

WCMS: WEB-BASED CONFERENCE MANAGEMENT SYSTEM

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Abstract: Web based conference organization and management is one of the most popular applications over the Internet developed recently. Conferences are events that bring knowledge and people together. There is however a lot of informational exchange, organizational and administrative work to be carried out before such an event can be a success. In this paper, an automated web based conference management system is described. Automation of certain management activities is proposed in order to take the pain out of such event organization. Academic conference organization is presented as an example to such an activity.

Keywords: Conference management, web application, web-based event management, Internet information systems.

1. INTRODUCTION

Conference organization is dreaded by many people undertaking it. The main reason for this is the amount of detail that needs to be considered, the importance of advance timing and keeping to deadlines, exchange of huge amounts of information, management of special requests, registration and many other details including the 'conference package' for participants. One of the most important additional issues in an academic conference is the need for management of the paper review process. Most of the above can be managed using a Web-based Conference Management System (WCMS) with greater ease.

In its earlier days, web based conference management systems only included a basic functionality; use of a conference web page where information and announcements regarding the conference are displayed. Following developments in the technology, a number of commercial and scientific services have recently been offered for

conference management such as specified by: IEEE (2003), IEEE (2007), TMS (2003), ICM (2003) and MEI (2003) and others.

The design and implementation of a virtual conference management system and its use are presented in (Shih *et al.*, 2000; Shih *et al.*, 2001). The system described includes all the necessary tools for the use of the system administrator, conference holders, referees, authors, and general users. Conference program management using the Internet is the topic of investigation of (Nicol, 1996). The conference management system developed is based on WIMPE – web interface for managing programs electronically. This is a system that uses Perl scripts and Tcl/Tk code to achieve its functionality and it needs a lot of manual management intervention from the administrators.

In developing applications to be used over the Internet (Hunt, 1998), applicability of traditional system design techniques to website development is investigated in (Marquis, 2002). It is shown that

some parallels may be drawn. The use of methodologies for website development is studied in (Taylor *et al.*, 2002) and it is found that a great majority of website development does not follow any special technique. A new object oriented methodology for web-based information system design is proposed in (Wang, 2001). More generally, a number of studies have looked at tools for web and web-based application development (Fraternali, 1998; Bulancak, 2003; Uma and Perraju, 2000). Web-Kernel (Bulancak, 2003) is proposed as a general core set of functionalities for easy web-based information server design and development. Today almost all conferences use web based conference management systems (Borbala, 2004; ConfMaster, 2003; Gu, 2003; Paperdyne, 2004; Softconf, 2004). These vary in capabilities to a great extent.

In this paper, the conference organization process is analyzed in detail and an *automated* web based conference management system (WCMS) that automates almost all of the main functions needed in the management of a conference is proposed. In section 2 the conference event and its requirements are studied. The WCMS software requirements are presented in section 3. In section 4, the database design and in section 5 the user interface design are described respectively. The ideas put forward are tested in section 6. Finally, conclusions are presented in section 7.

2. THE CONFERENCE EVENT

Organizational and management aspects of many conferences are similar in many respects. Academic conferences have the additional requirement of needing a review process. In this paper, an academic conference is taken as an example of conference management. In order to determine the requirements of the conference management software, it is necessary to analyze the stages of this event in detail. Conference management and the committees may have a number of different organizational structures. These structures depend on the history of the conference and the main proponents for its organization and implementation. Here, it is assumed that one or more chairpersons lead the conference organization and activity. A generalized process is described below which captures the main activities needed in a conference organization.

The conference process starts in earnest with the formation of a steering committee. This is the main committee that takes major policy decisions about the conference. The steering committee meets well in advance of the conference and develops its plans far ahead of the event. One of the main duties of this committee is to form other committees to run the organization activities. These include the organizing and the technical (scientific) committees. These major committees themselves may form the necessary sub-committees in order to carry out the

groups of tasks. The technical (scientific) committee itself may form the following sub-committees: technical program and reviewer sub-committees.

The conference technical areas and topics are usually determined at the joint organizing and technical committee meetings and are announced in the call for papers (CFP) announcements. Other organizational issues and deadlines are determined by the organizing committee.

Although there may be wide variations in the phases of conferences, a widely found phasing of academic conferences is as follows:

- i) planning and organization; leading to announcement and CFP,
- ii) manuscript submission,
- iii) review process; reviewer assignment and paper review,
- iv) announcement of review results,
- v) camera ready paper (CRP) submission,
- vi) registration,
- vii) pre-conference operations,
- viii) the conference-event; execution of the conference, and
- ix) post-conference activities and evaluation.

