February 2004

EUSES Consortium Researchers Help Everyday Computer Users Work Smart

by **Eric Appel** and **Margaret Burnett**, *EUSES Consortium*

Everyday computer users and their bugs

An oil and gas company in Dallas, Texas, lost millions of dollars in an acquisition deal due to errors in a spreadsheet. A person with diabetes drawing from Web-based resources to compute diet and exercise safety ranges can make dangerous choices using external data incorrectly. Rules set up incorrectly by e-mail users can send important e-mail messages to the wrong folders, or worse: into the trash.

The software tools available today are making it possible for millions of everyday end users to do what amounts to programming — and they are taking advantage of these capabilities to accomplish a huge variety of tasks, from managing their retirement funds to tracking their medications. In fact, the number of end-user programmers in the United States alone is expected to reach 55 million by 2005, compared with only 2.75 million professional programmers. But in the past, little attention has been paid to helping these users avoid errors.

Six universities join forces

Funded by a $2.65 million ITR grant from the National Science Foundation, researchers at Oregon State University, Carnegie Mellon University, Pennsylvania State University, Drexel University, University of Nebraska and Cambridge University in the U.K. have joined forces to launch a unique research collaboration aimed at gently helping everyday computer users notice their own "programming" errors early on and correct them. The collaboration is called the EUSES (End Users Shaping Effective Software) Consortium.

A key characteristic of the EUSES Consortium is that it combines the expertise of researchers who specialize in end-user programming, software engineering, programming languages, education and psychology. This multidisciplinary approach can effectively consider multiple dimensions of the problem, which should enable more effective solutions than are possible when considering only the technological aspects.

The EUSES Consortium pioneers new ways to help everyday users
Historically, the emphasis of computer-literacy training, self-help books and online help systems has been on helping end users to create spreadsheet formulas, e-mail rules, etc., but there has been no emphasis on quality control, accountability or human habits that might lead to errors. So we are trying not only to create technological devices that might locate mistakes but also to put those devices in the trail of the end user in effective ways so that they see potential errors they would not otherwise have noticed.

The idea isn't to create separate tools or pop-up messages, which research shows often annoy or distract end users instead of helping them, but instead to determine the most effective ways to "gently encourage" end users to remedy errors while they work. For example, in a spreadsheet, colored boxes might appear around certain cells, suggesting that the end user verify certain data. However, there is no requirement to do this and the user can choose to simply ignore the colors. If the user does the verification, the colored border might vanish or change, depending on the outcome, letting the user know in a subtle way that the verification was effective and the time well spent.

EUSES Consortium researchers are working on a variety of approaches to unite the programming interface with effective yet unobtrusive underlying reasoning. For example, some results have included the interactive "What You See Is What You Test" (WYSIWYT) testing methodology, assertions for end-user programmers, and semi-automated detection of erroneous combinations of units in spreadsheets. Another research direction is to investigate applying computer-human interaction principles to the design of programming languages and environments, emphasizing how the programming environment can help with the identification, debugging and prevention of errors.

Also being studied are the mental models of Web software construction held by sophisticated end users, and the results are being used to develop a tool for building simple Web applications. Approaches being explored include fault detection through statistical methods and through program analysis, pedagogical methods to encourage a quality-control culture for users of technology, and motivational and attention allocation issues for end-user programmers.

Contact us
To discuss how EUSES researchers working on aspects of end-user programming can help your company, to support EUSES research, or to discuss licensing terms for patented EUSES technologies, contact the project director. The EUSES Consortium welcomes the opportunity to partner with software companies interested in bringing EUSES Consortium findings to computer users to help them avoid costly errors.

For more information about the EUSES Consortium, go to:
http://eecs.oregonstate.edu/EUSES .

Eric Appel is operations assistant in the EUSES Consortium. In addition, he is an undergraduate student of computer science at Oregon State University, and especially likes photography and Web design.

Margaret Burnett is a professor in the School of Electrical Engineering and Computer Science at Oregon State University. Her research focuses on human issues of programming, especially when the programming is done by people not trained as professional programmers. She is the principal architect of the Forms/3 and the FAR visual programming languages and, together with Gregg Rothermel, of the WYSIWYT testing methodology for end-user programmers. She is currently project director of the EUSES Consortium.

For more articles visit www.sao.org/newsletter.