultural influence with 68% accuracy. The model was used to predict familiar and appropriate cultural concepts for use in adapting educational content and language for a student with over 75% accuracy. A flexible technique using ontologies and rules was developed for annotating and reasoning about cultural concepts and language. Finally, a classification scale was developed for automating the cultural adaptations targeted in the thesis. Findings from experiments revealed thresholds that tip student preferences for and against the use of cultural adaptations. Some interventions such as use of cultural references were beneficial in creating less tense learning experiences and maintained learning gains established for ILEs. However, extensive use of colloquial language detracted from the learning experience and confirms the need for some degree of student-initiated control.

Keywords: Phaedra Sarah Mohammed; Cultural Awareness; Cultural Semantics; Cultural Student Model; Dynamic Cultural Adaptation; Intelligent Learning Environment.