Various important events occur during the conference life-cycle. Some of these trigger the ending and/or the start of a new phase. The phases and important events in the academic conference life-cycle are shown in Figure 1. The existence or duration of some phases may vary according to the particular conference; for example, in some conferences the registration activity must be completed at the same time as submission of the CRPs. However, each of the above elements is present in some form within a conference organization and execution. It should be noted that planning, organization, monitoring and management activities continue throughout the conference life-cycle. Also, during each phase, activities for the forthcoming phases and events are planned and carried out.

Various processes are carried out within the conference life-cycle and within each of the phases described above. Figure 2 depicts a typical conference process with the committees set up and the associated processes and activities carried out. It should be noted that some details are omitted. Furthermore, certain activities may be delegated to sub-committees, hence changing the structure of the chart. The process diagram is self explanatory and summarizes all of the main activities that need to be planned for a successful academic conference.

An important part of any current conference planning and organization is the information technology (IT) related plans and logistics needed to be employed. The conference web-site design necessitates the provisioning for concurrent users, database integration, user-interface design, data submission

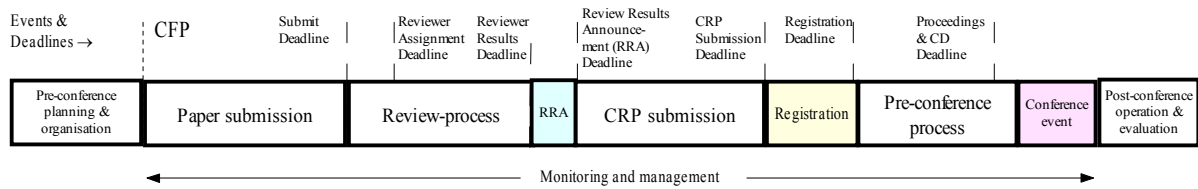


Fig. 1. Academic conference life-cycle.

