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An Electronic Journal Management System

Hrvoje Bogunović, Edgar Pek, Sven Lončarić and Vedran Mornar
Faculty of Electrical Engineering and Computing, University of Zagreb
Unska 3, 10000 Zagreb, Croatia
{hrvoje.bogunovic,edgar.pek,sven.loncaric,vedran.mornar}@fer.hr

Abstract. *A web-based information system for management of scientific electronic journals is presented in the paper.*

Journal management requires exchange of information between many participants in the publishing process, including authors, reviewers, editors, and lectors. Each participant in the process plays a different role, and cooperates with other participants. The web system is implemented using open source solutions on the Linux platform.

Three-tiered information system architecture has been used. Object oriented PHP (PHP hypertext preprocessor) is used as a server side scripting language to implement the business logic. Database management system is provided by PostgreSQL, although database connection abstraction is utilized. Apache web server is used together with SSL encryption mechanism to provide HTML content to end-user.

The system is currently in use for editorial support of an international scientific journal and the initial results have been encouraging.

Keywords. Journal management, PHP, web applications, web content management.

1. Introduction

Journal management is a complex and time-consuming task, especially without the process automation, or if the manuscripts, reviews, and other information is circulated by regular mail. The work overhead present in classical journal management causes time delays and requires additional personnel, extending the time required to publish the paper. One of the most difficult requirements on scientific journals is reduction of time from manuscript submission to publishing. To reduce this time it is necessary to efficiently conduct the review process and this can only be done using an information system that speeds up the exchange of information.

In this paper, we present a web-based information system that provides support to all participants in the journal management process including authors, editor-in-chief, editors, reviewers, lectors, and other editorial staff.

As far as scientific manuscript review is concerned, journal management is quite similar to management of conferences. However, journal management imposes some additional requirements that make it more complicated than conference management. After a journal issue is published, the journal has not finished its life time like a conference. Many papers are continuously being processed and the involved editorial personnel constantly change as new editors and reviewers join the process.

Some of the observed popular conference management systems are Confman [1], and Start [2]. Confman uses CGI scripts, which have performance and security issues. It also requires mSQL database system, which does not implement triggers or transaction mechanism. Start conference manager on the other hand does not use any database system and stores all the paper files and paper information in the file system. To summarize, both of these systems rely on obsolete technologies.

An effective journal management system requires database management with support for triggers and transactions. These requirements are necessary to provide high-level data integrity. The journal management information system, described in the paper, is implemented as a server side application with the help of the PHP scripting language. The user requires only a simple web browser and no applications are being installed on the user machine. Thus the user is considered as a light client.

The organization of the paper is as follows. Section 2 describes the general system architecture. A detailed analysis of database design is displayed in Section 3. Section 4 presents all the capabilities this web application

implements. Finally, a concluding section closes the paper.

2. System architecture

The proposed journal management system is three-tiered. The tiers are: the presentation tier, the business logic tier, and the data tier. The data tier is provided by database management system (DBMS). We used PostgreSQL DBMS for that purpose.

PostgreSQL is an open source DBMS with the support for triggers and transactions. Both were heavily used in order to maintain database integrity and avoid possible race conditions. Connection to the database is made in abstract manner so PostgreSQL can be replaced by any equally functional DBMS. Database tables and integrity constraints will be described in the next section.

The middle business logic tier represents the interface between the presentation layer and the database layer. It is implemented by means of PHP scripts. PHP is an open source language for server side scripting. It is widely used and contains a rich function library code, which makes it ideal for web applications. It is also object oriented so the developed scripts take advantage of object oriented design. Processing user data with PHP through HTML forms and producing SQL queries for the database is fairly effective. When a good mapping of database tables to classes of objects is performed then the scripts are well structured and easy to maintain.

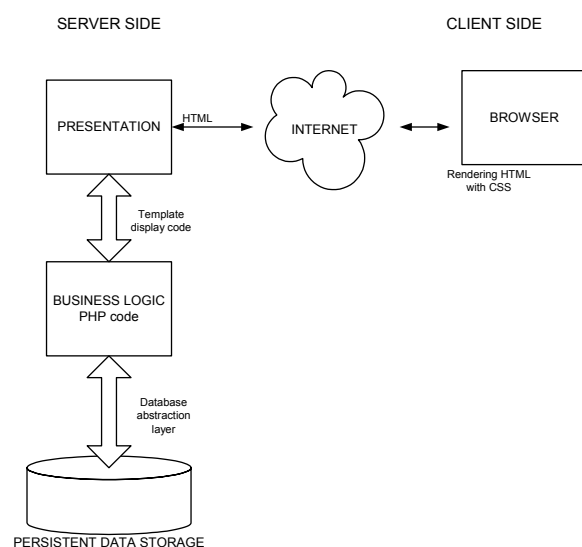


Figure 1. The system architecture

In order to abstract HTML code from PHP code into a script, a template mechanism is used.

