

SASy – A Study Assistance System

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We describe a study assistance system (SASy) developed and used at the University of Ulm. Computer science students get automated competent help concerning the formal aspects and exam regulations of their studies. The system generates individualized and situated warnings to students who are behind the schedule. SASy is JAVA-based and uses XML as data types.

MOTIVATION

University studies in Germany generally take significantly longer than expected by the regulations. E.g. computer science students at the University of Ulm need about 12 semesters in average despite the planned duration of 9 semesters.

Thus, currently a lot of effort in the German university system is targeted towards the structural improvement of curricula and course programs. Exam regulations are innovated through modularization, credit point systems are introduced and programs are reformed to be more compatible with international standards (i.e. bachelor/master).

However, analyzing the fact of long studies reveals that most delays are caused due to lack of information and self-planning at the students and not primarily due to lack of badly constructed curricula.

Closing this information and consulting gap by an assistance system promises sustainable gains in timely study performance. Such assistance has been established for a long time on a personal basis. There are consultancy institutions within the university and within the faculty where students can acquire help and tips concerning their specific curricula and exam regulations.

With a growing number of students the need for advice from assistants increased rapidly over the last years. Most of the questions could have been answered stereotypically, due their nature, but were asked and answered individually and thus often. Every student quitting costs time, time of her or his live, but also time of professors, assistants and the Admission Office. Experience shows that the above mentioned personal instruments are not well enough accepted by those students having problems with the efficiency of their studies. Usually they appear such late, that tips on measures to be taken come too late as well. As an effect students lose one or two semesters on bad planning of combinations of lectures or exams or - as a worst case – fail entirely. Experience also shows that a tremendous amount of gossip goes around the students misinterpreting the regulations due to misunderstanding the formal language of the exam regulations.

FUNCTIONS OF A STUDY ASSISTANCE SYSTEM

If students do not come early enough to the study consultants, there need to be a way to actively approach the students themselves in a timely manner. Obviously this task could be done by the consultants given they are at all times provided with a consistent view on all performances of all students. However the consultants do this job besides their regular work in research and lecturing. They will no way ever have the time to fulfil this desirable task.

But, also obviously the task of monitoring could be automated using the credit and student data bases. A technical system could also be the information source for regulations being translated into language understandable by students and for frequently asked questions around a degree program.

At the University of Ulm such an assistance system, called SASy, has been developed and is being implemented in the computer science programs.

SASy is offering several functions as a service in the Web.

The regulations are given as a hypertext in a student conform language. This hypertext is individualized by extracting from the legal text covering all of our four computer science programs the specific regulations for the respective student. The hypertext allows to link relevant curriculum resources such as module and course descriptions, credit point system, or teaching material with the regulations at meaningful positions. Frequently asked questions and descriptions of standard procedures augment this hypertext.

The most interesting feature of SASy is the active notification and guidance of students. If a student does not follow the required paths to pursue his studies in a timely manner, SASy can detect this deviation from the foreseen path by comparing the actual standing and history of this student with a reference model student. Email functions then notify individually about approaching deadlines of exams as well as giving suggestions on how to effectively proceed in the individual course of studies. Thus, SASy acts as a early warning indicator to accelerate the overall performance of students.

While the first two years of the computer science degrees at our university are very restrictive, defining narrow paths through the subject, the following years are more open. Our system profits from the newly established credit point system, making the studies modular and nevertheless easy to produce tips for SASy users (Gehring 2002).

Some aspects of students live and sorrows extend far from academic life. This information range from finding a new home in Ulm to student jobs and are collected in a large FAQ.

Compared to other more complex systems, SASy is not an all-in-one solution for all student interests, it more or less only handles the formal aspects of the degree programmes. So the adoption to other subjects and other universities is easy – and it does not implicate a complex computer infrastructure. Even small schools with only a web server could implement relevant parts of our system.

MODELLING A DEGREE PROGRAM

In order to monitor the course of a degree program a model is needed which can serve as a basis to guide students through their studies. Typically a study program is laid out as a sequence of parallel alternatives (mainly the lectures) according to the current semester of students. Conditions are imposed on the alternatives relating them on earlier lectures being prerequisites.