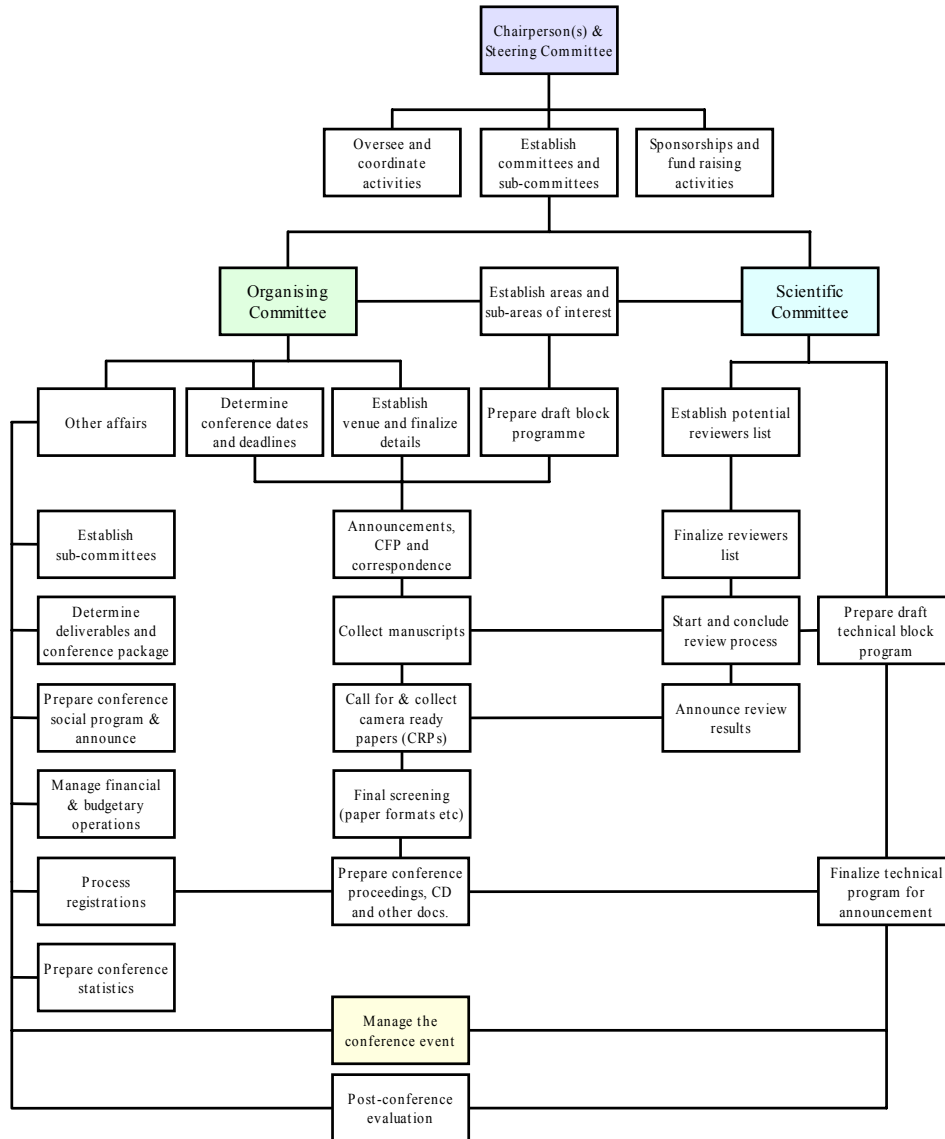


Fig. 2. Typical academic conference organization and process chart.

and entry, announcements and automatic messaging, database security and backups. It is these and other IT related issues that need to be solved for the development of a web-based automatic conference management system.

3. WEB-BASED CONFERENCE MANAGEMENT SYSTEM REQUIREMENTS

The web-based conference management system (WCMS) is designed to solve the old-fashioned conference management problems and to allow the

conference organizers to get the benefit of using the high technology with relatively little effort. As such, the CMS aims to solve communication, organization, delegation and decision making problems through use of the web technology. A large number of conference management procedures can effectively be realized and administered by the CMS. In this way, instead of sending forms and papers via postal service and fax, participants send them by using the Internet. This method solves many problems; authors can reach this service at any time from anywhere. They can repeat the process as much as they want.

Announcements carried out over the web site and sent using e-mail, immediately reach the relevant community. Any possible re-scheduling or any possible error-correction requirements can be maintained easily. Reverse is also possible; interested persons can find answers to their questions immediately. CMS can be used to invite the interested parties to a meeting at the start of the conference. Through e-mail, it can reach thousands of people within minutes. CMS can also make use of automatically personalized e-mails. E-mails can be sent as a reflection of any event done on the WCMS web site. In short, WCMS is designed and automated to provide fully computerized information technology solution to conference organization problems.

The life-cycle and the process chart (see Figs. 1 and 2) give a good idea about the conference organizing experience. It is however necessary to map the requirements, processes and event management to a web based computer software and application solution in order to automate certain aspects of conference organization. There exist two view-points from organizational aspects:

1. Automation as seen by the conference organizers,
2. Automation as seen by the users (mainly authors and reviewers).

Conference organizers need to automate as many events as possible for running the conference preparation, information exchange, manuscript submission, review process, results analysis and announcements, registration and other processes. Users want to obtain the relevant information as easily as possible, submit papers painlessly, obtain review results including reviewers' comments as soon as they are available. They also want to be able to register to the conference, book their accommodation and reserve places at social events. A third group of conference associates exist: these are the reviewers. Reviewers want to be able to reach the manuscripts easily, and send in their review results effortlessly within the specified time period and using the forms and formats for reporting back the results.

The *main conference web page* provides the first point of contact with the visitor to the web page and it is important that a user-friendly main page is designed (Marquis, 2002). This page will have links to other pages for easy navigation through the web site. Especially the "centers" specified below should be reachable from this page. It may also incorporate announcements, attractive displays, moving banners, flashing icons, and other script based attractions for the visitor.

- An *author center*
- A *reviewer center*
- A *registration management center*
- A *travel and accommodation management center*

- A *social activities management center*
- A *conference & site management center (C&SMC)*.

