Internet Based Syllabuses System (WebSYL)  
Using Personal Assistant Agents

Behrouz H. Far  
Department of Information and Computer Sciences, Saitama University  
255 Shimo-okubo, Urawa 338-8570, Saitama, Japan  
E-mail: far@cit.ics.saitama-u.ac.jp

The WebSYL system for the Electronic Syllabuses of the Faculty of Engineering, Saitama University is developed. The system contains entries for the lectures of all of the 6 engineering departments. The WebSYL system includes programs to automatically convert the database to hypertext format, programs for automatic generation of syllabuses entries by the instructors, form based and frame based search facilities and a bilingual search engine for keyword search. An important problem with systems with dynamic contents is the overhead on system administration to keep the system up to date. An important feature of the WebSYL system is minimizing the administration, by totally automating the contents management, using personal assistance agents and distributed objects technology. In this way instructors can update syllabuses entries from remote clients using ordinary browsers and the state of the edit is preserved for future updates. Automating this process has reduced the manual maintenance costs to zero.

Keywords: Personal Assistant Agent, Internet, System Management

1 Introduction

There are already many applications of the Internet technology in the academic area [1] and there are numerous systems aiming at building Internet based CAI systems. A main problem with any Internet based site with dynamic contents in general, and CAI systems in particular, is the administration overhead and maintenance costs to bring the system up to date.

The electronic syllabuses system project (http://sylab.cit.ics.saitama-u.a.jp) of the Faculty of Engineering, Saitama University, started in March 1996. The initial goal was to serve the syllabuses entries of the 6 engineering departments via Internet. The system can handle Japanese contents and has complex search facilities, local news, course selection guide, etc. Now the system has evolved to be totally administration free. The process of contents management and update is done via personal assistance agents that reside on instructors’ remotely located ordinary terminal connected to the Internet.

In this paper we introduce the design and implementation concepts of the WebSYL system (currently version 2.0). In Section 2 the basic design concerns are introduced and Section 3 embodies detailed discussion on the implemented modules. A brief system evaluation is given in Section 4 followed by a conclusion in Section 5.

2 WebSYL System Design

Figure 1 shows the conceptual view of the WebSYL system. There is a dedicated Syllabuses
server that serves the contents and there are some local terminals for students’ use. Instructors and other individuals may use local or remotely located personal computers and workstations to access the site.

Figure 1. Conceptual image of the WebSYL syllabuses system

The following factors were considered when designing the WebSYL system:
1. Being able to handle Japanese contents.
2. Extendibility of the system and flexibility to modify or add more contents according to the needs.
3. Minimizing the maintenance costs and eventual realization of a zero administration site.
4. User friendliness when used by students and easily maintained by the instructors.

The system can handle Japanese contents in all of its functional modules, specially, in the search module when searching for Japanese keywords and phrases and in the remote maintenance module for instructors to modify and revise the contents.

Courses contents evolve over time, so does the WebSYL system. The second factor is met through modular design and implementation of system’s functional components. New modules can be added to the system without disrupting the functions of the existing modules. Old modules can be replaced by new ones with a superset of input and output parameters and/or functions.

A main disadvantage of WWW contents delivery system is its time dependency. WWW system administrators feel increasing burden when maintaining such sites. We faced this problem when the first version of the system was designed. Design for maintenance concept is practiced in the second version system design. The third factor is met via using personal assistance agents and distributed objects technology (see Section 3.3).

Finally, the fourth factor is met via adopting touch-panel design of the user interface for on-campus terminals and using the latest techniques in building WWW based user interface.

Figure 2 shows the main window of the WebSYL system using a popular Web browser.
The interface is designed to be easily configurable by inexperienced students while containing enough depth for the expert users. Data for the entries is extracted from the course database and presented to the user in HTML, Japanese text, Postscript and Portable Document Format (PDF). (See Figure 3.)

Data record for each syllabus entry is composed of 64 data items. It includes all the required data about the course contents, detailed sessions, handouts, textbooks and reference books, evaluation data, such as examination or report, administration data, information related to the instructors and the timetable. Extra area for free format text and messages is also provided for added flexibility. The selected syllabus entry is formatted automatically and displayed based on the user’s selected format.
3 Functional Units of WebSYL System

The WebSYL system consists of the following functional modules.

- **Automatic text to html conversion module**
  The initially gathered syllabus files had to be processed and converted to the HTML files and database records. In the past this was done by manual typesetting the whole documents that could take a long time. The WebSYL system includes programs to parse the Japanese text files and convert them to HTML documents and/or database records. More than 200 initial syllabus entries were converted using this method with an error rate less than 3%.

- **Bilingual context sensitive search**
  The bilingual search engine accepts words and phrases in both Japanese and English, conducts search, ranks them based on appropriateness and produces a list of candidate syllabus entries. Both the depth of search and its granularity can be adjusted by the user.

- **Timetable search**
  The actual timetable for the courses taught and a personalized timetable can be generated and displayed upon request.

- **Local news module**
  A kind of billboard maintained by the Engineering Department staff is provided to call the students or inform them of the forthcoming events, etc. Such billboard entries are generated and displayed automatically.