For instance, in the first four semesters the curriculum plans for four lectures in parallel in each semester. If one student fails in one of the lectures, she has to make up for the respective lecture in the following semester, having the effect that a consecutive lecture has to be postponed. Such conditional behaviour how curricula can evolve in the individual case led us to using augmented transition nets (Kieras et al. 1983) to model a program.

Exam status is modelled as nodes, the arcs are annotated by the conditions leading to the next state. Figure 1 shows a simplified transition net for the computer science program at Ulm.

For each student an instance of the transition network is activated. By passing lectures the conditions successively evaluate true and the state of the student will proceed towards graduation. Since the conditions variables can be related to semesters it is easy to detect missing lectures and generate the respective warnings and tips.

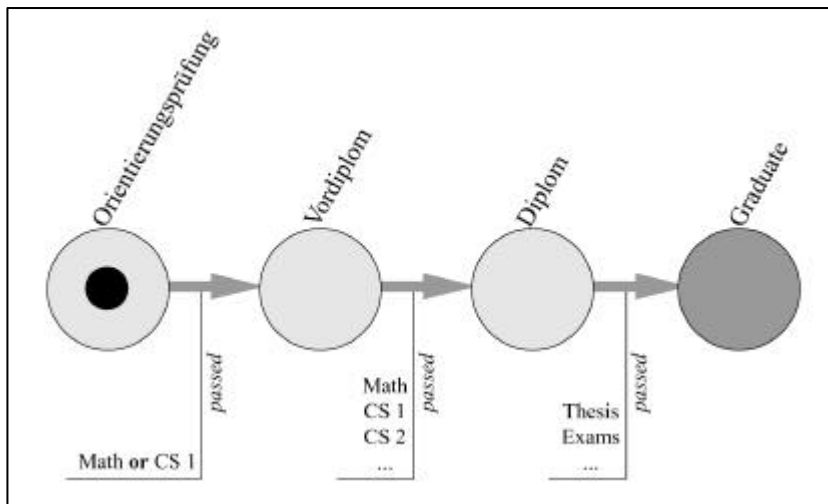


Figure 1: An augmented transition network drives SASy.

SYSTEM ARCHITECTURE

It is necessary to offer SASy as a 24 hour, location independent service. Therefore SASy is designed as a service in the World Wide Web without requiring specific software to be installed at client machines (figure 2).

For the information concerning the hypertext exam regulations (PO) and the FAQs an ordinary web browser is used to access the SASy web server. The exam regulations and the FAQs are coded in respective XML document types being converted to HTML when accessed by the browser. For the guidance component a Java applet is downloaded as a student's user interface into the browser. It connects with the server containing the relevant models of the student and of the reference degree program. The applet also retrieves actual grades through a proprietary protocol from the data base (HIS, Hochschul-Informationen-System) run at the university's admission office. On the basis of this information and the intended course of studies, the SASy-client produces in the case of problems on-screen warnings and tips on how to get out of the danger zone again. For the ideal student it shows the actual standing and praises extraordinary performance to increase motivation.

Besides the user driven interface the proactive notification is one of the major goals of SASy. Therefore SASy instances are run at the admission office, connecting to the data base and sending mails with the consulting information to the students having problems. This direct contact without the need of activity from the students minimizes the risk of SASy being overseen by our main target group, the weak students.

IMPLEMENTATION ASPECTS

The language of the original exam regulations is very formal as being written by lawyers. It is hardly understandable by a legal layman. Thus the exam regulations are annotated with "easier" language and represented in an XML document type in one effort while annotating it. Another obstacle for interested students is the all-in-one form of our regulations. All four computer science degree programs are written down in one single document, confusing students with unnecessary paragraphs concerning only other degrees. Thus we give students an annotated form of exam regulations being reduced to the special needs of the degree. The annotations explain paragraphs by e.g. giving use cases or anecdotes how to interpret them. In addition helpful links within SASy or to other spots in the web can be included. In the separate FAQs, the exam regulations are presented only in the annotated and condensed form.

Representing the degree programme, the regulations and FAQs in XML allows easy alteration, if changes are to be made. Additionally this allows implementation of other subjects or new degree programmes in a straightforward way.