4. DATABASES AND OPERATIONS FOR CMS

In order to carry out the functionalities needed from it as explained above, the conference management system may keep a database with nine main tables. In Figure 3, tables and their interconnection with relative modules can be seen. The purpose of each table is given below:

- *Authors table*: is used to store information about corresponding authors, including institution, department, address, e-mail and username and password entries chosen at registration time.
- *Papers table*: is used to store information about the papers submitted, their corresponding authors, list of other authors and their institutions, paper title, subject areas, latest submission identification link to the submitted file, status and the summary result of the paper evaluation.
- *Submissions table*: paper and submission identification numbers, submission date/time, filename, extension type and status.
- *Reviewers table*: is used to store information about the reviewers. Their research interests or expertise areas are also entered for matching of papers according to reviewer specializations.
- *Review assignments table*: paper-reviewer information pair is kept for easy handling of assignments.
- *Review-results table*: keeps information about the results of reviewer evaluations for each paper.
- *Registration table*: is for keeping the registration related information. As registration is to be made available to non-authors too, it is thought as a separate table.
- *Interested parties table* (potential authors and attendees): is for sending directed conference announcements to interested parties. This table holds the names, and full contact addresses of potential authors and other interested parties.
- *Travel, accommodation and social (TAS) table*: is for recording the attendee and spouse requests regarding the travel, accommodation and social activities.

Operations:

1. Author Center (paper operations; only for authors):
 - *Abstract/manuscript submission*: abstracts or full-length manuscripts are uploaded and registered to the server hard disk. Information about the paper is collected via submission form and stored in the paper table.
 - *Abstract/manuscript update*: information and files may be updated after the initial submission up until the review start period.
 - *Paper status*: paper status can be viewed whenever required. Status report is prepared from the appropriate fields stored in the paper table.

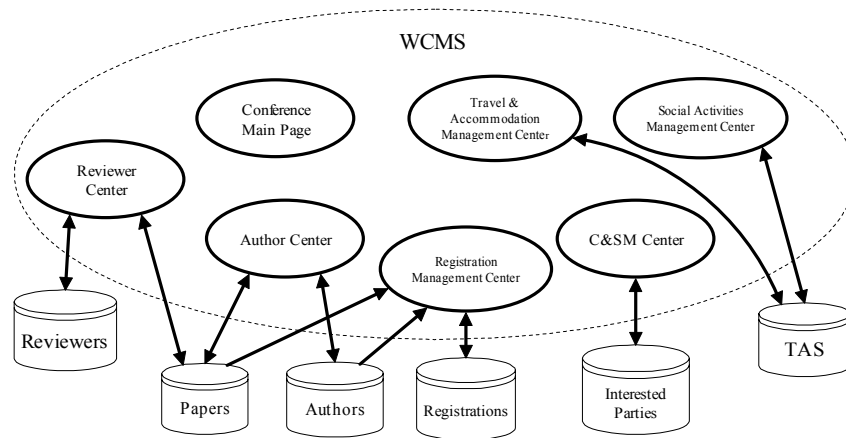


Fig. 3. Sample main files used in a typical WCMS database.

- *Camera ready version (paper) upload*: accepted paper's camera ready versions are uploaded and stored in a special area of the server hard disk. This access is only enabled for the accepted papers.
- *Camera ready version (paper) update*.

2. Reviewer Center (review operations; only for reviewers)

- *Reviewer registration/login*: reviewers can formally start their tasks by registering and logging into the server using their own username and passwords.
- *List assigned papers*: information about papers assigned to reviewers is stored in reviewer table.
- *Read paper*: papers themselves are stored on the server hard disk. Reviewers read papers by clicking on the appropriate link or by downloading them using this link.
- *Evaluate paper*: paper evaluation parameters are collected using a reviewer evaluation form available through the review page and are written to the review results table.
- *Update evaluation*: evaluations can be updated until the end of evaluation period.

3. Registration Management Center (registration operations; only for attendees)

- *Registration*: anyone can register himself/herself by filling the registration form. Registration information is stored in the registrations table.
- *Registration update*: registration information can be modified by registered users.
- *Invitation letter*: invitation letters are prepared for the authors with accepted paper(s) based on the evaluation results stored in the paper database. Registered attendees may also request invitation letters.

4. C&S Management Center (Conference & Site Management operations for the administrators)

- *List papers*: administrator can list paper related information using the papers table.
- *List registrations*: administrator can list registration information using registrations table.

- *List reviewer evaluation*: administrator can list evaluation information by using reviewers table.
- *Send mail to interested parties*: administrator can send mail to all interested persons at the start of the conference process by using information stored in the interested parties table.
- *Distribute papers to reviewers*: this module is run only once after the end of the abstract/full paper collection period. This module uses the reviewers and papers tables.
- *Summarize review results*: this module is run only once after the review deadline ends. It checks for "accepted", "rejected", and other recommendations for each paper and summarizes the results; informs the authors.

