CILT SEED GRANT REPORT
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PROJECT TITLE:

"INTEROPERABILITY AMONG KNOWLEDGE-BUILDING ENVIRONMENTS"

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WEBSITE:

http://www.cs.colorado.edu/~gerry/xml/

PROJECT SUMMARY:

A number of software environments have been developed to support collaborative knowledge building, typically incorporating a persistent discussion forum. Despite striking similarities and interesting differences among these community learning tools, there has been little direct interchange of ideas, designs, experiences and data among the developers. **A first step toward increasing collaboration in this research community is to define a mark-up**

language to represent, archive and translate the data captured in these systems. This will help us to understand the design space of such knowledge building environments, to share software tools and to archive data for analysis. This project brings together representatives of research groups building related tools and evaluating the learning supported by those tools. (Proposal Abstract)

RESULTS AND IMPLICATIONS:

Requirements for an XML DTD

The PI led a student project in the Fall analyzing the requirements of an XML (eXtended Markup Language) DTD (Document Type Definition) for data interchange among Knowledge-Building Environments (KBEs) featuring threaded discussions. Data requirements for five KBEs were considered:

- WebGuide – a KBE with perspectives
- DynaClass – a threaded discussion forum for college classes
- DynaGloss – an interactive glossary with discussion
- DynaSource – an interactive bibliography with discussion
- JIME – an on-line scholarly journal with on-line review

Draft of two XML DTDs – a recursive and a non-recursive version

The PI hired one of the students from the student project, Aaron Martin, to continue work on the grant in the Spring and Summer. Two DTDs were developed. A recursive representation of discussion threads facilitates the display of the threads by associating nodes directly with their parent nodes. A non-recursive representation uses explicit links to connect nodes. This requires computation and manipulation to reconstruct the threads, but allows for multiple links to a given node. In some cases, one of these versions is more useful than the other.

Development of translation procedure between recursive and non-recursive versions

Some KBEs lend themselves to either the recursive or the non-recursive version for import or export. Therefore, it was necessary to have a procedure for converting between the two alternative versions. This conversion routine has been developed.

Development of several export procedures to XML from source code and from output

We developed export routines from the five KBEs listed above to the XML standard format defined by our DTDs. In some cases, the routines were integrated with the KBE's source code. In other cases (especially where the source code was not readily available or easy to modify), we produced the XML from the KBE's HTML output. These are the two major ways of exporting to XML and we illustrated both of them.

Development of a display style sheet for XML files

The recursive version of XML output from our procedures is automatically displayed in a well formatted way by the Internet Explorer 5.0 browser. Therefore, it was not necessary to design custom style sheets.

Development of a website to make DTDs and procedures available as Open Source

The project website is currently under construction and not available to the public yet. It will be released prior to the end of the project in late August. The site will provide complete instructions and tutorials in how to use the project software and how to program export procedures from other KBEs. The site will include the two DTDs, sample export procedures from source code and from HTML, and the conversion procedure between recursive and non-recursive XML formats.

Organization of a workshop on interoperability among KBEs at CSCL '99

The PI organized a workshop at CSCL '99 on KBEs. It attracted over 60 participants, including many of the people associated with this CILT project.

Submission of funding proposals to continue project

The PI submitted a number of funding proposals to continue the CILT project, often in collaboration with other project members:

- Proposal to Intel Corporation for development of KBE component architecture for interoperability. Submitted October '99. Not funded.

- Proposal to Colorado Advanced Software Institute for development of KBE component architecture for interoperability. Submitted November '99. Not funded.

- Proposal to Lotus Corporation for development of study of models of KBEs. Submitted January '00. Not funded.

- Pre-proposal to NSF ITR program for international collaboration on KBE component architecture for interoperability. Submitted January '00. Not funded.

- Pre-proposal to NSF ROLE program for research on KBEs using discourse analysis. Submitted March '00. Not funded.

- Proposal to NSF CSS program for research on KBE component architecture for interoperability. Submitted February '00. Pending.

- Proposal to NSF ITR program for research on KBE component architecture for interoperability. Submitted February '00. Pending.

- Other proposals to be submitted.

Preparation of reports

This is the final report on the CILT project. Details and products will be included in the website.

LESSONS LEARNED: COLLABORATION:

The technical goals of the project have been met in terms of producing formats and procedures that demonstrate the feasibility of data interoperability among KBEs. However, the inter-institutional collaboration goals have not yet been met. All of the work on the project was done at the PI's department. There was only limited interaction with other project members, mostly with Chris Hoadley.

Early in the project it became clear that a certain level of preliminary work was needed before collaboration between institutions could occur. The basic technology had to first be created (at least in a preliminary, demo version) and the goals of the project had to be made more concrete with demonstrations of data interchange among different systems. Because the PI and his colleagues had access to several KBEs, they were able to undertake this preliminary work on their own. Unfortunately, that took the entire seed grant year to accomplish.

NEXT STEPS:

The next step is to involve people at other institutions in making export procedures from their KBEs. Once the seed project work is documented on our website, this should be relatively easy to do.

A longer range goal is to build components of KBEs that can work together within a well-designed component architecture. The work on XML data may actually lead naturally to this stage. The PI is currently working on a version of his WebGuide KBE in which components exchange data using the XML DTD developed in this project. As other developers create export procedures to this format, they will be moving in this direction as well.

RELATED RESOURCES:

Links to the KBEs used in this project are available at: http://www.cs.colorado.edu/~gerry/webguide/