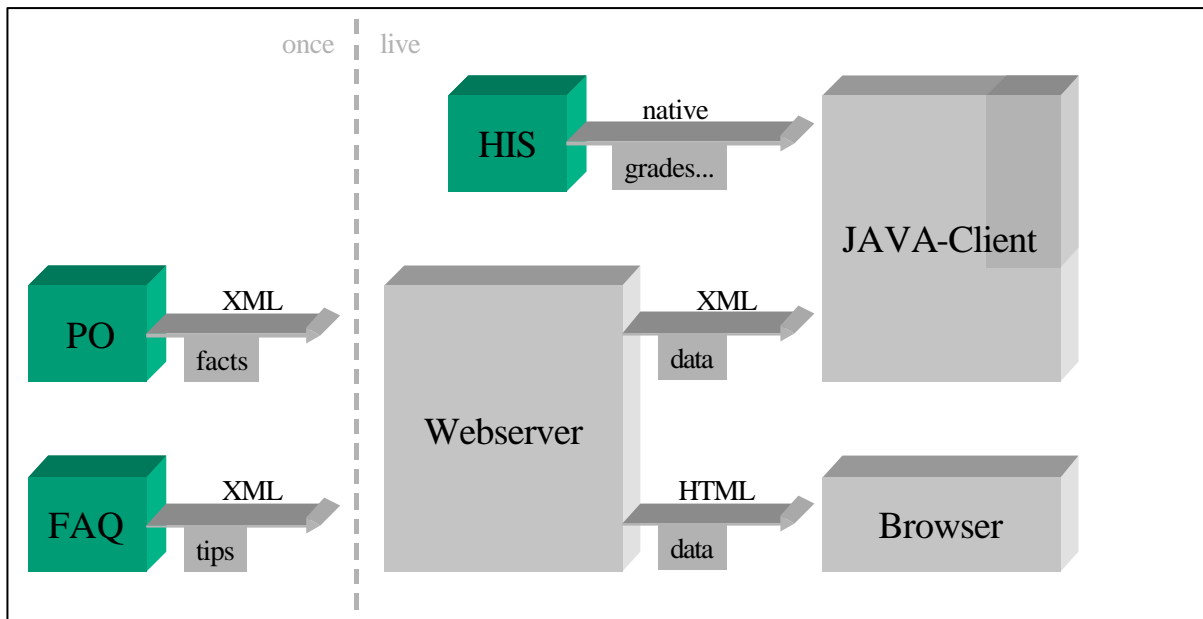


Figure 2: SASy architecture

DATA SECURITY

An important aspect of the system is data security. The data protection laws in Germany are rather strict concerning personal data – like the students' grades. The system uses this data only while generating the consulting report. This concept of not storing any personal data is one of the advantages of SASy. All other functions work without private data and though aren't problematic and even usable via a standard browser.

The client software avoids unnecessary data transfer and storage on the local machine. Only the data needed for the consulting is transported via secure transmission over the net. As an addition, the finishing applet overwrites all local variables with random data.

While connecting from a university machine, the applet contacts the grades database in HIS and gets information on the students standings. We allow this connection only from inside the university network to avoid security holes. From other machines, the students could manually enter their grades and maintain their own user record to get proper consulting.

CURRENT WORK

Currently all grades are stored in the central database at the admission office while they don't know about the necessary certificates from the students. (Students at our university have to take several courses with certificates instead of grades.) Gathering this information will follow in the near future in an automated sense, meanwhile students are able to enter their certificates manually into the SASy client to get recommendations based on the complete standings and not only the grades.

The client contains access to all types of information handled by SASy, another advantage of the architecture: links to existing web pages are easy to implement.

All information in the FAQ were collected over the last years by student advisors and sorted into hierarchical categories. We provide a large collection of example letters and requests concerning different possible applications. SASy shows the annotated exam regulations in a more intuitive way than the original exam regulations.

Another function of the client is a kind of what-if game. The students can play with their grades and see what happens to their standings. Designing the user interface we cared for easy accessibility (Shneiderman 1998) even for beginning students without computer science background and chose an intuitive presentation of the actual standing in the degree programme (figure 3).

