

On-line Publication of CS Laboratories

Deborah L. Knox
The College of New Jersey
Department of Computer Science
Trenton, New Jersey 08650-4700

knox@tcnj.edu

Abstract

Many computer science educators are actively developing laboratory materials in support of their courses because the lab activities provide a rich learning environment. Some instructors are hesitant to pursue this type of pedagogy because of the time commitment required or because of a lack of materials to use as a starting point. This paper describes the development of a repository of computer science laboratories to encourage development and use of labs.

The project described is an on-line repository, a database developed for the WEB using HTML forms to help tailor user requests for information. The backbone of the repository is currently CGI scripts written in PERL. The features of the prototype include lab submission, searching by keyword or topic, and an annotation capability for each lab.

We also describe the plans for a SIGCSE sponsored peer reviewed on-line repository of lab materials which will create a recognized avenue for the dissemination of labs. The peer review process will help insure a level of quality, and grant developers recognition for their scholarly work in support of teaching.

Rationale for On-line Publication

In the field of computer science education, there is a need for the dissemination of information for use in curriculum development. A variety of sources exist for instructors to explore for supporting materials.

Permission to make digital/hard copy of part or all this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage, the copyright notice, the title of the publication and its date appear, and notice is given that copying is by permission of ACM, Inc. To copy otherwise, to republish, to post on servers, or to redistribute to lists, requires prior specific permission and/or a fee.
SIGCSE '97 CA, USA

© 1997 ACM 0-89791-889-4/97/0002...\$3.50

We can thumb through the past volumes of the *SIGCSE Bulletin* for descriptions of projects and directly contact the authors. Similarly, we can hear firsthand about projects at the SIGCSE Technical Symposiums and follow-up during or after the conference. There is the on-line NSF Computer Science Courseware Repository, limited to NSF funded projects [1]. Recently, a WEB page of links to on-line materials that support the teaching of computer science was announced [2]. Both of these on-line sources are accessible via the SIGCSE home-page [3]. None of these sources is specific to laboratory materials, and only the Technical Symposium papers are peer reviewed. Computer science educators often express the need for gaining recognition for the scholarly work they develop to support their courses. Others in the field want a reliable source for entire projects, including labs. Independently, others have proposed an on-line journal, specifically to address the need for published courseware [4].

The number of people and/or organizations involved in on-line dissemination of materials is increasing. Many disciplines are actively offering similar services. In mathematics, there is the Netlib Repository [5]. Political Science Manuscripts (PSM) is a general purpose abstract service [6]. An interesting summary of on-line publishing and its advantages and drawbacks also details the development of PSM and outlines future plans for archiving conference papers [7]. We refer the reader to the ACM electronic publishing plan, which directs the societies of the ACM to offer the "facilities and mechanisms whereby authors can post collections of their works and obtain public comment on early versions of them" [8].

The need for a lab repository was first discussed by the SIGCSE Working Group on Closed Labs in the Summer of 1995 [9]. Members of this group believed that the availability of samples of lab projects that faculty had used successfully would be helpful to others wanting to integrate the lab experience into their courses. At the time, we recognized that the world wide web provided an

easy avenue for collection and dissemination of these materials. At the 1996 SIGCSE Technical Symposium, the audience at a panel discussion on laboratories called for a central location for information on labs [10]. A subsequent conversation with the chair of SIGCSE led us to develop this WEB based lab repository, which has received approval from SIGCSE [11]. The prototype project was demonstrated to a few members of the Working Group on Computing Laboratories during June 1996 at the ACM SIGCSE/SIGCUE Conference on Integrating Technology into Computer Science Education. Future directions of the project were discussed, and will be presented later in this paper. The Working Group included a section in their report outlining some of the options in developing a WEB based repository [12].

It is evident that there is an on-going interest in a lab repository. This paper represents the first time the project is being discussed with the general SIGCSE membership. The following sections will give an overview of the Lab Repository Project and discuss the prototype as implemented on the WEB. The case for a peer reviewed collection of lab materials is presented and the future of the project is discussed. Finally, the need for participation by SIGCSE members is detailed, and conclusions are drawn.

