TLTP (UK Universities Teaching & Learning Technology Programme) Newsletter

'SMILE - supporting multimedia interactive learning environments - a pragmatic approach to developing distributed teaching and learning applications on the network'.

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Introduction

The SMILE Project is concerned with supporting people within new computer-based 'interactive learning environments'. It is an extension of a general programme of applied prototyping and the evolution of generic mechanisms for application development and distribution.

Key features of focus include attraction, engagement and ease of use; the support of access and interaction - including the organisation and presentation of information. In contrast to developments exploiting proprietary and stand-alone technologies and tools, the technologies of UNIX, X11 windows, client-server computing and the RISC (Sun Microsystems Sparc) machine have been employed. Our technical strategy has focused on portability across machines, scalability of applications, and the ability to deliver on networks and distribute applications to multiple users smoothly and transparently, with good performance.

Applied Research

Our approach has been to develop working prototypes (demonstrating concepts and mechanisms) providing for the organisation of information structures by 'authors', and delivery through high quality graphical interfaces providing simple access. At the outset in 1988, there was no single technology or tool which provided an ideal solution. We began using PC's and Mac's and the hypertext tools 'GUIDE' and 'Hypercard', but they did not provide the basic features we required. The UNIX operating system, superior processors in workstations, and newly emerging object-oriented programming languages, offered a development route providing a necessary level of sophistication. In our investigation of generic mechanisms for information modelling and application building, we wanted to involve a variety of 'end-users' and subject matter domains.

Levering on an early prototype - the 'GPE' Graphical Programming Environment (*Figure 1 shows a screen from one of the GPE demonstrators*) - we embarked on a series of projects in 1991. These included, 'STILE' with the Department of Textile Industries, 'Access' with the Library, and 'VPH' with the School of English (and English & History at Manchester Metropolitan University), and 'EVE' with the Leeds College of Health.

A new prototype application development and delivery tool - the 'Media Language' - was tested in the development of these case studies. 'ML' provides facilities to import data files generated in external packages in standard format e.g. ASCII and pcx. A simple scripting language enables authors to construct high quality interactive browsable presentations in the form of fixed-canvass presentation-interaction frames - 'Chunks'. Chunks include text with selectable text ('hypertext'), pictures with animation, sound, graphical networks and buttons. *Figure 2 shows a screen from the 'VPH'.* Evaluation of 'ML' projects revealed a number of issues and design principles. Subject experts find the exercise of classifying and organising their material for delivery through the computer a challenge. When applications grow beyond a small-to-medium size, problems of scale

and complexity make keeping track of content and its structure an issue and highlight the importance of an information model as a framework. While some teachers are very keen and well able to 'author' computer-based applications, the majority have neither the time nor the skills to develop such materials in a sufficiently sophisticated or cost-effective fashion. The performance of larger-scale applications on institutional networks when requested by multiple users suggested a different strategy. A different prototype was needed - providing a level of 'automation' in the organisation of content with a simplification of tasks - e.g. the 'authoring' task separated into (i) specification and generation of domain materials, (ii) design of the framework (iii) design of the interface (re-usable frameworks and components) (iv) editing and mark-up of content for presentation and interaction.

'GARDEN Framework'

A new challenge was the development of a vehicle for a new environmental foundations course - in parallel with the definition of course structure and content - in less than a year. The delivery platform was not certain, except the requirement for a Sun Sparc workstation as server. The assumption was that student 'workstations' would include PC's with 8-bit colour displays with a resolution of 1024x768.

A new tool - 'GARDEN' (General Application Realisation and Development ENvironment) - was tested. It re-used some components from 'ML', and in order to provide a better distribution model, some useful features of the UNIX operating system were encapsulated. 'GARDEN' provides a flexible, expandable, enhanceable and distributable "electronic book" with a number of useful features. The prototype features an advanced graphical user interface capable of adaptation to practically any display resolution and size, enabling a wide range of machines to act as delivery platforms. It provides multiple users with precisely controlled and monitored access to large scale textual and pictorial information resources. (Real-time audiovisual data types were not required). It provides developers with an effective mechanism for organising content into high quality interactive applications. Application frameworks can be constructed by information designers from a resource of templates and re-usable features. Editors can work with authors to ensure content location and mark-up for presentation. Content is organised through nested menus within a directory tree structure based on UNIX files - with content as leaves. System administrators are provided with a flexible network distribution model, security mechanisms, management of access permission and time-stamped logging for all user actions and monitoring of use.

The 'EFC' was delivered in October 1993 to the new Environment Centre for use by students from a variety of departments. *Figure 3 shows a screen from the 'EFC'* . The first prototype supports some of the special needs of educational and training applications. By means of simple control files, the editor or administrator can define prerequisites displayed to the user, enabling specific orders of interaction with materials. We are hoping to apply some of our research ideas in the area of instructional technology using AI techniques of planning for more sophisticated pedagogical interaction in future implementations.

Discussion

This programme of work has been concerned with the evolution of generic functional and user interface components for large-scale, digital distributed multimedia applications. Our approach has been user-centred pragmatic prototyping matching a subset of user needs - facilitating the organisation, distribution and management of multimedia resources.

Pedagogical interaction is a special type of interaction and teaching and learning are complex processes involving rich communication. The aim of the SMILE Project is to deliver this variety of interactivity as an enhancement (an additional module) of a general purpose (modular) system. The development and delivery of computer-based educational materials requires a variety of skills

and new methods. Materials should be designed and used within the context of interactive learning environments which are multimedia, include non-digital artefacts, and encourage communication between people - teachers and learners.

Currently, access to materials on the World Wide Web is creating a new dimension for distributed multimedia. We are constructing an HTML bridge into our garden.

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