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# SIG: End-User Programming

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**Abstract**

As users continue to grow in number and diversity, end-user programming is playing an increasingly central role in shaping software to meet the broad, varied, rapidly changing needs of the world. Numerous companies have therefore begun to sell tools enabling end users to create programs. In parallel, ongoing academic research is aimed at helping end-user programmers create and adapt new kinds of programs in new ways. This special interest group meeting will bring together the community of researchers and companies focused on creating end-user programming tools, thereby facilitating technology transfer and future collaboration.

**Keywords**

End-user Programming (EUP), End-User Software Engineering (EUSE), End-User Development (EUD)

**ACM Classification Keywords**

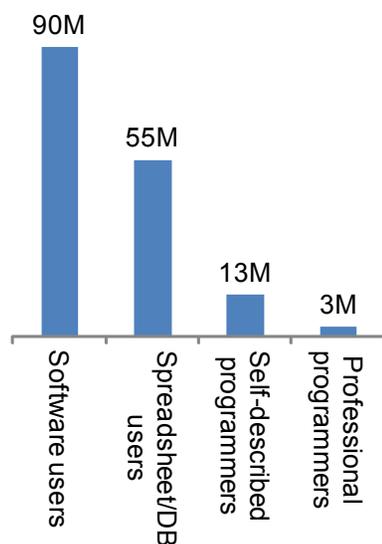
D.2.5 Testing and Debugging; H.1.2 User/Machine Systems—Software psychology

**General Terms**

Design, Human Factors, Languages.

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**Figure 1:** Estimates for the number of people in the US in 2012 who use computers at work, who use spreadsheets at work, who would describe themselves as programmers, and who would say they are professional programmers [25].

## Introduction

Many software users perform tasks that vary on a yearly, monthly, or even daily basis. Examples include engineers, scientists, marketing specialists, accountants, teachers, and administrative assistants. Consequently, their software needs are diverse, complex, and frequently changing. Professional software developers cannot directly meet all of these needs because of their limited domain knowledge and because their development processes are too slow.

End-user programming (EUP) helps to solve this problem by enabling end users to create their own programs [18]. One way to define “programming” is as the process of transforming a mental plan of desired actions for a computer into a representation that can be understood by the computer [12]. We define “end-user programmers” (EUP) as people who write programs, but not as their primary job function — they write programs in support of achieving their main goal, which is something else, such as accounting, designing a web page, doing office work, scientific research, entertainment, or engineering. While there are only about 3 million professional programmers in the United States, over 12 million people say they do programming at work, and over 50 million people use spreadsheets and databases, and thus may also be considered to be programming [25] (see Figure 1).

Hundreds of research and commercial tools have been directed at supporting EUP. Commercial tools that facilitate EUP include Microsoft’s Excel for creating spreadsheets, National Instrument’s LabVIEW for creating visual programs primarily by engineers and scientists [20], and Adobe’s PhotoShop Scripting for manipulating images [1]. At the same time, researchers in academia continue to discover technical and social innovations aimed at facilitating EUP. For

example, recent papers at CHI have described new tools to support creation of mashups [6][29], multi-surface applications [8], and animations [10][14].

This special interest group (SIG) meeting at CHI’12 has the specific goal of helping members of industry and academia to meet one another, uncover shared objectives, and lay the groundwork for future technology transfer, collaboration, and funding. Similar meetings at CHI’2004, CHI’2005, CHI’2007, CHI’2008, CHI’2009, and CHI’2010 were extremely well-attended by 40-80 participants each year, leading to numerous new collaborations between industry and academia.

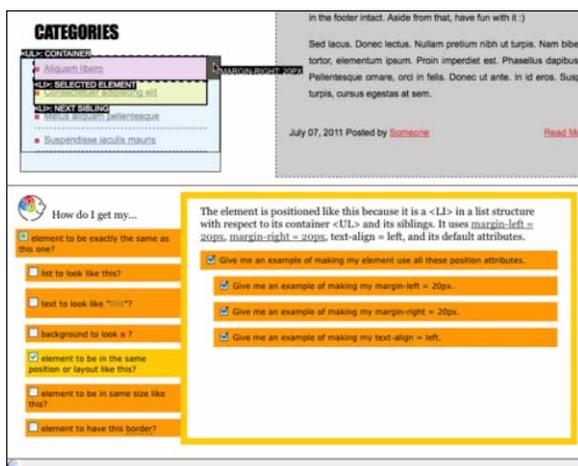
For example, three of this 2012 SIG’s proposers (Dove, Myers, Scaffidi) formed a collaboration as a direct result of meeting at the 2010 SIG. At that meeting, we identified a shared interest in helping end users to reason more effectively about the performance of programs that they create with LabVIEW (which is a product of National Instruments, where Dove is a software architect). We are now prototyping and evaluating those extensions. In addition to this particular collaboration, other collaborative efforts have flourished with Adobe, IBM, and many other companies as a direct result of prior SIGs.

Therefore, the 2012 SIG is intended to help other researchers and companies obtain the benefits of similar collaborations.

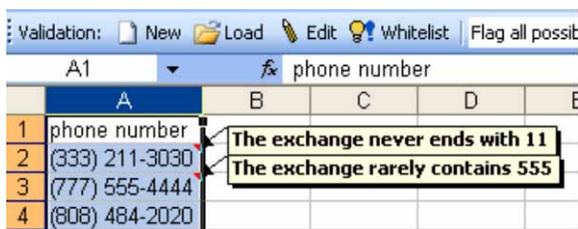
## Examples of related work at CHI

EUP research has gained momentum, with many projects presented at CHI.

Some of these CHI publications resulted from the “Natural Programming” project, which one of our organizers (Myers) has led for over 15 years to make



**Figure 2:** WebCrystal explains how HTML and CSS can be used to achieve the result shown in an existing web page [4].



**Figure 3:** Topes allows end users to identify and fix possible formatting errors in the data of spreadsheets and other programs [24].

programming more “natural”, or closer to the way people think. We have performed numerous empirical studies, leading to new programming languages and tools (e.g., [4][15][22][23][24][26]). For example, Figure 2 shows a technique to help users understand how web pages were authored [4]. As another example, Figure 3 shows a tool that helps users find formatting mistakes in spreadsheets [24].

Other researchers have presented projects investigating how end-user programmers learn from one another [5], how to help them understand APIs [2][7] (Figure 4), how to help them debug [9][27], how to help them automate web browser operations [16][17][30] (Figure 5), how to help them manipulate data retrieved from sites [6][11][13][28][29], how to help them customize the behavior of mobile phones [21], and how to motivate and help them to create animations [10][14].

Given the attention to EUP evidenced by the CHI research community, we expect this SIG to foster increased collaboration and technology transfer.

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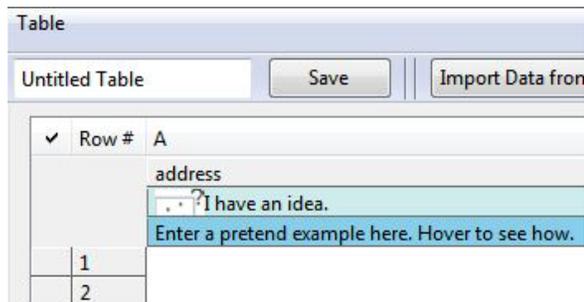
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**Figure 4:** Blueprint retrieves examples of how to implement user-specified functionality [2].



**Figure 5:** The user wants to create a table of apartments to compare prices and location but is not sure how to populate it. The Idea Garden [3] suggests putting in a “pretend example”, which it can use to infer data types using topes [24], which it in turn uses to identify web sites specializing in those types of data.

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