Database Connectivity:

For the database interconnection, the ODBC (Open Database Connectivity) standard, which is an interface between applications and databases is used. The use of ODBC, allows SQL commands included in CGI modules to access databases more easily. With ODBC, the type of database used is not important. CGI modules are used to produce database oriented web pages; alternatively, they are used to transfer information from web forms to the databases.

5. USER INTERFACE DESIGN AND DEVELOPMENT

WCMS software. A simple web tree design allowing the major functionalities mentioned in the earlier sections is shown in Figure 4.

Reviewer operations, some registration and most paper operations require a password. Registration module has two choices, one for first time registration and the other used for the cases where modification is required on the registration information. Paper operations are made available under the author operations. During registration of the abstract/full paper of a candidate paper, detailed

information about the paper and information about the contact person (corresponding author) are taken. Then, the WCMS assigns a paper identification number to this paper automatically which is then used in subsequent communications and processes relating to this paper. Information updates regarding the paper are carried out through the “paper submission/update” page within the author center. The “paper status” link shows the most recent status information about the paper and it is especially useful for checking the reviewer notes. Acceptance status and suggested corrections are also shown through this page. Authors are informed using automated e-mail messages. For example, “invitation letters” are prepared automatically for each individual author whose paper has been accepted.

Reviewer assignment, user access authorization, database operations, review results evaluation module, statistics and “send mail” modules shown within the C&SM center in Figure 4 are for administrative purposes. The reviewer assignment module is for automatic assignment of papers to reviewers. Table 1 shows the algorithm used for reviewer assignment. Reviewers are then informed by e-mail that they can start evaluation. The decision on the number of reviewers to be assigned for the review of each paper is taken by the scientific committee. Authors can follow the evaluation results and can read the reviewer comments as results are submitted in and while the review process continues.

User access authorization module allows user name and password pair to be assigned to authors and other users. Database operations module allows access and handling of the tables within the WCMS database. Review results evaluation module allows the evaluation of reviewer returned results as a whole. Statistics module allows tracking of user groups, number of papers submitted, classification of paper types according to certain given criteria, institution or country based classification of authors and attendees, etc. The “send-mail” module uses its mail list and pre-arranged mail text to spread any message to many persons automatically. It is used by the administrator for the purposes of prompting the authors to submit their papers by a certain deadline, informing the reviewers to start their evaluations, announcing possible deadline extensions, etc.

6. TESTING THE IDEAS

In order to test our ideas, we have developed the automated WCMS and applied it first to the

management of the national Signal Processing and Applications (SIU'2001) national conference held annually in Turkey and later to the International Geoprob'2005 Conference.

The WCMS works in a client-server mode similar to most Internet based applications. The client side is an ordinary web browser. The server side is implemented using ColdFusion®. This allows the database and site integration as well as a host of other features. Sample applications for the designed WCMS were implemented with the above features. The first application was the SIU'01 conference web site for which the site map is shown in Figure 4. A sample screen shot of the site is shown in Figure 5.

7. CONCLUSION

Web based conference management systems have become popular in recent years. Indeed, once their potential is seen, they invariably become the main platform for conference organizations. This is due to the flexibility it provides for conference organizers by taking the chore out of information management through the provision of automation as well as efficiency for information dissemination.

In this paper, web based conference management has been studied in detail. The whole process has been investigated from conception to the actual conference event. Functional and informational requirements of such a system have been investigated and the results presented. It has been shown that the web-based conference management systems can be used to make life much easier for conference organization and management. The academic conference has been taken as an example of such applications and details of such a system have been exposed through step-by-step analysis. A simple database and user interface design has been provided. The automation of the reviewer assignment process has been described and an algorithm has been proposed. For future work, it will be very useful to have the automation of conference technical program generation built into the system. This is hoped to be undertaken in future work.