This brings us to the presentation tier. "Smarty" template provides ability to create HTML code from a template after PHP supplies all the necessary variables. Once HTML is generated, the web server, in our case Apache web server, delivers HTML content to end user's browser who then renders the web page with the help of the supplied cascading style sheet (CSS). The system architecture is shown in Fig. 1.

Session handling must be provided since users need to log into the web application. Cookies are usually delivered to user's machine but some users do not allow any cookies. For this reason, we decided to propagate session variables through URL rewriting. All session data together with the session identifiers are stored in the database.

3. Database description

The most important information stored in the database is person and paper data. The database was designed using Chen's entity-relationship (E-R) diagrams. The basic elements of the database are the following.

Person data consists of personal information (first name, middle initial, second name, address, email, etc.), place, country, title, fields in which person is competent and institution in which belongs. Every person can be associated with multiple fields. A person is associated with his/her role in the editorial process. Each person may have multiple roles in the editorial process.

Paper data consists of paper title, abstract, keywords, paper file, and paper source file. A paper is described by paper category (like case study, technical note, etc.). During the processing a paper is associated with different states (received, accepted, rejected, to be revised). A paper may have multiple reviews. Each review is related to the reviewer (person conducting the scientific review of the paper).

A review consists of recommendation (accept, reject, major or minor changes), summary of evaluation (excellent, fair, etc.), comments to author, confidential comments to editor. Fig. 2 shows the E-R diagram for the tables mentioned above.

The database also supports creation of an electronic journal issue, which consists of accepted and lectored papers. Each published issue may have several sections. An issue section consists of several papers and may have a section title.

