ADAPTIVE SOCIAL CONNECTEDNESS IN A MULTIMEDIA E-LEARNING ENVIRONMENT

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Keywords: adaptive systems, social connectedness, communication.

Abstract

Adaptive hypermedia systems are beneficial to e-learners in tailoring content to individual characteristics such as prior knowledge, learning preferences, etc. However, unlike popular non-adaptive learning management systems such as Moodle and Blackboard they do not support social connectedness by allowing communication with other learners. This can lead to feelings of isolation amongst learners and ultimately learner demotivation. Enabling communication has been shown to improve cohesion within a learner group and allows a tutor to monitor learner participation and intervene before learners become disengaged. This paper outlines a stand-alone component connect! for the selection of multimedia communication tools in adaptive e-learning systems to support social connectedness. In addition to the already proven benefits of supporting social interaction, attaching such a module to an adaptive hypermedia system allows us to introduce the novel feature of tailoring the communication method to the individual needs of the learner. We draw on research in the area of media ecology to assist us in making our decisions.

1 Introduction

Connectedness has been described as the feeling of being “in touch”. It describes a fundamental need of belonging and promotes social relationships. Connectedness is related to, but not identical with the concept of ‘social presence’, the awareness that others are present. Social presence conveys the impression of connectedness, but active contact with others is necessary for true connectedness [13].

E-learning is increasingly used for training and education. Students in a course are often from a variety of different organizational backgrounds, levels of knowledge and have different learning goals. Adaptive hypermedia learning systems aim to tailor the learning material seen by the student to the individual differences of the students [7]. However, unlike face-to-face learning, e-learning can not provide supporting group dynamics among peers and tutors miss out on social contact that would enable them to detect a learner’s disengagement [2]. To bridge this gap, social connectedness features can be integrated in an adaptive virtual learning environment to compensate for this lack of immediate social contact.

A recent presentation of the state of the art of adaptivity in e-learning platforms [7] made the meaningful division into popular systems and adaptive systems. Adaptivity usually refers to the systems ability to adapt navigation, content and recently also the presentation of the content to the model of the user. It is clear from this work that adaptive hypermedia systems do not support social connectedness.

This paper outlines a framework that enables an adaptive hypermedia e-learning system to provide social connectedness. This framework surpasses traditional popular systems in that it allows us to use the information the adaptive system has about a user to tailor the form of connectivity to individual characteristics. In section 2 we briefly describe the concept of social connectedness, introduce adaptive hypermedia systems, and describe how work in the area of media ecologies can be used to select appropriate communication tools for e-learners. In section 3 we outline the specific criteria we will use in our selection process. In section 4 we describe the connect! adaptation framework. In section 5 we conclude and describe future work.

2 Related Work

The discussion of the requirements for adaptive social connectedness in multimedia e-learning environments requires a combination of previous work from a number of areas of expertise. The following subsections give a brief overview on work in the areas social connectedness, adaptive multimedia learning environments and media ecology.

2.1 Social Connectedness

Social connectedness has been mentioned as the most fundamental concept compared to social presence and awareness [13]. The concept of connectedness has been developed originally in a psychological context and refers to an individual’s relationship to society. The fundamental need for social connectedness impacts the choice between communication channels, e.g. conversations on mobiles have been mentioned as pacifiers in the literature and text messaging as a way to share an experience [13].

Social connectedness can be supported by providing for a number of typical settings for social interactions [10]. Opportunistic and spontaneous communication happens incidentally and often initiated by one party only. Awareness of presence is the experience of other people populating the
same space, often the same physical space, although the concept can be transferred to virtual space as well. The importance of social connectedness for learning is based on Vygotsky’s theory and his concept of the “zone of proximal development” (ZPD) [14]. It represents a level of development that can be attained when people engage in social behaviour. The guidance of a tutor and peer collaboration helps to surpass what the learner can attain alone.

2.2 Adaptive Multimedia Learning Environments

Adaptive hypermedia systems for learning or multimedia e-learning systems usually have a basic architecture that consists of a user model, a domain model and an adaptation model (see Figure 1).

