

Code Sharing on the Web - Two Approaches

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ABSTRACT

We present two approaches to the general task of leveraging the social aspects of the World Wide Web (WWW) to facilitate knowledge transfer among site participants. In particular, we have built two independent communities for the purpose of streamlining access to and immediate sharing and execution of computer programs for the generation of computational art. The first site, OpenCode, allows visitors to compile and execute Java Applets submitted by members of the community, providing a social context for executing and sharing code on the Web. Based on feedback from site members, we developed a second site, E15:Web, which serves as a repository for images and programs for a new desktop-based programming environment called E15. In E15, user programs are scripts that are executed in read-eval-print loop (REPL) mode, not requiring compilation. This programming model allows users to develop programs iteratively, emphasizing visual results over development process. This approach relaxes notions of *completeness* that OpenCode site members felt were inherent within a more formal submission model. Thus, E15:Web serves as a community for *works in progress*, in an attempt to encourage participation through the absence of finality inherent within traditional submission models.

Author Keywords

Education, Data Sharing, Programming

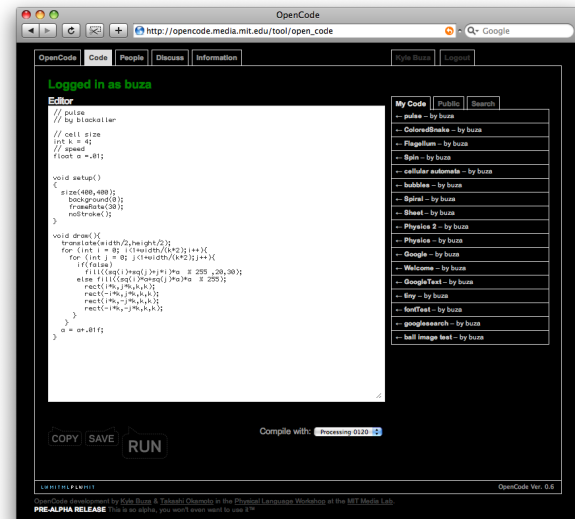
ACM Classification Keywords

H.3.5 Online Information Services: [Data sharing]

INTRODUCTION

As we enter a new era of widespread collaboration and sharing made possible by the WWW, one question that remains is how to build appropriate communication channels to and from this new medium with respect to the tools used for digitally mediated creative expression.

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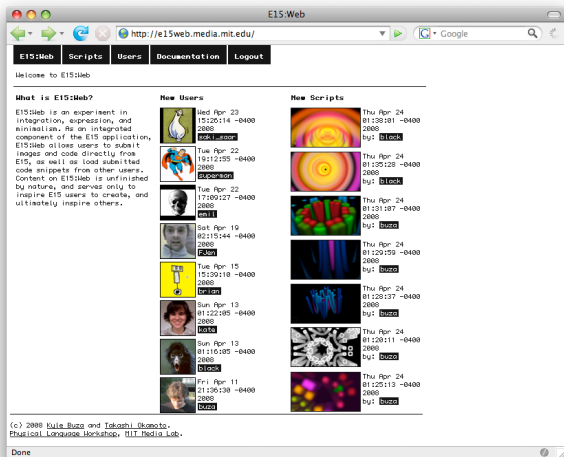
Here, we consider two approaches to code sharing made possible by the web. In OpenCode, users are presented with an in-browser program development environment to simplify the experimentation process through shared program collections. In E15:Web, a desktop application is employed for program development, but with the emphasis placed on the visual output over program source code. That is, as opposed to existing online repositories like Sourceforge (<http://www.sourceforge.net>), or creative code sharing sites like Scratch (<http://scratch.media.mit.edu>), which place an emphasis on the submission of functional *applications*, E15:Web is a repository for *works in progress*, made possible by the E15 REPL programming model.