There are two other main functional modules:
- Course selection guide using Case-Based Reasoning (CBR).
- Remote maintenance modules.
  These are described in details in the following subsections.

3.1 Course selection guide using Case-Based Reasoning (CBR)

There was a strong need from the students to verify the required credits in order to graduate. Such information is generally compiled in the Course Selection Guide (officially called Rishu Annai) that is delivered to the students upon their enrollment. However, understanding the contents and verification process takes a long time for both the student and the advisor because the situation is different for each student and his/her enrollment year. A kind of personalized Course Selection Guide is offered by the WebSYL system using Case Based Reasoning (CBR) technique that has a record of about 140 individual cases and 18 solution patterns and they are adapted automatically to encounter new cases. As depicted in Figure 4, based on student’s answers to an online questionnaire the most appropriate case is selected from the case-base, adapted and presented to the student. This function is under test run since 1998.

Each case is represented by two sets of description and solution entities. The cases are first filtered by the department and enrollment year, etc. The subset is further narrowed down by a match between description sets of the query and recorded cases. Finally, a common solution pattern between the query and remaining cases is recognized. The solution pattern is modified to be a close match to the new query case. This solution pattern then is presented to the student. The student’s satisfaction, a number ranging between 0 - 10, is taken as a measure for success. This feedback is taken into account in future inquiries. New cases are recorded automatically and verified against the old case and those considered worthy to be remembered are added to the casebase.
3.2. Remote maintenance module

In WebSYL system, almost zero concentrated system maintenance has been considered as a strong system design factor. Therefore a mechanism to allow instructors add, revise or update their data entries from remote terminals, using CGI and plug-ins is devised. The instructors can access their workspace using ordinary Web browsers. The mechanism is depicted in Figure 5.

Figure 4. Course selection guide using CBR

Figure 5. Conceptual view of the automatic update process
Security is a main concern in distributed systems. The instructors must go through two step authentication process using password and secure internet connections to obtain access to their assigned workspace.

A serious difficulty with the Web based contents administration, using CGI and forms, is maintaining the state of access. The state preservation is successfully emulated in the WebSYL system such that the instructors can access the same workspace and start the contents administration job from the state they had left in their previous access.

3.3. Instructors’ Personal Assistant Agent (PAA)

A main problem with the remote administration facility of the WebSYL system is its poor response time during the pick access hours. Every single revision and submission requires execution of a long (about 50K line) script that substantially affects the performance of the system. The instructors should receive immediate feedback on every action they take. HTML and CGI forms do not allow this kind of tightly coupled interaction. Moreover, HTML and CGI forms can hardly maintain the state of the access during revisit or access interruption. Furthermore, identity verification on each revisit can be quite disturbing to the instructors who are not supposed to be Web system specialists.

Using Personal Assistant Agent (PAA) removes the above mentioned problems. Figure 6 shows the main window of the PAA. The PAA is an operating system independent application build using Java programming language and is downloaded to the instructors’ remote terminal. The instructor invokes PAA to produce a new syllabus entry, revise or edit the old entries. The PAA takes care of the state of access as well as personal information required for multiple accesses to the WebSYL server. The contents management process and editing is done off-line therefore the data transmission costs are substantially reduced. The connection to the WebSYL server is made at the background when considered to be necessary and the submission of the information requires almost no knowledge of the network and data communication.

![Figure 6. Instructors’ Personal Assistant Agent (PAA)](image-url)

In WebSYL system, the server and PAA agents can find and communicate with each other dynamically, using Common Object Request Broker Architecture (CORBA) [3] as depicted in Figure 7. CORBA allows PAA agents and WebSYL server find each other and coordinate their behavior on a common object bus. The advantage of using object technology is using those objects as a metaphor for task sharing between the client and server. Furthermore, the security services of CORBA allows safe and risk free data communication.

In WebSYL system, the Java ORB is used. With a Java ORB, an applet or application can invoke methods on CORBA objects using the IIOP protocol over the Internet. Consequently, there is no need to use CGI programs which are the cause of extra overhead on the server. Furthermore, the client-side ORB enabled applications or applets can be used in any Java enabled terminal or browser.
4 System Evaluation

The WebSYL system has been used successfully in the past few years by the students, instructors and system administrators. The average access hits has been doubled annually (see Figure 8). With the increase of number of site terminals and off-campus access points a further increase is expected. Furthermore there is another project called OpenText [4] to connect the WebSYL system with the Faculty of Engineering’s intranet to offer the contents of selected lectures on-line. The WebSYL system together with the OpenText will bring the state of the art in user oriented Internet based instruction system into the hands of the prospective students.
5. Conclusion

Design and implementation of the WebSYL electronic syllabuses system of Faculty of Engineering, Saitama University, was discussed. The main features of the system are the ease of use, modular design and zero concentrated administration. Adding server push and Web channels has substantially improved the access time in the client side. Using Personal Assistant Agent (PAA) has reduced the maintenance costs to almost zero and using CBR in course selection has added to the usefulness of the system. The WebSYL system (version 2) is actively used by both students and instructors and feedback from the users will be used to add new or improve the already existing functions of the system.

References