The Lab Repository Project

The original vision for this project was to provide a central WEB based location or repository for abstracts of developed labs and the collection of links to the on-line location of the full laboratory write-ups. Each author's email and/or URL address is provided to facilitate contact between the author and the faculty member using the lab in a class. (This would include requests for examples or solutions from the authors, at least until student access can be prohibited.) A novel feature provides a "work in progress" atmosphere -- we collect annotations on the strengths and weaknesses of the labs as faculty members access the labs and try them out. As people add their comments about what worked or add suggestions for modifications, these comments are accessible to others browsing through the lab abstracts (categorized by computer science course content and also keyword addressable). This facilitates the fine-tuning of the educational experience for our students.

The on-going dialogue capability, much like a bulletin board, is not supported by traditional publication methods. Often times we have no idea who else is developing labs in a particular area or who has tried the published labs or whether the experience was good for an environment similar to our own.

This WEB site provides a known location for faculty to browse for project ideas for specific courses or topics within a course. It provides the lab developers with feedback from our peers. The collection of annotations will help potential adopters judge the success of incorporating a specific lab. The Lab Repository will create a recognized avenue for the dissemination of scholarly work in support of teaching.

The archiving of lab materials has a different focus than that of the *SIGCSE Bulletin*, or of the *Proceedings of the SIGCSE Technical Symposium on Computer Science Education*. The format of the publication for these is not conducive to including all the materials necessary for a complete lab, although authors typically do include an email address, ftp site, or URL in the paper for further information. This project supports more than is available by the printed format. In the future, not only descriptions of labs will be archived, but working multimedia versions of labs may be made available for use or demonstration.

Another key contribution of this WEB based archive is the ability to communicate easily with a wide audience with matching interests. The project has the potential to facilitate the creation of networks of people interested in specialized topics. With this forum, educators will be working in less isolation, and will have a support mechanism in place to help them incorporate labs in their courses.

Traditionally, little recognition has been given to the efforts involved in the development of labs. Because of this, some faculty are hesitant to pursue this method of pedagogy. Computer science educators are calling for recognition of the scholarly work involved in development of a lab, similar to that afforded to authors of papers published on other types of research. This project is the initial phase of a peer reviewed forum for laboratory development, which is discussed later in this paper.

The SIGCSE Lab Repository WEB Site

The lab repository project is found at
<http://www.tcnj.edu/~compsci>.

This archival project consists of a number of self-explanatory web pages. Representative pages are described below (space does not permit screen captures). The project is a database system designed for the WEB, using HTML forms as the primary user interface. CGI scripts have been coded in PERL to manage the database tasks.

The homepage of the repository prototype site displays a selection of clickable options:

- Add a lab to the database
- Generate a complete list of the labs
- See a list of all the lab titles
- List lab titles by subject
- Search the database for a lab

Add a lab to the database

The prototype was developed under the assumption that the repository accepts non-reviewed forms of lab abstracts, so our descriptive text will not include mention of a peer review process at this time. The page that opens upon the "add" selection is form driven, asking for the appropriate information with either fields to fill in or a pull down menu to select entries from. To add a lab to the database, the author fills in the following information:

Lab Title:

Author(s):

Date of Submission:

Subject of this lab: [Choose from the list, or select "other"]

Keywords describing this lab:

On-line Access/URL:

Author's Email:

Abstract:

In each field, an appropriate example entry is provided. It is assumed that the URL or ftp site leads the adopter to the materials necessary for the lab, including the full lab text. It is necessary for each author to assume full responsibility for keeping the links and the materials up to date. (Alternate arrangements may be necessary under the peer reviewed on-line publication mode.)

Some quality control is needed. The editor responsible for the archive needs to verify the existence and the availability of the lab materials described by each abstract. In addition, applicability of the lab to computer science education may need to be determined.

Generate a complete list of the labs

The listing of the labs in the prototype database assumes a manageable number of submissions. As the number becomes very large, we may need to eliminate this option and steer the user to list labs by subject only. Each lab's information of title, author(s), date submitted, subject, keywords, and abstract is listed. At the end of each entry are clickable selections to:

- View this lab
- Mail to the author
- Comment on this lab
- View the comments for this lab

Viewing the lab is a hypertext link to the actual lab. Commenting on a lab is a link to a form which is used to collect the appropriate information. Viewing the comments brings up the annotations collected on a specific lab. Each web page also contains a navigation button to direct the user back to the main menu.