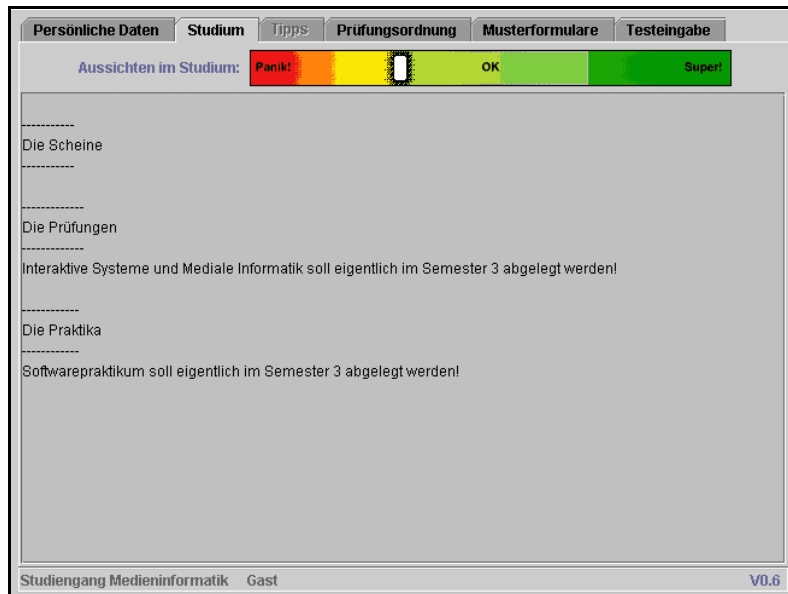


Figure 3: Displaying actual standings in a degree program.

FUTURE WORK

The next steps in developing SASy are adoptions to make the system available for other subjects at our university. A corresponding project (SOFA) started in late 2002.

A promising extension of the current SASy will be a statistics module. Momentarily we only know some basic facts of our students: the mean time to finish, the duration of the final theses, or, the percentage quitting without degree.

To increase our teaching performance, more information would be important: the real learning curve, the reasons why quitting students leave and so on. With all the information used in SASy, some highly informative statistics are possible. Even student motivation could profit directly from such information. Students could compare their personal performance to that of other students, from other degrees, subjects or even universities, if similar systems are used there (figure 4).

RELATED WORK

There are several types of support systems being used in virtualizing universities. Major developments are course management systems and learning platforms, such as WebCT (WCT 2002), Blackboard Learning System (BLS 2002), Lotus Learning Space (LLS 2002), or Saba Learning (SAL 2002), just to name a few. The focus of these systems is to provide a management base to conduct and retrieve course material.

Another type of systems is used to manage student grades at admission offices. In Germany the HIS system suite is widely spread in this category (HIS 2002). One of the components (called HIS-QIS) allows students to access their record through self-service functions over the web.

PerSa (Claußen 2002) is a personal assistance service for students being most related to SASy. In PerSa the student life in a virtual or semi-virtual university is supported by agents representing e.g. the library, the learning spaces and so forth.

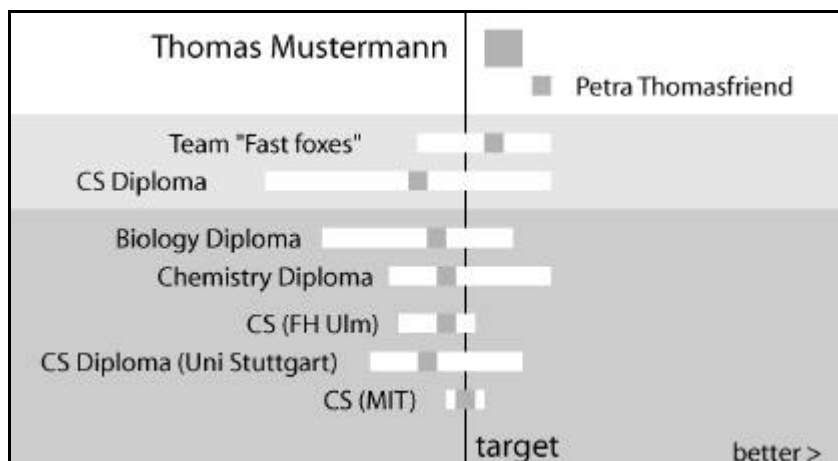


Figure 4: Comparison chart of a student.

CONCLUSIONS

We presented the core ideas of a student assistance system, called SASy. It guides students through their way pursuing a complexly regulated degree program. The major aim is to prevent students from losing time due to bad planning of their specific curricular set up. SASy will be deployed from 2003 on, which will give us first evaluation results on its benefits by early 2005. Simulations gave promising results in order to shorten the average duration of studies in our programs.

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