

THE USE OF STREAMING MULTI-MEDIA IN MICROELECTRONIC EDUCATION

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1. Low-cost Multimedia in teaching

At Massey University we have developed and exploited tools, which enable teachers to create and use multimedia in their teaching. In a previous Microelectronic Education conference it was claimed that Multimedia was very expensive to produce, costing perhaps millions of dollars[1]. In this paper we will demonstrate that this need not be the case. We will describe a 20 hour multimedia course in Advanced Computer Architecture that was developed by the author in less than 200 hours of preparation time (actually less than \$10K). See (http://www-ist.massey.ac.nz/~crjessho/comp_arch). This course (and the cost estimate) was based on starting with a set of PowerPoint presentations, such as may have been used in lectures.

2. The AudioGraph System

The AudioGraph system [2, 4-7], is the result of a collaborative project between Surrey and Massey universities in the development of multi-media authoring tools for use by academics - rather than multimedia professionals, for the production and delivery of course-ware via the world-wide web. The goal was to place the production of the media firmly in the hands of the educators rather than the technologists.

At the outset the aims of this project were:

- a) to provide simple-to-use tools with an intuitive interface capable of producing multimedia presentations for a wide range of teaching activities, so that anyone, with a basic computer literacy, could become a multi-media author;
- b) to ensure that the preparation time for multimedia presentations is orders of magnitude shorter than the industry norm of 200 hours of preparation time for each hour of presentation;
- c) to ensure that the footprint of the web sites produced was small enough so that users could provide a large corpus of multimedia tuition on a reasonably sized server;
- d) to enable students, if necessary, to be able to stream the media content at modem connection speeds; and finally
- e) to provide cross-platform delivery of the multi-media content using the Netscape browser plug-in interface.

The project has been successful and all of the above goals have been met. The tool is available from the NZEdSoft Institute at Massey University and is being used by a number of Universities around the world[7]. The key to goal 1 was to use a novel multimedia authoring paradigm, which is unique in that it treats the media as a pure sequence rather than a set of timed events. An iconic interface is that is used to represent the temporal nature of the presentation provides the intuitive interface for editing.

Goals 3 and 4 are met using some aggressive compression techniques. We use GSM sound compression and PNG image compression. Both contribute to small web sites and low-bandwidth download.

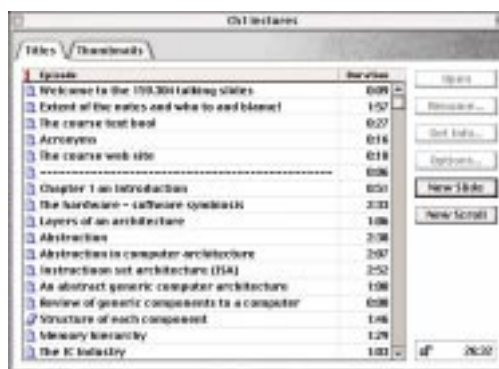


Figure 1. Opening screen showing presentation with durations

3. A Quick Guide to the Tools

The opening screen of the AudioGraph recorder (authoring tool) is shown in figure 1. This gives a list (or thumbnails) of the set of slides that will make up a presentation unit. One basic technique is to take a PowerPoint presentation, export it, read it in the recorder and annotate it with voice and vector graphics. The view shown is tabular and gives the approximate length of each unit as well as that for the complete presentation.

Figure 2. shows one of the slides being edited. Three windows are shown, the main display, which gives a preview of the presentation, the tools window, which selects the graphics and other media tools and finally, at the bottom of the window, the edit console that gives an iconic view of the time line of the presentation. This window also has controls for playing and editing presentations.

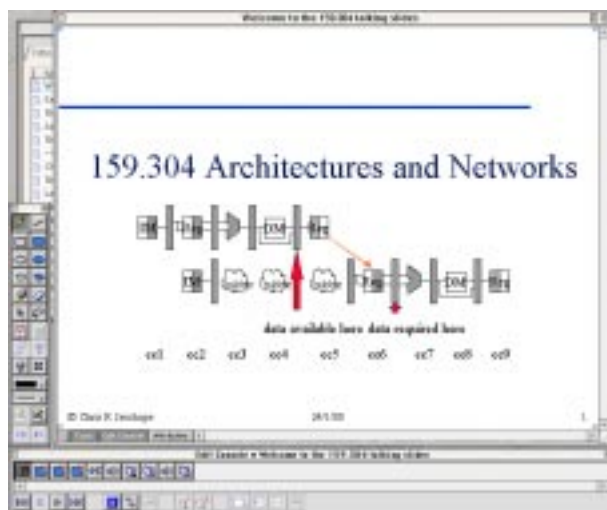


Figure 2 Editing a slide from the presentation

Once the presentation is completed a web page can be automatically created. At this stage in the production of the imedia, all sound and images are compressed into a form that can be played back using the AudioGraph web-browser plug-in. Figure 3 shows a screen shot of the Netscape navigator

playing back the presentation. Two windows are shown. One contains the same slide as in figure 2, which is being played by the plug-in.

