

FOCUSED, COMPRESSED VIDEO TUTORIALS

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Introduction

How does one integrate software into the classroom without neglecting the subject matter of the course? This is an area of great concern for teachers who see the benefit of many of the software packages available for their classes, but also feel the pressure of having to cover a specific amount of course material. One solution to this problem at Appalachian State University has been for us to make compact, focused video tutorials that help teach our students how to use software. Since we make these video tutorials available through the World Wide Web, they act as 24-hour tutors for our students, who can watch the videos as frequently as they need to and also work along with the videos as they watch them. This aspect is important in that our students can have help with software issues without a great deal of class time being required in addressing these issues.

Video tutorials like the ones we have produced can be created using several different screen capture programs, including Snapz Pro, HyperCam, and Camtasia. The sizes of the files we create are usually less than 1 MB per minute of video, depending on the program and settings used. The typical length of our videos is about 2 to 4 minutes for each one, thus the file sizes are quite small. Our students can then view the videos using Microsoft Media Player or Apple QuickTime Player, depending on the screen capture program that was used to create the specific video that they wish to view.

The purpose of this paper is to specifically discuss the advantages of making video tutorials available via the World Wide Web, and to discuss and compare the three screen capture programs mentioned above and the settings that optimize interplay between small file size and good picture quality within each one. We will also include instructions on where to download the programs and how to find more detailed instructions for their use.

Benefits of the Videos

As noted above, the ultimate purpose for the video tutorials is so that students can obtain help with software issues without requiring their instructors to spend a great deal of class time addressing these issues. This actually encompasses two separate purposes that we envision for the videos. First, the videos provide our students with free unlimited software tutoring available at the students' own convenience. This can be for any software being used in their course, whether it is Excel, Maple, Minitab, or literally any

other program that may be used in the course, even if the program itself is not installed on the actual computer the students use to watch the videos. Secondly, the videos allow instructors to spend less class time on software issues, thereby freeing up class time for more important mathematical content.

A less obvious but important purpose that we envision for the videos is that we believe they will encourage students to use the computer as a supplement to the course. It is our belief that if students know exactly how and where and the ease in which they can obtain this free unlimited software tutoring at their own convenience, they are much more likely to be willing to use the computer to help with exercises they have been assigned and their basic overall understanding of the mathematical concepts discussed in their course.

These three main purposes that we envision for the videos are only enhanced by how simple it is for us as instructors to actually create the videos themselves. As it turns out, we as instructors are able to make this free unlimited software tutoring available to our students with a very small amount of additional work on our part. In the next section, we will discuss the three screen capture programs we mentioned in the introduction to this paper and exactly how easy it is to create videos using each one.

Discussion of the Screen Capture Programs

Each screen capture program we will discuss is easy to use. After downloading and starting one of the programs, a user can then illustrate uses of any software on his or her own computer screen while speaking instructions into a microphone, and use the screen capture program to capture the screen activities and corresponding audio in a video file.

Snapz Pro is the best screen capture utility available to Macintosh users. It can be used with the current Macintosh OS X operating system, as well as older Macintosh operating systems, and can be downloaded at <http://www.AmbrosiaSW.com/utilities>. Snapz Pro, unlike the other screen capture programs we will mention below, can create still pictures (e.g., .jpg, .gif, etc.) as well as videos. Snapz Pro videos, once created, can be viewed with Apple QuickTime Player, a free player for both Macintosh and Windows. The cost of Snapz Pro is \$40 or \$49 depending on the operating system with which it will be used. We should also note that Snapz Pro X for OS X allows users to use USB audio input, while Snapz Pro² for older Macintosh operating systems does not accept USB audio.

Some of our main considerations when we create our own videos are keeping file sizes small while retaining good picture quality. We accomplish this by using appropriate Snapz Pro and computer settings. First, we reduce the color and resolution settings on our display as much as we possibly can without drastically affecting picture quality. Typically we use a display of size 640 × 480 with 256 colors. Within Snapz Pro we then choose a frame capture rate of 5 frames per second. We have noted that frame rates lower than 5 frames per second cause our videos to appear less fluid, while higher frame rates increase our file sizes noticeably without increasing picture quality very much. Also within Snapz Pro, we choose a high key frame number, perhaps between 80 and

500. The key frame allows the program to self-correct the video in certain places. Lower key frame numbers cause the program to self-correct more frequently, and thus can dramatically increase the size of the resulting files. Finally, after we finish creating a new video, the video must be compressed. For this we use the Apple Graphics compressor, which we have found gives a high compression ratio while still retaining good picture quality. With the settings described above, our videos usually end up requiring around 750 KB per minute of video.