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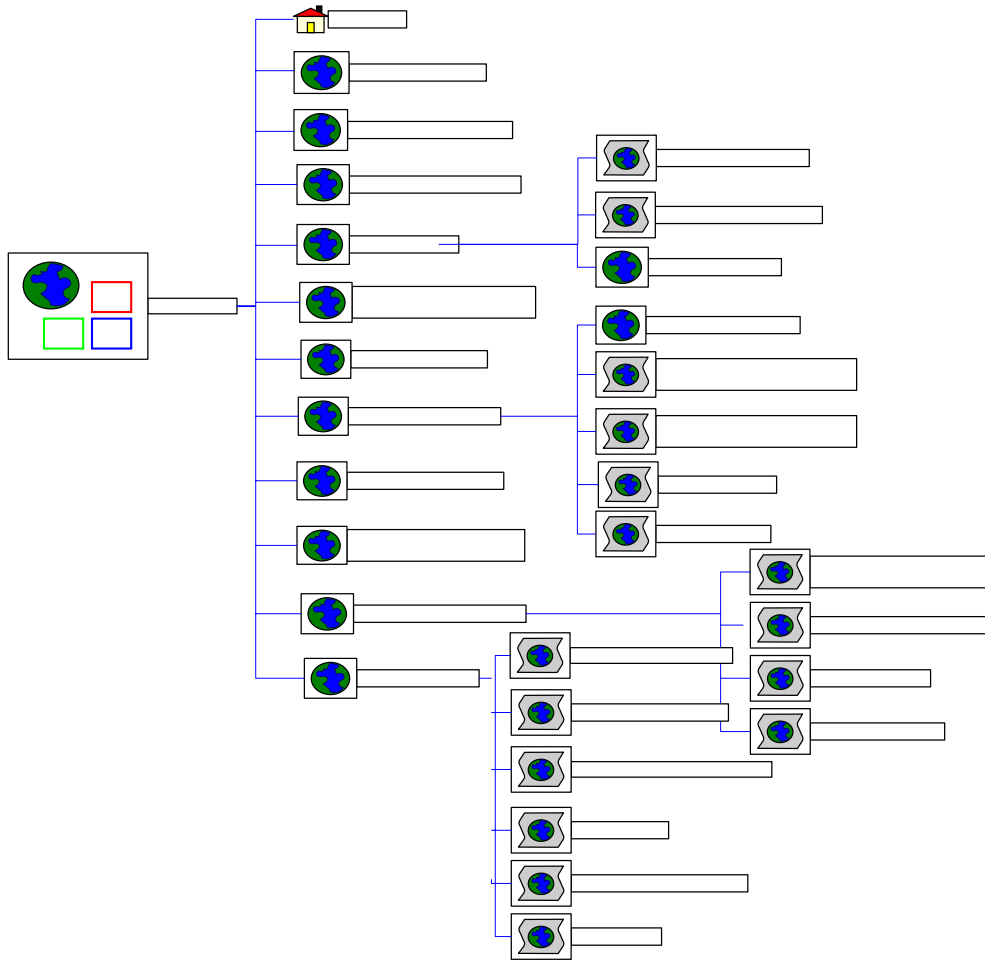


Fig. 4. A simplified WCMS site structure.

Table 1 Algorithm for paper allocation to reviewers

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PROCEDURE < ASSIGN PAPER REVIEWERS >
BEGIN
  INITIALIZE number_of_iterations;
  SET P = max no. of papers that may be assigned to a reviewer;
  SET R = number of reviewers required to check each paper;
  SET paper_set = all papers in paper-database;
  SET paper_tobe_assigned = R * paper_set;
  FOR i=1 TO number_of_iterations
    SET paper_test_set = paper_tobe_assigned, remain_paper_set = paper_tobe_assigned;
    SET reviewer_set = all reviewers in reviewer-database, reviewer_paper_set[i] is empty;
    DO WHILE paper_test_set .GT. 0
      SELECT paper randomly from paper_test_set;
      DELETE selected paper from paper_test_set;
      REPEAT UNTIL all reviewers are checked;
        SELECT one reviewer randomly from reviewer_set;
        IF reviewer has not been assigned paper more than P;
          IF selected paper is not assigned to selected reviewer before;
            IF authors and reviewer is not from the same institution;
              IF any author does not carry same surname as the reviewer;
                IF reviewer interest area matches the paper subject area;
                  REMOVE selected paper from remain_paper_set;
                  ADD selected paper and reviewer to selected reviewer_paper_set[i];
                ENDIF
              ENDIF
            ENDIF
          ENDIF
        ENDIF
      ENDREP
    ENDDO
    SET iteration_result[i] = paper_rest_set;
  ENDFOR
  COMPARE iteration_results by checking how many reviewer evaluation processes remain un-assigned;
  UPDATE Reviewer-database according to the comparison;
END
END-PROCEDURE