OPENCODE : PROGRAMMING IN THE BROWSER

OpenCode (<http://opencode.media.mit.edu>), is a web-based programming environment targeted at simplifying access to computational art programs. Users can browse the program source of graphical programs written in the Processing dialect of Java (<http://www.processing.org>) submitted by other users, and execute them within the context of the browser itself. Users of the site can modify existing pieces of code, and re-compile them in-browser. This fluidity dramatically simplifies the experimentation process by allowing users to be only a few clicks away from program execution. An added benefit of this model is that because program compilation happens on the server, we have the ability to collect usage statistics related to code etymology and nature of user par-

ticipation.

While few members of the OpenCode community have lamented the lack of traditional IDE features like tabbing, more have commented on the lack of an easily digestible gallery of imagery that represent submitted programs. In addition, many users expressed an uneasiness with respect to the submission model, where programs are saved when submitted to the site, and effectively "frozen" in a particular state. Many users believe these types of programs to be *works in progress*, and tend to be skeptical of a conceptually persistent development model inherent with the site.



E15:WEB : SHARING CODE FROM THE DESKTOP

E15:Web (<http://e15web.media.mit.edu>), is a site for sharing *in-progress* code snippets from a new graphical programming application called E15. The development of E15:Web was directly influenced by the user feedback obtained from OpenCode users, which included requests for Flickr-like image galleries of submitted programs and a general aversion to the inherent *persistence* of the submission process.

Seen from the perspective of the creative individual, the browser can be viewed as a medium too confining for sufficient creative exploration. Performance limitations and security restrictions outweigh the social benefits made possible by a web-based development environment. In E15, we chose to alleviate these restrictions by separating the development environment from the browser in order to maximize creative potential. As our users have expressed a distaste for the submission model common to OpenCode and web-enabled desktop application-based development environments like Scratch, E15:Web uses an entirely new programming methodology.

In E15, users write programs in the Python programming language to generate procedural animations and interactive visualizations based on WWW data. Leveraging the REPL mode of program evaluation, these programs can be updated and changed at any point during their execution. While interactive programming of this type is not new, the product of an E15 program is not an application *per se*. With respect to

computational art generation, E15 program development is often more of an interactive session than a targeted design effort. The result is a programming style that is iterative, as opposed to the *compile, run, debug, repeat* programming style that produces conceptually *complete* applications. Thus, in many cases, writing programs in E15 feels less like a completed process – the code can always be tweaked and the visual result massaged at runtime. The goal of E15:Web is to allow the seamless transfer of these unfinished E15 code snippets directly to the WWW, where they may be viewed, shared, and modified by other members of the E15:Web community. This transfer process is made to be as simple and noninvasive as possible. At any point during the execution of a program, the user may submit a screenshot and the accompanying program evaluation history to the E15:Web site. The end result is a collection of easily browse-able imagery produced from snapshots of the running desktop application. The emphasis is placed on the visual result as opposed to the process that led up to the creation of that result.

While user submissions proceed seamlessly to the E15:Web site, we also hoped to retain the ease of experimentation that users enjoyed on the OpenCode site. In OpenCode, programs can be run with a single click – there is no "download-and-open" requirement. In order to integrate similar functionality into E15:Web, the E15 application contains an embedded web browser, allowing users to simply click on a link to a script and immediately begin its execution.

While simple, this model clearly lends itself to a number of security issues. The most significant is the possibility of users running arbitrary Python scripts that could be malicious in nature. In the current implementation, this has been left unaddressed for reasons of flexibility. Most solutions to this problem simply place the user in a security sandbox that restricts their creative potential, a scenario we choose to avoid. To our knowledge, no malicious functionality has ever been concealed within applications in this particular domain, perhaps due to the relative lack of anonymity accompanying them.

Evaluation/Future Work

The OpenCode community has been active since 11/2006, and as of 1/11/09, has 1443 registered users. Site statistics show that over 90 percent of site visitors are lurkers, viewing but not contributing content. It appears that most active members do not use the site for active development, but simply to post previously created work. Inspired by user feedback, we plan to integrate program thumbnails and more substantial code management functionality into the next version of the site.

Unfortunately, E15:Web remains largely inactive due to its inherent coupling with an in-development programming environment that is still only of alpha quality. As the maturity and distribution of the E15 application grows, we expect to obtain more data on this submission model.