CREATING COURSE MATERIAL IN THE FORM OF ON-SCREEN DOCUMENTS AND VIDEOS

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1 Introduction: Technology for Communication

As a sequel to the author's presentation at ICTCM in 2004, this presentation focuses on the role of technology as a means of communication and it discusses some of the new opportunities that have arisen in the wake of recent improvements in the hardware and software. With proper training, one can learn to write rapidly and effectively with a scientific word processor like Scientific Notebook. In fact, it shows that, for those who acquire the skills, a computer screen is measurably superior as a whiteboard to a standard chalkboard or even an electronic board. The next logical step is to record the entire process including both the activity on the computer screen and the audio. In this way, I make video versions of my lectures available to my students. Students who are having trouble working through their lecture notes have the option of a virtual re-entry to the classroom to attend any chosen part of my lecture again, just as if they were sitting in the classroom. At the end of each of my lectures, both the lecture notes and its video recording are mastered into a CD. I master the disk and upload the files to my office computer which operates my CD duplicators. Within minutes, each student has been supplied with a CD to take home.

2 Using a Computer as a Whiteboard

2.1 Producing Lecture Notes with Scientific WorkPlace or Scientific Notebook

The MacKichan Software (www.mackichan.com) products Scientific Workplace and Scientific Notebook are the key to the use of a computer as a whiteboard. They make it possible to type quickly and effortlessly and they make it possible

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to insert interactive ingredients that make use of the built in computer algebra system.

The notes produced with Scientific Notebook have a truly professional textbook look. They are easy to publish on a website and, in order to read and print the notes, a student is not required to purchase any software.

My recommendation to a new user of the MacKichan products is not to attempt to make immediate use of them as a whiteboard. I began by using these products to produce my books, articles, and course materials When I was ready, I threw away my chalk for ever and carried my laptop into the classroom.

2.2   Inserting Drawings into a Document

Broadly speaking, drawings are of two main kinds, vector graphics and raster graphics. Vector graphics have true printer quality. Raster graphics products provide only screen quality but are less restrictive.

My first choice for vector graphics drawings is SmartDraw 7 (www.smartdraw.com). Using SmartDraw 7 (or earlier versions of SmartDraw) in conjunction with the Copy Picture feature in Scientific Notebook, one can easily make drawings like the one on the left below and the whole process takes under a minute. An alternative to SmartDraw is Corel (www.corel.com) Designer, Version 10 or earlier. I must emphasize, however, that there is an incompatibility between the Copy Picture feature of Scientific Notebook and the latest versions of both Smart-Draw and Designer. It is possible to order SmartDraw 7 over the phone but only their latest Version 2008 can be ordered on-line.

When we need the extra freedom that raster graphics allows, we can use any one of a number of products. My first choice is SmartDraw FotoFinish but I sometimes use Corel PaintShop Pro. The figure on the right below shows an example raster graphics drawing that makes use of the flood fill tool that can be provided only in a raster graphics environment.

Vector Graphics   Raster Graphics
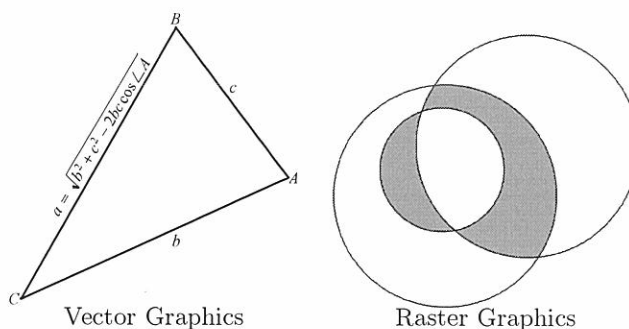
3   Recording Computer Activity

An instructor who is sufficiently fluent with the process of using a computer screen as a whiteboard can move to the next level and record the entire process

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as a sound movie. There are two principal software products that may be used for creating such recordings of computer activity. These are Camtasia Studio 5 (www.techsmith.com) and ScreenCorder 5 (www.matchware.net). Each has its own role to play.

3.1 Recording in the Classroom

For recordings of lectures given in the classroom in front of the students, speed and reliability are the main considerations. My choice for this purpose is Camtasia Studio. It includes a recording utility called Camtasia Recorder that is able to record any rectangular region of the screen, together with all sound, and to export the recording very rapidly as a high quality AVI file. Once the AVI file has been made, I use Camtasia Studio to master a CD. Within a few minutes, I have a CD mastered with a friendly welcome menu that shows links to all of the lecture notes to date and to the recording of that day's lecture. The students line up to collect their CDs to take home.

A question that I have been asked frequently is why I bother with CDs. An obvious alternative would be to convert the recordings into a streamable format like Flash or WMV and provide it on my website. I have several answers to this question:

1. Even my fastest 2.6GHz quad core desktop takes many hours to render the 4.5 hours of lectures that I give on a typical Monday or Wednesday at Kennesaw State University. The earliest I could provide the material on a website would be the next day.

