DIVISION OF COMPUTER SCIENCE

USING MULTIMEDIA CASE STUDY MATERIAL FOR TEACHING REQUIREMENTS ENGINEERING

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ABSTRACT: *This paper describes the development and use of multimedia case study materials on the World Wide Web. Materials were used in two final year courses on requirements engineering. The main motivation for providing materials in this form was to provide a convincing basis for practical elicitation and specification activities carried out during the course. It was also hoped that providing information in this way would increase student motivation and permit flexibility in self-study, as well as providing staff with an opportunity to gauge student reaction to using materials in this form. Students have, on the whole, reacted positively to this experiment and have apparently found the materials provided particularly useful in providing orientation at the beginning of the course.*

KEY WORDS*: World Wide Web, multimedia, case study, requirements engineering.*

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1. Introduction

It has long been recognised that learning is greatly facilitated by the use of examples. In the area of software system development, examples are provided through case studies. Case study materials, including background information and documentation from a real or imaginary client organisation, have traditionally been provided on paper. To teach skills such as those needed in requirements elicitation, lecturers often role-play clients or users so that students can have some experience of the interview process, but it is difficult to make the students feel that they are taking part in a real system development.

In this paper we describe a new approach to teaching through case studies which exploits the technology of the World Wide Web (WWW). The final year Requirements Engineering options for the Computer Science and Applied Computing degrees at the University of Hertfordshire are based on an 'almost real' case study developed in collaboration with City University and Imperial College, London.

The case study involves specifying requirements for a Federated Active Badge Location System (FABLS) which is to be developed at City University as an extension to the existing Active Badge Location System (ABLS) at Imperial College. The ABLS currently in operation in the Department of Computing at Imperial provides information about the whereabouts of certain members of staff within the department. There is currently a move to implement such a system at City University, and to link that system with the one running at Imperial to form a federated

system, so that information about individuals on both sites can be provided in an integrated manner. Students are asked to elicit and specify requirements for the federated system in practical exercises carried out during the course.

The rest of this paper describes the way in which the material for this case study was produced, and how it was used in the Requirements Engineering courses. Some initial findings regarding the use of these materials are presented, and some conclusions concerning the presentation of multimedia case study materials on the WWW are drawn.

2. Producing the Materials

A rough plan for the materials was produced to correspond with the structure of Requirements Engineering course as a whole. Since the course was to present three important factors affecting the requirements engineering process as:

- the technology to be used in implementing a system
- the organisational environment in which the system would operate, and
- the users and stakeholders of the system to be built

it was decided that there should be a page of information about each, with a further page containing links to other material about requirements engineering currently available on the Web.

On the basis of this initial design a number of short videos were then shot at Imperial College. These included pictures of the active badges and sensor technology in use, as well as footage of short interviews with individuals in the Department of Computing who were asked to adopt particular views on the system: for example, a secretary was asked to explain why she thought the proposed system might be useful, a lecturer was asked to act as a client for the project and describe what he would like from the system, and a second lecturer was asked to express some concerns about aspects of the system such as privacy and security.

The videos and soundtracks recorded in this way were digitised, and some stills from each were captured. This was done using Fusion (TR) software on a Macintosh Quadra 660 (TR), with an animation compression algorithm and a playback rate of 3 frames per second. A more detailed design for the pages was then produced, and the stills were incorporated as planned. The resulting pages were then made available through a Unix Web server. Unfortunately, there was not at this point time to include any of the videos or soundtracks before the beginning of the course. The five pages provided are as follows:

- *Background and Aims* - students are reminded of what they must do for the case study, and provided with links to each of the pages below.
- *The Technology* - a picture of a badge and a sensor is shown with a brief description and a link to further information provided on the Web by Olivetti, the company which makes and supplies the active badge technology.
- *The Organisational Environment* - some information about Imperial College and the way it currently uses its active badge location system is provided together with links which allow students to take a photographic tour round part of the building in which the system is installed. From this page, there is also a link which enables students to view the output from the current ABLS which is itself displayed on a Web page.