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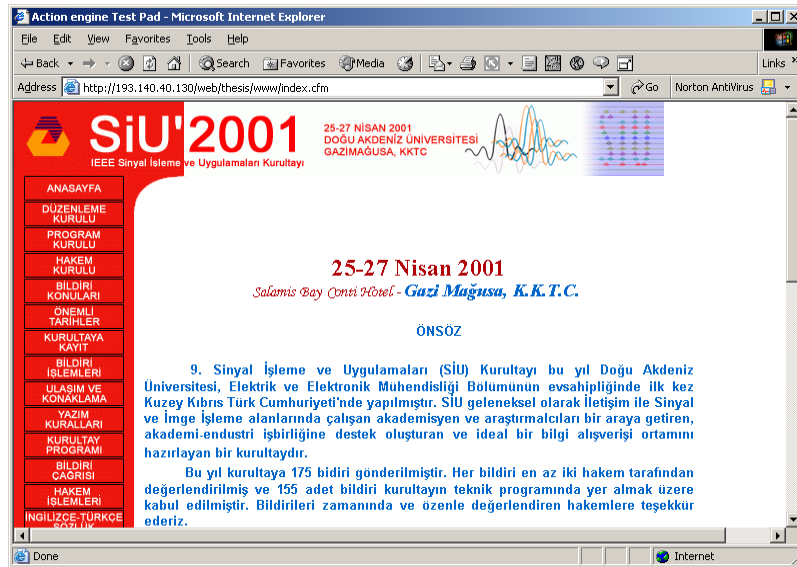


Fig. 5. "Home" page from a sample conference application.

REFERENCES

- Borbala (2004). CyberChair: Online conference services. <http://borbala.com/>.
- Bulancak, A. (2003). *Web-Kernel: analysis & design of a web based kernel engine*. M.S. Thesis: Eastern Mediterranean University.
- ConfMaster (2003). The conference management system. <http://www.confmaster.net/>.
- Fraternali, P. (1998). Web development tools: a survey. *Computer Networks and ISDN Systems*, Vol. **30**, pp. 631-633.
- Gu, Z., X. Jin and B.C. Desai (2003). CONFSYS: The CINDI conference support system, *Proc. of 7th Int. Database Engineering & Applications Symposium (IDEAS'03)*. pp. 414-418.
- Hunt, R. (1998). Internet-services, facilities, protocols, and architecture, *Computer Communications*, Vol. **20**, pp. 1397-1411.
- ICM (2003). International Conference Management. <http://www.conference.com>.
- IEEE (2003). Meetings and conferences policies. http://www.comsoc.org/socsTR/documents/pp/p_p_5_8_4.html.
- IEEE (2007). IEEE conferences organization manual. <http://www.ieee.org/web/conferences/mom/index.html>.
- Marquis, G.P. (2002). Application of traditional system design techniques to web site design. *Information and Software Technology*, Vol. **44**, pp. 507-512.
- MEI (2003): Meeting Expectations Inc., Meetingexpectations conference management system. <http://www.meetingexpectations.com>.
- MyReview (2005). Conference management system. <http://myreview.lri.fr/>.
- Nicol, D.M. (1996). Conference program management using the Internet. *Computer*, Vol. **29** (3), 1996, pp.112-113.
- Paperdyne (2004). Conference management system. <http://www.paperdyne.com/upcoming.html>.
- Shih, T.K., J.Y. Huang, J.C. Hung, T-H. Wang, and W-C. Pai (2000). The design and implementation of a virtual conference system. *IEEE COMPSAC 2000, The 24th Annual International Computer Software and Applications Conference*, pp. 261-266.
- Shih, T.K., J.C. Hung, T-H. Wang, Y-S. Chen and S-E. Yeh (2001). Virtual conference management system. *Proc. of 15th IEEE Int. Conference on Information Networking*, 31 Jan.-2 Feb., pp. 776-781.
- Softconf (2004). START: conference management system, <http://www.softconf.com/START/>.
- Taylor, M.J., J. McWilliam, H. Forsyth and S. Wade (2002). Methodologies and web site development. *Information and Software Technology*, Vol. **44**, pp. 381-391.
- TMS (2003). CMS-Plus conference management system. <http://cmsplus.tms.org/CMS/CMSPlus.nsf?OpenDatabase>.
- Wang, S. (2001). Toward a general model for web-based information systems. *International Journal of Information Management*, Vol. **21**, pp. 385-396.