![Figure 1: Basic Architecture ALS](Image)

The domain model represents the concept of the subject domain and it describes these concept structures as concept maps, semantic networks or concept graphs. The user model represents general characteristics of the user such as location, preferences for devices, previous knowledge, knowledge state, learning goals. The adaptation model connects the two previously outlined models and any models relevant for the adaptation to the user’s needs, using adaptation rules. It thus enables individualized selection matching the preferences of the user [8].

Hypermedia e-learning systems can be characterized by the features they provide. [7] differentiates between popular and adaptive systems. This characterization describes one of the main problems with adaptive systems; they are not used much outside the research environment [7]. An overview is provided in Table 1. We can immediately observe that the systems described either lack the collaboration features or the adaptivity features.

Most of the popular systems such as Moodle, OLAT, OpenUSS and Sakai have their strength in features directly related to learning, learning management and cooperation. Most of the systems have a chat, but no other features supporting collaboration. They do not possess any features supporting adaptivity.

Adaptive systems obviously have their strength in adaptivity, providing features for adaptive guiding, link annotation, link hiding and adaptive presentation support. The overview considers AHA!, Alfanet, ELM-ART, InterBook and NetCoach. The systems do not contain the complete list of learning related features, cooperation features are only supported by Alfanet and NetCoach and collaboration features cannot be found in any of the systems, except for a chat in NetCoach.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Moodle</th>
<th>OLAT</th>
<th>OpenUSS</th>
<th>Sakai</th>
<th>AHA</th>
<th>Alfanet</th>
<th>ELM-ART</th>
<th>InterBook</th>
<th>NetCoach</th>
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<tr>
<td>Assignments – Choice</td>
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2.3 Media Ecology

Media ecology considers the effect of media on human perception and understanding. It considers the study of the structure, content, and the impact on people. A recent study shows that boys have better internet access than girls, and the oldest and youngest members have less access than teenagers. Older teens have more access points available and more affluent families have more and better internet access than poor families [11]. Similar information on use of ICT [9] provides guidelines which technologies should be used. The selection of suitable media has to match...
the learners’ social values, access to tools and typical activities [12] to support full social interaction of the learner [14]. For the social connectedness component media ecology can help to select tools suitable for the individual learner. The methodology for this selection will be described in section 3.2.

3 Adaptive Social Connectedness

The connect! module aims at bringing together social connectedness and personalized e-learning. As mentioned before, most adaptive systems do not support collaboration tools and provide only a minor selection of cooperation tools. To bring the two aspects together one can either try to introduce adaptivity to the popular but non-adaptive systems that are oriented towards social interaction, or introduce a social interaction component to the adaptive systems. This research aims at the latter.

3.1 Existing Tools Supporting Connectedness

The tools which enable social connectedness are well-known and used by many of the learners in their daily lives. This is of great benefit for the accessibility of peers. If a learner needs to contact peers or the tutor while using the e-learning system, they will be available even if they are not logged into the e-learning system. The tools suitable for social connectedness need to support a feeling of “being in touch” [13]. The degree of connectedness can vary between co-presence, an awareness of others, co-location, the feeling of being in the same place as others and perceived access to another intelligence, the feeling of having someone else for support within reach [3].

The tools used to support social connectedness can be divided into the different categories: chat, podcasting tools, web conferencing tools and text messaging tools. Each tool category is represented by at least one commonly used program. The chat function is represented by the internet messenger, Skype and Yahoo! messenger. YackPack is an example for a podcasting tool. Skype is an example for a web conferencing tool. Users can leave their mobile phone number to be available for other learners to contact them.

E-Learning systems usually use communication tools that are included in the system itself. This restricts communication, especially synchronous communication, to other learners that are also accessing the system at the same time. In addition to that, learners might have to get familiar with tools they have not used before.

The module will select the tool based on learner preference. The learner will see all other peers using this tool regardless of whether or not they are using the e-learning system.