- *The Users and Stakeholders* - photographs and brief statements from the secretary at Imperial and the two lecturers described above are presented together with links to those individuals' home pages where possible.
- *Further Information about Requirements Engineering* - links are provided to other relevant information on the Web including newsletters and tools for requirements engineering.

These pages can be viewed starting at URL:

`http://www.cs.herts.ac.uk/~comrsj/badges/main.html`

3. Using the Materials

The main aims of providing multimedia case study materials on the Web were:

- to give students the chance to practice searching for and assimilating information held in a form which is increasingly used by many organisations;
- to give students a more concrete view of the technology to be used in the system they would specify by providing graphics and/or videos of the physical artefacts involved and providing direct access to other systems already using the technology;
- to provide students with a rich and convincing basis for role-playing human information sources.

It was also hoped that providing information in this way would increase student motivation and permit flexibility in the arrangement of self-study periods since materials can be accessed at any time while the campus is open, in any order, and as often as the student requires. A further reason for incorporating these kinds of materials was that it provided a relatively safe way in which to gauge student reaction to using materials in this form before moving to greater reliance on such materials in future courses.

Students were given the URL shown above in the first week of the course, so that they could begin to familiarise themselves with the information. They were asked in the first week to organise themselves into groups of 4 or 5, and told that most of the practical work in the course would be done in the context of their groups.

In the second week of the course, students were asked to spend some time understanding the information presented on the Web, in order to prepare themselves for practical exercises in requirements elicitation to be carried out in the third week. At this point, they were also asked to decide who in the group would role-play what parts in the practical exercises. For example, one person would need to role play a requirements engineer, another would need to role play the client for the project, a third would need to play one of the potential system users, and so on. As well as the information on the Web, students were also given a single page of information about the client and each of the potential system users, so that each had a reasonable amount of information to base their role-playing on. This was necessary because, although there was plenty of information about some of the users already on the Web in the form of home pages, other users, such as the departmental secretaries were not represented in this way. Students attempting to role-play secretaries may have found this difficult if they had not been given supplementary information. From the third week of the course onwards, students were simply told to refer to the Web pages if they had any queries about aspects of the system they were trying to model.

4. Results

Feedback received from students through questionnaires filled out at the end of the course has been encouraging. On the subject of whether the materials on the Web were useful, 45% agreed or strongly agreed, 40% were neutral, and none strongly disagreed. Numbers responding to a question about what the format for materials for next year should be were:

text only and on paper only	0
text and graphics only and on paper only	13
on the Web, as this year	15
more materials should be provided on the Web	12

Analysis of the hit rates for each page shows a total of 541 hits for all pages, which, for the 65 students on the two courses, averages out to approximately 8 hits per student. Of these, 121 hits were in week 2, and 131 in week 3 with use later in the course tailing off to as little as 2 hits by week 8. The materials were also quite well used during the revision period (74 hits in one week). Overall, the page explaining the background and aims of the case study was used most (203 hits), with each of the pages directly connected with the case study being used a roughly equal amount (technology: 96 hits, environment: 85 and users: 89) and the page providing further information being used least with only 68 hits.

5. Conclusions

The feedback from student questionnaires shows that students appreciated being given something other than purely textual paper-based materials, and a definite majority would recommend providing as much, if not more information on the Web in further courses.

The pattern of use for the pages provided this year suggests that they were most useful at the beginning of the course in providing background and context for the practical work done in the following weeks. The perception of lecturers teaching on the course was that students seemed to understand the case study quite easily and to have less trouble thinking themselves into role-plays than on other courses where less stimulating materials are provided.

For next year's course, it is intended that the full video clips and sound tracks will be included, and it will be interesting to see whether this has any impact on student reactions to the material. A number of useful suggestions for extending the materials were also provided by the students, and it is hoped that at least some of these will be implemented before next year's course. These suggestions included:

- linking in with a requirements engineering newsgroup
- linking in course notes and handouts
- including an extended reading list

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