Interoperable Conversations in a Peer-to-Peer Learning Environment
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Abstract

Natural human interaction is characterised by a rich set of communication modes often not available to the online user. Interoperable conversations enable an online user to interact with the environment in a manner that is more natural and relevant to one’s context. ECOLE is a prototype of a peer-to-peer learning environment which supports and encourages conversations within and across conversation modes in a managed fashion.

1. Introduction

The idea that learning can be facilitated by constructive participation in a community of practice is not new (Vygotsky [7] and [8]; Bielaczyc [2]; Rogoff [5]; Sfard [6]). A necessary ingredient in any effective collaboration is the need to ground interactions in a visible and shared context (Crook [4]). The situatedness of interactions – the situation of the context of messages exchanged between members of a community in the context of application – is significant (Brush et al [3]). ECOLE or electronic collaborative learning environment, was designed to support the linking of contexts to enable conversations to be initiated and subsequently resumed in a context other than that for which it was originally designed or intended. This paper describes the design principles of ECOLE and its applicability to peer-to-peer learning.

2. The ECOLE system

2.1 Collaborative learning environments

The social constructivist view proposed by Vygotsky ([7] and [8]) emphasises the importance of the contribution of collective experiences to the personal learning experience. Collaborative interactions enable the design, critique, management and distribution of knowledge within the community by its members (Bereiter [1]; Rogoff [5]). Learning, in this model, focuses on developing meta-cognitive skills to facilitate reflection, internalisation, and self-directed knowledge discovery.

The nature of human interactions gives rise to two problems within collaborative environments. In the first instance, the factor that enables most human interactions to be compensatory and complementary is the interchangeability of human conversation modes, and the ability to integrate conversations across different modes to construct new conversations. This is derived from the ability to construct abstractions of the underlying information represented in the various location forms. The separation of abstraction and representation has enabled higher-order processes which would not have been possible otherwise. Here, we use the term “conversation modes” to loosely refer to common “modes” of communication on the Internet such as discussions, annotations and emails.

The second problem, faced by many organisations and learning communities, is knowledge management. Structured procedures are needed to contextualise, codify, retrieve and reuse information. If online conversations are nothing more than needles in a barn of digital haystacks, such conversations are of little use. Users require support to transform information into knowledge, and to interact with the community constructively. The semantic web initiative, championed by Tim Berners-Lee, was developed to address similar kinds of problems. Other related initiatives include topic maps, an ISO standard, which provides a structured framework to track, index and organise information.

2.2 Evolving conversations in ECOLE

Existing collaborative environments do not address the important issues adequately. ECOLE was designed with two guiding principles: conversations can be initiated from contexts of varying granularity, and conversations can be expressed in and span across a variety of interaction modes. Anchoring conversations in contexts of varying granularity enables the user to interact with the community at the level and in a manner which addresses his most immediate needs. However, the proliferation of such conversations, if untracked, will lead to loss of contextual information and eventually result in an unmanageable tangle of information. ECOLE manages and tracks contextual information between conversations, even across conversation modes, thus ensuring the bi-directional retrievability of context for any conversation.

ECOLE consists of five primary components: links manager, discussion board, annotation engine (for in-page discussions), email, and the context manager. The links manager supports the creation of categorised web resources which provides the basis for any conversation. The context manager tracks all conversations both within a particular modality and across modalities. Conversations can evolve, starting from a categorised web resource, across
several conversation modes. Users accessing a conversation can retrieve and access the original context from which the conversation was spawned to understand the environment of the original location. In each transformation, the context manager establishes a bi-directional link between the source and target conversations. A user can subsequently retrieve the context from which the original conversation was conceived. However, transformations of conversations are governed by certain rules, summarised as follows.

Figure 1. Evolution of conversations

The following scenario illustrates how conversations evolve in ECOLE and the potential instructional value this holds. The learners in this scenario are grappling with the cross-referencing feature in Microsoft Word. The scenario starts some time after the instructor has added links to Microsoft Word tutorials in ECOLE.

Andrew (Links→Annotation): [starts tutorial, comes across the term “cross-reference” and adds a public annotation] It may just be possible to implement a bibliography facility in Word with this. Helps consolidate my references.

Bobbi (Links→Annotation): [sees Andrew’s comment and contributes one] Surely, cross-references are possible between Word documents (I recall our instructor saying so). Wow, a bibliography facility in Word!

Instructor (Links→Annotation→Discussion): [sees Bobbi’s comments and, concerned for his reputation, clarifies the issue] Bobbi is only partially correct. Yes, cross-references can be used for *simple* bibliographies but nothing more. You can’t reference resources across docs.

Charlie (Discussion): [reads instructor’s posting and responds] I heard that Word can indeed support complex bibliographies. Check your stuff, sir!

Instructor (Discussion→Email): Dear Charlie, you are right: Word can support complex referencing mechanisms but only via extensions – though I do not like your tone.

Charlie (Discussion→Email): [receives email from instructor and, realising he may have misunderstood the instructor, checks the evolution of this conversation and responds] You’re right – sorry…

Don (Discussion→Email): [sees instructor’s posting alerts his friend, Bobbi] Hey Bobs, check this out…

Bobbi (Annotation→Discussion→Email): [checks the instructors posting and, armed with a better understanding, updates her comment] The instructor has clarified this in the forum – Word isn’t that capable.

Don (Links→Annotation→Discussion, Links→Annotation→Email): [having traversed the conversation trail, he realises that Andrew may also be in the dark, and decides to email Andrew about Bobbi’s comments] Dear Andrew, You may want to review Bobbi’s comments…

Andrew (Links→Annotation→Discussion←Email, Links→Discussion): [receives email from Don, and checks Bobbi’s updated comment. Realising he’s totally confused, decides to discuss the tutorial in the forum…]

3. Conclusion

Collaborative learning environments emphasise the importance of active participation in the learning process, that knowledge and competency are attained by interacting with the environment. An inherent limitation of many collaborative environments is the artificial constraint of supporting new conversations only in the form of the original conversation. For example, a discussion thread will remain locked in a discussion board. Interoperable conversations have the potential to enhance the online experience and to bring online users one step closer to acquiring affordances normally taken for granted in natural human interaction. ECOLE enables multi-modal and multi-granular conversations to be spawned, reused and tracked. This helps promote contextualised learning processes and encourages reflection, qualities necessary for deep learning. Presently, ECOLE addresses only one aspect of collaborative learning. However, efforts are underway to explore other dimensions of collaborative learning using ECOLE and to test the effectiveness of ECOLE in ISS courses.

4. References