Comment on this lab

This selection is to collect feedback from our peers as they use the labs in the repository. Their comments may relate to the length of time a particular lab required when they adopted its use, or to the modifications necessary for a particular environment, or to relay the success they had in integrating the lab into their course. It is this section that helps future users of the repository. (Hopefully, it won't degrade to simply a bug reporting facility!) The responses may also help the author improve future write-ups of the lab. The submittals to this section need to be screened by an editor to insure suitability.

The information requested in a form driven mode includes:

Your Name:

Your Email address:

Your Homepage URL (optional):

Today's Date:

Within the space below you may write anything you feel might be of interest to the author or others.

View the comments for this lab

Each comment submitted is listed, giving all the information detailed above. At this time, the database is not set up to group responses to comments according to thread. This can be incorporated in a future version.

See a list of all the lab titles

The current list of all titles in the database is given, currently in the form of title followed by author. These are hypertext, and link back to the lab information, as described above in the complete listing of the labs.

List lab titles by subject

Here we guide the user with a pull down menu, listing common computer science courses. The list needs to be a bit dynamic, focusing perhaps on ACM curriculum guidelines and responsive to the needs of the users of the repository. Currently, the prototype list is generic with entries such as CS1, CS2, Operating Systems, Architecture, Programming Languages, Algorithms, Graphics, Databases, Artificial Intelligence, Parallel Processing, WEB Programming, and Other. The user submits his/her choice, and the labs that were submitted under the appropriate category are listed.

Search the database for a lab

Two types of searching are desirable. First, we provide a generic type of search engine that collects all records that match any of the keywords supplied. The labs that include matches in either the keywords, title, or author fields are listed. The user does not need to specify which field to search. All of them are utilized in the generic search. Second, specific searching will return only records (labs) that match all of the keywords supplied. This advanced searching feature has not been implemented yet.

These are the key features of the prototype lab repository. The proof of concept trial run was successful. Submittal is easy. Maintaining annotations on each lab is doable. Selectively listing labs by keywords or topic facilitates our browsing. The full lab text can be reached via a hypertext link on the same WEB page as the abstract, provided the author maintains the material in a suitable format. The abstract could contain information about the format, and any additional information about software or plug-ins that might be needed. Ftp sites can also be included.

This phase of the project was demonstrated to Professor Lillian (Boots) Cassel, Chair of SIGCSE, and to a number of Working Group on Computing Laboratory members. Their responses to the prototype have been positive and lead us to the next phase in the development of the CS Lab Repository.

The Future of the Project

It is apparent from the SIGCSE sponsored working groups on laboratories [9, 12] that a goal exists to assist computer science educators with the integration of labs into the curriculum. There is a recognized need for a repository of developed lab materials. In addition, there is a strong desire to provide a level of quality control. Perhaps most important is that the people developing lab materials have their efforts recognized. Lab development is no easy task. Many of us have discovered that it can require a huge amount of time. The message that needs to be conveyed to tenure and promotion committees and to our administration is that lab development can be equated to other forms of scholarship. Indeed, a peer reviewed published lab should receive recognition equivalent to other types of peer reviewed research publications. Successful lab development is scholarship in support of teaching.

One way to accomplish the recognition factor and automatically control quality is to establish a peer reviewed on-line lab repository. We are in the process of doing this. In the near future, an editor will be named, and reviewers will be selected from the SIGCSE members

answering a call for participation. It is our intent that an electronic mailing will be sent to the membership during late 1996, and additional forms will be made available at the 1997 Technical Symposium in San Jose in February.

Reviewing a lab requires a higher level of involvement than simply reading the text of the write-up. The labs must be tested. This may involve writing code, or evaluating code provided. It may involve determining if the lab is workable in other environments. The editor's job will be to insure that each submission is given fair treatment, that certain publication guidelines are met, and that the repository is maintained.