The other shows the index window, which gives an html view of the structure of the presentation. There is a correspondence between this window and the opening window in Figure 1. If required this may be edited in a conventional html editor, to provide additional text, images or links.

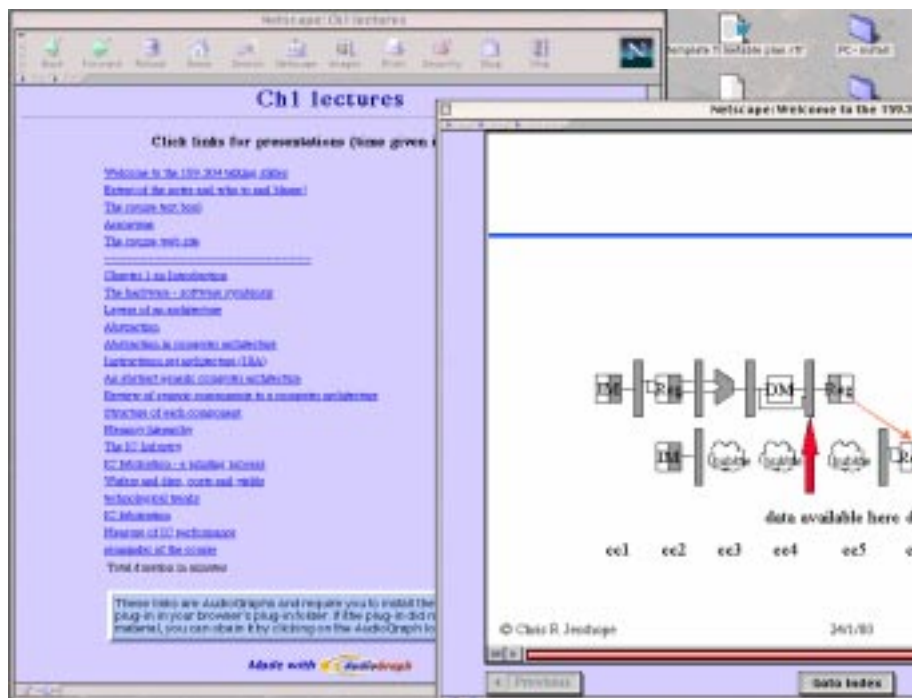


Figure 3. The presentation as a web page, showing index and one slide.

4. Use of the Tools at Massey University

This tool has been used to deliver 2 courses at Massey, both available on-line at (<http://www-ist.massey.ac.nz/~crjessho>) and described in more detail in [3]. One course is a first year digital design/general computing paper, which is delivered entirely in distance mode, where students will receive both CD and server-based web material. This mode makes use of recorded "lectures" presented in web pages and which can be taken at the students own pace. The multimedia lectures are supplemented by worked examples again using recorded multimedia and voice animated computer code. The course is assessed exactly the same as a conventionally delivered internal paper, by assignment and examination. The second example is a post-graduate course in advanced computer architecture, including the influence of microelectronics on computer design. This course is delivered internally, making use of the same techniques as in extramural

teaching. Instead of formal lectures on this course, students again use CD and server-based web material, which comprises some 20 hours of recorded lectures in multimedia format. This material was based on PowerPoint presentations, many of which have been animated to better convey the concepts. The time freed up by this self paced delivery of material is used to provide tutorial support in smaller groups, where difficulties are discussed and analysed and worked examples are presented. The use of this tool has also been evaluated by independent researchers at Surrey University [8].

5. Conclusions

We have introduced tools and examples of their use. These tools are ideal for developing multimedia courses, especially in technically complex areas such as microelectronics and microprocessor design. However, the same techniques can be used in the training of software and equipment, as might be used in a microelectronic production environment. The key issue here, as with University courses, is that the target market for the courses are small and the change of the material is relatively rapid due to rapid technological developments. Under these conditions it is not feasible to use the might of professional multimedia authoring tools, as the 200+ hours required for each hour of teaching material is too expensive. The AudioGraph tools reduce this development time by 1 to 2 orders of magnitude and make the use of multimedia for small target audiences cost economic.

6. References

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