2. There is nothing like the quality of the original AVI file compressed with the lossless TSCC codec. Furthermore, the Camtasia Player that is bundled by Camtasia Studio into my CDs is ideal for my recordings.

3. My students have told me that they prefer my stuff on CDs.

3.2 Recording Outside of the Classroom

In contrast to recordings that are made in the classroom where speed of production and stability of the software is the top priority, there is also a need for recordings of a much more polished nature that would be made in the privacy of an office. For such recordings, I believe that the recording utility of choice is ScreenCorder because it has the unique feature of allowing editing during the recording session.

When a recording session is paused, Camtasia Recorder, shown on the left below, offers only the options to resume or to stop and export the video. In contrast, ScreenCorder provides an actual timeline.

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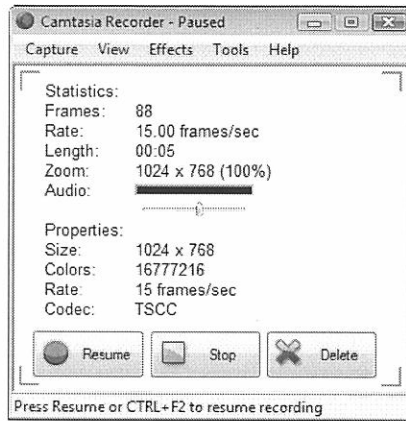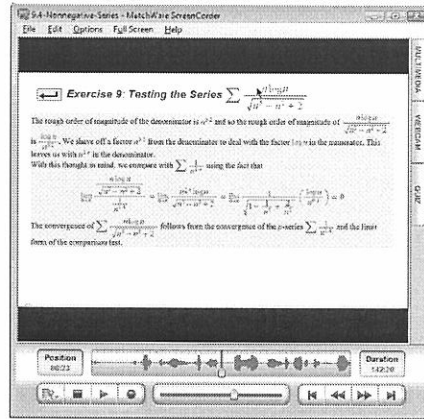
Camtasia Recorder   ScreenCorder 5

In this way, ScreenCorder 5 provides actual editing features. One can play any part of what has already been recorded in a session. One can choose to overwrite from any point onwards or one may insert video and audio, or insert audio with video frozen or overwrite the audio track. ScreenCorder 5 also allows the project to be saved at any time. One may therefore come back at any time, even after the computer has been turned off, and resume the recording process.

After the movie has been made by ScreenCorder and exported as an AVI file, the next step is to import it into a Camtasia Studio 5 project and to use the sophisticated Camtasia editing and movie production features to produce the movie in its final form.. I believe that both Camtasia Studio, and ScreenCorder are indispensable tools in the hands of anyone who wishes to produce quality instructional material in video form.

4 Hardware Issues

4.1 Recording Sound

For recordings made in the classroom, I use a simple Logitech USB microphone that I plug into my laptop. However, for the more polished movies that I make at home, I cannot emphasize too strongly the need for good sound equipment. I use a top quality condenser microphone that I plug into a preamplifier that can supply the phantom power that a condenser microphone needs. From the preamplifier, the signal goes into a compressor that helps to eliminate pops, overloads, and background noise. From the compressor, the signal goes into a USB mixer that, among other things, will give control to treble and bass. It is most important to be able to boost treble and reduce bass for voice recordings. Then, finally, the signal goes into a USB port of a computer. The computer must not be located anywhere near the microphone. If the computer is a desktop, is should not even be in the same room and there needs to be an effective

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sound reducing screen between the computer and the microphone. My recommendation is to buy all the necessary sound equipment in a music store rather than in a computer store.

4.2 Burning CDs and DVDs

CD and DVD copy machines have become much more common over the past couple of years, and the price has dropped sharply. You can expect to find an nice free standing copy machine for about $2000 and, if you are willing to load the disks by hand, you can find a machine for much less. I have had very good results with duplicators made by Microboards Technology http://www.microboards.com/. Their prices are reasonable and their technical support is excellent. My one problem with Microboards is that they are unable to supply on-site service. It is necessary to ship a machine to them when something goes wrong.

5 The Author's Own Video Products

Using the techniques described in this article, the author has produced two products, a precalculus level product called *Virtual Math Tutor* and a calculus level product called *Virtual Calculus Tutor*. Each of these provides a friendly hyperlinked document structure that presents both the theory and the detailed solution to hundreds of exercises. When a student has identified an item that requires more than the mere reading of a document, a couple of mouse clicks take him/her to a video version of that item. The video version places the student in a virtual lecture room with an instructor. For a demo of Virtual Calculus Tutor, go to the following URL.

http://science.kennesaw.edu/~jlewin/VCT/VCT-Demo-2-24-2008.html

6 Conclusion

The process of using a computer as a whiteboard requires some hard work and intensive training, and it also requires the spending of some money on software and hardware. But, for those to take the plunge, it is possible to elevate the quality of mathematics teaching to a new level. The response I have had from students is enthusiastic and they show great appreciation for the service that I provide to them.

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