3.2 Adaptation Criteria for Social Connectedness

Information ecology recommends selecting tools that are suitable for the user. In the context of the connect! module this requires assessing the digital literacy of the learner, the learning style and the tools preferences of the learner. The digital literacy of the learner describes the ability to use technology or communication tools [6]. Learning styles define how a person learns and some research shows that these learning styles also have an impact on the preference for communication tools [1].

The adaptation has to consider the knowledge level of the learner to enable discussion with peers on a similar knowledge level. To cater for discussions rather than private conversations, a minimum group size has to be considered [4]. Group members belonging to the same or neighbouring of six knowledge levels (beginner, immediate, advanced, each level 1 and 2) enable an incremental change of group members, rather than an abrupt change of groups with learning progress. This again enables groups to stay stable as long as members progress in a similar fashion, which supports group cohesion and therefore caters for social connectedness.

<table>
<thead>
<tr>
<th>Adaptation Criteria</th>
<th>Assessment Items</th>
<th>Importance Ranking</th>
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</thead>
<tbody>
<tr>
<td>Knowledge Level</td>
<td>n/a – Input User Model of learning system</td>
<td>1</td>
</tr>
<tr>
<td>Tools Preference</td>
<td>Tool list, Ranking of tools</td>
<td>2</td>
</tr>
<tr>
<td>Learning Style</td>
<td>Online ILS Questionnaire</td>
<td>3</td>
</tr>
<tr>
<td>Group Size</td>
<td>Minimum number of 2, Maximum number of 6</td>
<td>4</td>
</tr>
<tr>
<td>Digital Literacy</td>
<td>Self-perceived skills, Time spent online, Years of internet use</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 2: Adaptation Criteria for Social Connectedness

A list of assessment items for each adaptation criterion details the selection process and depending on the importance ranking the criteria carry more or less weight for the selection process (see Figure 2). The knowledge level is assessed using the input from the user and domain models of the learning system. Therefore there are no further assessment items. The tools preference is assessed through feedback to a list of available tools and a preference ranking of the tools listed. Learning style is assessed using an online ILS questionnaire [5]. The system checks whether at least two or a maximum of 6 learners with similar preferences can be found. If the group is bigger than six learners, a new group has to be founded. Digital literacy is assessed through self-perceived skills, time spent online and the years of internet use [6].
4 Connect! Adaptation Framework

The criteria outlined in section 3.2 and the basic architecture of adaptive learning systems lead to the framework outlined in Figure 3. Initially the information already contained in the user model of the adaptive system is used. We assume that input for adaptation to the knowledge level and the learning style can be retrieved from the learning system. This is combined with information collected from the student in an assessment for the connect! module. This information covers a list of communication tools, a ranking of these tools, both required to adapt to tools preferences of the learner. Self-perceived skills using the internet and time spent online as well as years of internet use provide information on the digital literacy.

The connect! module stores all the required information in the connect! profile database. The adaptation engine requests input from the connect! profile database.

The initial research considers the module as outlined above. Future works will include interfaces with some of the adaptive hypermedia systems such as AHA! and further development of adaptivity features in non-adaptive systems such as OLAT make the module suitable for those also. The benefit for systems with communication features is the option to use tools familiar to the learner and an improved accessibility of peers that are not logged into the system. The module will be tested with secondary school students of the senior cycle in a blended learning scenario over the school year 2008/2009. The test considers learning styles as a selection criteria for learner grouping and uses the connect! module to support stronger learner interaction and to provide feedback from the teacher. The module will be evaluated by assessing the impact on the learning results compared to students using non-adaptive system support.

The connect! module is part of a research project that aims at delivering an adaptable system focusing on the quality of experience (QoE) of the learner. The improved communication options will make a contribution towards QoE.

Acknowledgements

This work is supported by Science Foundation Ireland (SFI) Research Frontiers Project CMSF 696.

References


5 Conclusions and Future Work

Our research combines for the first time considerations of social connectedness, and adaptivity in adaptive e-learning systems. The proposed connect! module enables continuous social interaction, supporting users of adaptive e-learning systems.


