CIMEL: Constructive and Collaborative, Inquiry-based Multimedia E-Learning
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We have developed a beta prototype of CIMEL, a multimedia framework for constructive and collaborative, inquiry-based learning in computer science courses (see Figure 1). *Constructive* learning goes beyond learning by receiving knowledge passively, to learning by building systems, with immediate, visual feedback. *Collaborative* learning encourages students to interact with instructors and librarians, via both live links and remote-controlled "show me" sessions or by reviewing a multimedia FAQ of recorded "show me" sessions. *Inquiry-based* learning guides the student into pursuing exploratory research in a community of students and scholars. A reference librarian persona suggests research topics, then helps students extract content from both traditional library resources as well as dynamically mined material, answer typical questions and help construct annotated bibliographies, reviews and research proposals. Within this general framework, we have already developed content for several courses in the Computer Science curriculum, including Introduction to Computing for first year students, Software Engineering for upper level undergraduates, and Object-Oriented Software Engineering at the graduate level. We have evaluated the multimedia and emerging trends technology and found significant effects on learning [1, 2, 3, 4, 5]. Recent experiments extend our results to teaching Java to first semester students. Our papers and other documents, evaluation materials and prototype are available at www.cse.lehigh.edu/~cimel.

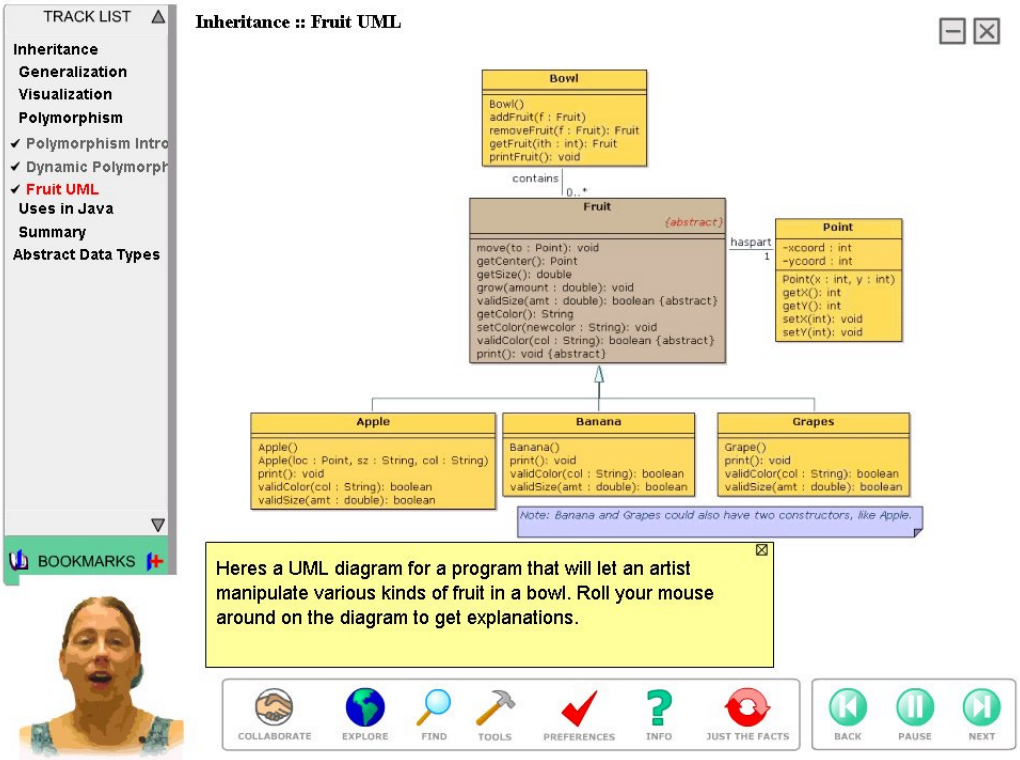

Figure 1: Screen Capture from CIMEL prototype

This past summer REU students from Morgan State University and Cedar Crest College (a historically black and a women's college, respectively) as well as a RET middle school teacher and two minority students from a local high school, joined the CIMEL team to assess and improve the CIMEL interface and content for a diverse audience. Already we have added a black female as a new professor persona. Our goal is to expand access to computer science education, attracting more students with diverse learning styles, especially women and minorities, to study and appreciate the field as a broad intellectual discipline.

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Our **roadmap for development and dissemination** incorporates the following elements:

- **Sample multimedia for a first year course is currently available**, special topics for an upper level course have also been implemented, and plans have been made to investigate adapting the multimedia for use in secondary schools.
- A **public interface** at cimel.cse.lehigh.edu illustrates our main ideas and sample content, including software engineering, trend detection in object oriented programming, and usability.
- **Additional content is available via a private login** that we can provide instructors access to upon request. As of now, additional content includes *Objects and Classes* (an objects-first introduction to Java with BlueJ) and *A Taste of Java* (a traditional syntax-first introduction to Java). By November, new units on conditional structures in Java, Strings and Arrays in Java, Social and Ethical Issues, and Artificial Intelligence will be available.
- By the end of summer 2003, we expect to complete six to eight multimedia units (out of a projected 11) on breadth of Computer Science topics, plus four to five units introducing programming in Java. We can arrange to make this material available for adoption at other universities next fall.
- **A manuscript of *The Universal Computer: Introducing Multimedia with Computer Science* is available for review now**. We plan to revise our material introducing Java, expand the current chapter on Operating Systems and Networks into two chapters, and write one new chapter on User interfaces and Web Page Design next spring, for possible adoption next fall.
- Textual data mining techniques that help students discover emerging trends have been implemented and evaluated in an educational setting. **A software infrastructure for research in text mining is available** at hddi.cse.lehigh.edu.
- A multimedia unit on inheritance in object-oriented programming, available in the public interface, **demonstrates an inquiry-based multimedia framework for the detection of emerging trends** in Computer Science. It significantly improves learning at both the graduate and undergraduate level.
- Research continues with efforts that propose to study domain-expert best practices of trend detection in support of further automation of the trend detection process.
- **Collaborative tools** that provide a seamless network-based connection between students, instructors, and teaching assistants are under development. The current implementation includes an instant messenger, a conference chat system, a shared white board, and a "show me" remote demonstration capability that relies on a sophisticated representation of multiple interactions across a network.
- **Parties interested in reviewing the additional multimedia or textbook for possible adoption** should contact Glenn D. Blank at glenn.blank@lehigh.edu.

References

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