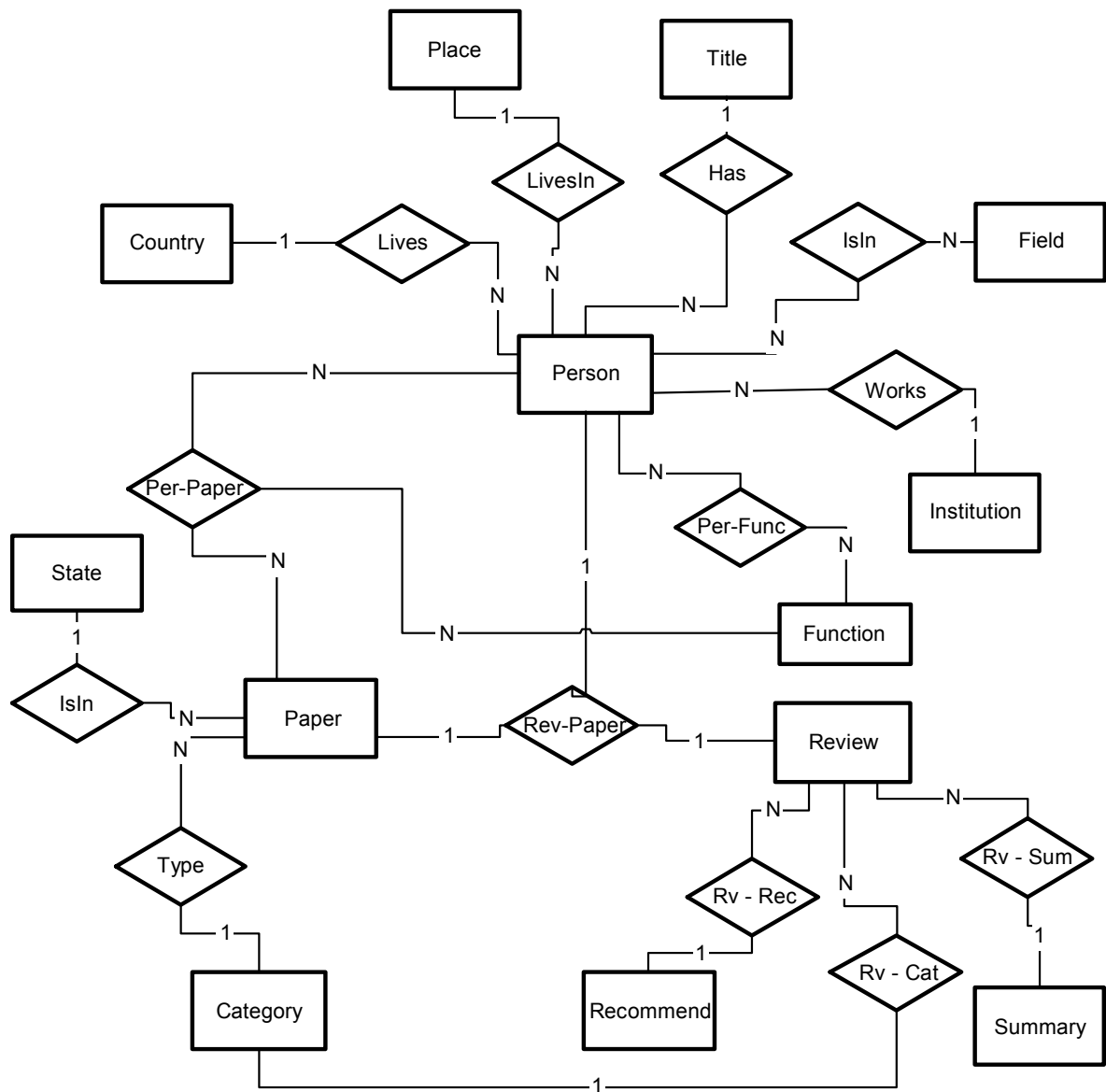


Figure 2. A simplified E-R diagram of the database

4. System functionality

Several different functional modules within a journal are implemented. In this section we provide description of the developed modules. All of the modules except paper submission are protected by username and password.

4.1. New paper submission

This module provides functionality for new paper submissions. The new paper submission procedure consists of three steps. In the first step, authors supply data about paper, including title, abstract and keywords. The next step consists of supplying authors' personal data. In the last step, the authors submit the paper file. Corresponding

authors are automatically e-mailed and paper's username and password is supplied. Each author gets his author_id. Using the author_id the author can retrieve his/her previous personal data when submitting another paper.

4.2. Revised paper submission

The paper username and password are used to log into the system and view the paper status. From that area, revised paper or source files of accepted papers can be submitted. Authors are also allowed to edit their personal data. This is also the place where the reviews will be published so that the authors can read them.

4.3. Administrator

The administrator module provides a basic web content tuning. The predefined e-mail content can be altered, if desired. Contents of some HTML pages are supplied from the database so administrator can easily modify that contents to his needs. Personal data of all the people active in the journal can be viewed or edited. Additional database entries can be modified e.g. possible categories of a paper. Administrator may also add/change editorial personnel such as the editor-in-chief, or associate editors.

4.4. Editor in chief

The editor-in-chief (EIC) has control over the entire journal management process. EIC has the ability to view all the papers and has the duty of assigning an editor to every newly submitted paper. An e-mail notification form is used by the EIC to add some personal text to the automatically generated message to the editor responsible for the paper.

The EIC also manages journal staff (edit, view, add people). In case that the paper's editor is unavailable, the EIC can assign reviewers to paper or send them reminders of overdue papers. A report can be generated with the time-line for each paper, which is under review. The EIC can also decide whether paper will be rejected, accepted or sent for author revision. Accepted papers need to be screened by the lector prior to publishing.

The EIC creates a new issue by selecting the papers from a list of accepted and lectored papers. In cases where a conflict of interest exists for certain editor(s) who have access to the system, the EIC may disable editor access to the paper in question. This may be the case when an editor is also an author of a paper submitted to the journal.

EIC can also see a report showing the number of papers assigned to each editor. This information is useful to ensure the load distribution across the editorial team.

4.4 Editor

Each new paper has an editor who is in charge of overseeing the review process and recommending the decision about the submitted paper. If the submitted paper clearly does not meet the requirements and the editorial policy of

the journal, it may be rejected by the editor without the review.

In order to determine reviewers for the paper, the editor can search through the list of reviewers by their field of expertise (we used ACM classification), or by their names. The editor can also see how many times a particular reviewer has been requested to review papers, and when the last paper was reviewed. An e-mail notification form is used in the reviewer assignment process. An automatically generated e-mail message can be customized by adding personalized text prior to actual sending of e-mail. The editor can add new reviewers and can send e-mail reminders of overdue papers to reviewers. The editor is allowed to browse papers assigned to other editors in case consultation is required. Once all reviews have arrived the editor makes a recommendation to the EIC regarding the paper in question.