The Need for Contributions

This project needs your support to guarantee its success. Those of us who develop and use labs in our courses may take it for granted that most instructors use the same methods. That most certainly is not the case! There are many computer science educators who do not use this type of instruction to support their classroom efforts, perhaps for lack of time for development or for need of some guidance in terms of content. Wouldn't many of us spend some time browsing an on-line resource looking for some ideas to bring to our courses, just as we frequently browse printed material?

The Computer Science Lab Repository, slated to be an on-line publication, needs you to

- submit your labs,
- work with the labs in the repository,
- comment on the labs in the repository, and
- volunteer your time to review.

Conclusions

This paper describes the prototype vehicle for on-line publication of computer science laboratory materials. The on-line publication promises dissemination to a broad audience. It also provides a flexibility in the delivery and content of the materials. Most important, it supports archival capabilities unlike printed materials.

The electronic forum for the repository of lab materials supports automatic searching and indexing, customized by each user. This represents a significant savings of time. A discussion of cost reduction of on-line publication is beyond the scope of this paper.

The prototype WEB based database project supports the submission of lab abstracts, with a link to the complete lab.

An opportunity for feedback on each lab in the repository is provided. This may lead to an improvement of content. Positive comments will help users feel confident in adopting specific labs, knowing that more than one instructor has used the material successfully. The repository can be searched by keyword or topic. The search facility matches keywords, title words, topic, or author.

The future of the lab repository is currently in its planning phase. Lab materials will be submitted in an appropriate format to an editor who will contact reviewers. Once labs are reviewed and accepted, they will be stored in the repository. The rest of the prototype's capabilities should remain as described or upgraded. It is our plan that much of this groundwork will be in place in time for this Conference.

Acknowledgments

We would like to recognize Chris Cerruto for the time and effort he spent helping design and program the lab archive prototype.

Bibliography

(URLs were verified at final submission, November 1996.)

- [1] National Science Foundation Computer Science Courseware Repository.
<http://www.education.siggraph.org/nsfscsr/nsfscsr.home.html>
- [2] R. McCauley, email message to all SIGCSE members, August 2, 1996. On-line resource page available at:
<http://www.usl.edu/~mccauley/edlinks>
- [3] SIGCSE home page on the WEB
<http://www.acm.org/sigcse>
- [4] M. Goldweber, "Proposal for an On-Line Computer Science Courseware Review", a poster presentation at ACM SIGCSE/SIGCUE Conference on Integrating Technology into Computer Science Education, June 1996.
- [5] Netlib Repository
<http://www.netlib.org>
- [6] Political Science Manuscripts (PSM)
<http://www.tcnj.edu/~psm/>
- [7] W.J. Ball, "Political Science: The State of the Art and (Slightly) Beyond in On-line Publishing", preprint, to appear in *Social Science Computer Review*.

[8] P. Denning and B. Rous, "The ACM Electronic Publishing Plan", *Communications of the ACM*, April 1995, pp. 97-103.

http://www.acm.org/pubs/EPUB_PLAN.html

[9] L. Cassel, H. Taylor, chairs. SIGCSE Working Group on Closed Labs NECC, Baltimore, Maryland, June 1995. Unpublished manuscript.

[10] U. Wolz, moderator, L. Cassel, D. Knox, J. Hartman, V. Proulx, N. Dale, P. Schragger, panelists. Panel discussion: "Laboratories for Computer Science Courses: Dissemination via the World Wide Web", 27th SIGCSE Technical Symposium, February 1996, pp. 399-400.

[11] L. Cassel, Private correspondence, April 1996.

[12] D. Knox, U. Wolz, D. Joyce, E. Koffman, J. Krone, A. Laribi, J. P. Myers, V. Proulx, K. Reek "Use of Laboratories in Computer Science Education: Guidelines for Good Practice. The Report of the Working Group on Computing Laboratories", ACM SIGCSE/SIGCUE Conference on Integrating Technology into Computer Science Education, June 1996.

The SIGCSE Lab Repository WEB Site

<http://www.tcnj.edu/~compsci>

Computer Science Lab Repository

The SIGCSE Lab Abstract Database

Submit a Lab

List All of the Labs

List All of the Lab Titles

List Lab Titles by Subject

Search for a lab

Information about this site

Help

[Hi-Res CS Labs Database Page]

Computer Science Lab Repository
© The College of New Jersey
Computer Science Department