HyperCam is a different screen capture program and is basically equivalent to Snapz Pro, but HyperCam is available for Windows users instead of Macintosh. It requires Windows 98 or higher, and can be downloaded at <http://www.hyperionics.com> at a cost of \$30. HyperCam creates videos that can be viewed with Microsoft Media Player, another free player available for both Macintosh and Windows. Like Snapz Pro X, HyperCam accepts USB audio, and, unlike Snapz Pro, allows the cursor to be highlighted in videos and allows videos to be paused during recording. Snapz Pro simply captures screen images and thus Snapz Pro videos cannot be paused during recording.

Camtasia is another screen capture program available for Windows users instead of Macintosh. It also requires Windows 98 or higher, and can be downloaded at <http://www.techsmith.com/download/studiodefult.asp>. The cost to download Camtasia as listed on this web site is significantly higher at \$349, although an educational discount is possible that would reduce the cost to \$149. As one would expect due to its higher cost, Camtasia comes with numerous features not available with Snapz Pro or HyperCam. Camtasia can be used to create .avi, .mov, .rm, .wmv, .camv, or Flash videos, and of course accepts USB audio. Depending on the file type selected by the user, videos created with Camtasia can be viewed with Apple QuickTime Player, Microsoft Media Player, RealPlayer, or Camtasia's own built-in player. Like HyperCam, Camtasia allows videos to be paused during recording and the cursor to be highlighted in videos, but with Camtasia mouse clicks can also be enhanced, and editing movies after their creation is much simpler with Camtasia than either HyperCam or Snapz Pro. (Editing a Snapz Pro video after it is made is possible, but the small file size may be compromised.)

We should emphasize several considerations in comparison of the three screen capture programs we have discussed. First, as we mentioned, Snapz Pro can only be used with a Macintosh operating system, and HyperCam and Camtasia can only be used with a Windows 98 or higher Windows operating system, although videos from any of these three programs, once created, can be viewed from any platform. As we also mentioned, some of our main considerations when we create our own videos are keeping file sizes small while retaining good picture quality. For this the Snapz Pro settings we described would be appropriate for HyperCam and Camtasia users as well. More specifically, in terms of file size, Camtasia and Snapz Pro are comparable and seem to perform better than HyperCam. To reach this conclusion, we created some comparable movies about five minutes in length using each of the three programs. The Snapz Pro movie required 3.4 MB, the Camtasia movie 3.5 MB, and the HyperCam movie 8.1 MB. We should also note however that the picture quality of the Snapz Pro and HyperCam movies were

comparable, but the picture quality of the Camtasia movie was noticeably better. Also, we noted that by the end of our five-minute Snapz Pro movie, a three second video-voice lag had occurred (*i.e.*, the audio ended approximately three seconds before the video). Similarly, a five second video-voice lag had occurred by the end of our five-minute HyperCam movie, but there was no video-voice lag in our five-minute Camtasia movie.

The following table summarizes some of the important points in comparison of the screen capture programs Snapz Pro, HyperCam, and Camtasia.

| Program | Operating System | Cost | 5-Minute Movie Size | Picture Quality | Accepts USB Audio | Pause While Recording | Video-Voice Lag |
|-----------|------------------|-------|---------------------|-----------------|-------------------|-----------------------|-----------------|
| Snapz Pro | Macintosh | \$ 49 | 3.4 MB | Good | Yes | No | Yes |
| HyperCam | Windows | \$ 30 | 8.1 MB | Good | Yes | Yes | Yes |
| Camtasia | Windows | \$149 | 3.5 MB | Best | Yes | Yes | No |

Upon deciding to create video tutorials, one should consider his or her goals. Snapz Pro and HyperCam are less expensive than Camtasia and can be used to create good quality videos in a cross platform format. Therefore, if the goal is only to make straightforward tutorials, Snapz Pro or HyperCam would suffice. But if one wishes to create higher quality videos using various effects and extra features, Camtasia may be a better choice.

Conclusion

As noted above, we see three primary benefits to making video tutorials available to students via the World Wide Web. First, they provide students with free unlimited software tutoring available at their convenience. Secondly, they allow instructors to spend less class time on software issues, thereby freeing up more class time for mathematical content. Thirdly, we believe they encourage students to use the computer as a supplement to their course. Since the videos are not difficult at all to create, we believe the benefits of the videos are magnified by the fact that making them available to students does not require instructors to make a significant additional investment of time outside of the normal time requirements of the course. Indeed, at Appalachian State University we have successfully used video tutorials in Business Calculus, Calculus I, and some statistics courses, and we anticipate eventually constructing and using video tutorials in our entire calculus sequence and also in linear algebra. A collection of some of the videos that we have created are currently available online at <http://www1.appstate.edu/~marland/movies/movies.htm>, and more videos will be posted there as we create them.

For more details regarding our use of video tutorials at Appalachian State University or for answers to specific questions about any of the three screen capture programs we discussed above, please feel free to contact the authors by email or U. S. Mail. And we would also be very interested in hearing from colleagues at other institutions about their experiences using video tutorials in their own classes.