4.5. Reviewer

After logging into the web system, the reviewer needs to enter the review. The scientific review consists of: the paper category (general, case study etc.), the recommendation (accept, reject, etc.), the summary of evaluation (good, fair, etc.), the note to authors, and the confidential note to the paper editor. The reviewer has an option to reject the review. If the reject button was pressed, the reviewer is supplied with an e-mail form, and is asked to explain the reasons why he/she cannot serve as a reviewer for that paper. In addition, the reviewer can suggest the names of alternative reviewers. A fair review process is ensured by an anonymous review process.

4.6. Lector

The revised paper submitted by the author must undergo the lectoring process to ensure the correctness of the English language. The lectoring process starts when the lector downloads the paper and makes the necessary language corrections and improvements. The lector then uploads the revised version to the system, where it can be accessed for further processing.

4.7. User documentation

The user documentation is provided as a flowchart of the web application for each module. The flowchart is built using Garret's information architecture (IA) diagrams [3]. We figured that such flowcharts would be useful and easy to navigate. Describing the information architecture is a demanding task and we have found Garret's diagram to be the most descriptive. The diagram of the reviewer actions is shown in Fig. 3.

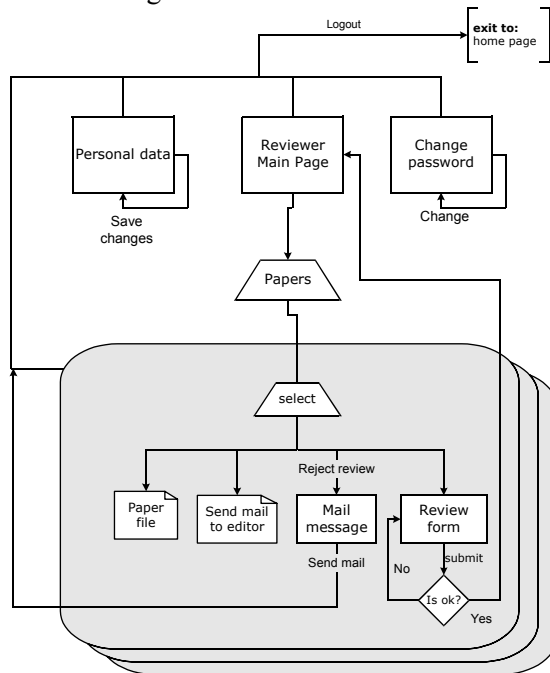


Figure 3. An example of Garret IA diagram

5. Security and other issues

An issue of secure access to the information system has been carefully addressed. SSL encryption is used for password security. The system state changes depending on the current user activity and the user's role in the system. Available functionality depends on the current user role. A user in a certain role cannot execute scripts that are reserved for users in other roles.

In order to prevent users from submitting parts of SQL code in a form that could compromise database integrity, all user data is first quoted before being included into SQL statement. Of course as a prerequisite for the security of a web application, is the security of the server that runs the application.

The user interface is made as intuitive as possible. This is especially important for authors and reviewers who may not be familiar with the

inner workings of the application and do not have time to read lengthy documentation. To ease the publishing process the author is obliged to submit source files (preferably in LaTeX format) of the accepted paper. From these source files a PDF document is generated and consistency can be achieved in the paper appearance.

6. System realization and deployment

The experimental journal management system runs on a personal computer running Linux operating system and the required database and web servers. The open software used in realization of the system allows use on other operating systems, too. The advantage of the developed journal management system is that it does not require any special hardware requirements for the server.

The system is fully functional and is currently in experimental use for managing and publishing of a scientific journal called the Journal of Computing and Information Technology [8]. The goal of experimental use is to test the system and implement changes and improvements, if necessary. The experimental phase currently involves processing of more than twelve papers, with editors and reviewers assigned and participating in the process. First results demonstrated that the authors have accepted the new system and experienced the advantages offered by electronic processing of manuscripts. The amount of effort and mail expenses have also decreased as a result of electronic communication between the participants in the editorial process.

7. Conclusion

In this paper a web-based journal management and publishing system was presented. It enables easy, secure, and fast management of an electronic journal, at the same time reducing the editorial personnel requirements. It also enables a journal to be entirely published on the web independently from its paper version. The developed journal management system helps automate the review and publishing process, thereby reducing the time from manuscript submission to publishing.

8. Acknowledgements

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