Beyond Print

After a long wait, multimedia in SPIE journals has finally arrived. This means that the text and figures in your papers can be augmented by online publication of audio and video files. For some authors, the graphs and images they use to describe their work and results are quite sufficient. For others, the ability to show a sequence of graphs as an important parameter is changed will assist them in arguing their case, providing insight for their readers. In the field of image processing, a set of flicker comparisons between an original image and an altered version should help readers (uh, viewers?) to see differences that are not obvious from a side-by-side comparison of static images.

One of the problems that had to be solved before multimedia files could be included with papers was the size and types of formats that would be accepted. Despite a convergence of formats in recent years, there is still a wide variety available and used today. Some of them are generated by commercial applications and accessible through a few readers. Because of this, the files must be playable using standard media players such as QuickTime and Windows Media Player. For video files, QuickTime nonstreaming video (.qt or .mov), MPEG (.mpg), and DV (.dv) are acceptable. The preferred formats are .mov and .mpg.

In the case of audio files, you can use PCM (.pcm), WAV (.wav), AIFF (.aif), and MP3 (.mp3) at 128 Kbs or greater. The file size has to be small enough that viewers can download it in a reasonable time. Although it would be nice to be able to provide a larger file size by using streaming formats, they are not accepted currently. A recommended maximum size for each multimedia file is 5 MB. Whenever possible, use one of the accepted compression codecs to minimize your file sizes.

Along with the video, you must provide a separate frame taken from the video. The frame image doesn't have to represent the full content of the video because it is only intended as a static representation of the video file, which will appear in the paper as a figure that will be linked by the publisher to the actual video file after the paper is accepted. The acceptable file formats for these still images are TIFF, EPS, PS, or PDF. In addition, a caption or description of the content of the multimedia file is required (similar to a typical figure caption). The full guidelines and detailed specifications are available at http://spie.org/x1808.xml under the heading "Multimedia Guidelines."

To gain some idea of how this process works, I took my camera (Panasonic Lumix DMC-Z20), set it to movie mode, and took some shots around our house for a short video report, "Botanical Engineering in Druid Hills" (Video 1). It provides supporting evidence for last month's editorial, "Engineering at Home." The quality of the video is nothing to write home about. (My daughter-in-law says it resembles something edited out of *The Blair Witch Project.*) I found that it helps to have a script ahead of time. Although I used an audio track (voiceover), it is not needed for most technical videos. But the script is useful to be able to carefully define, record, and assemble the sequences that you need to make your points economically. I was surprised to find that the three sequences in my video added up to 57 MB. I assembled the sequences using iMovie, one of a suite of applications that comes with a Macintosh. I edited the sequences to eliminate extraneous frames and fixed the audio to keep me from sounding like a rambling idiot. When I saved the resulting product as a movie intended for use on the Web, I was surprised to find that the Quicktime movie was

Video 1 Example video for this editorial (QuickTime, 5 MB).

5 MB, the maximum recommended size. Most disappointing is that the image is a dinky 240×180 pixels compared to the 320×240 images recorded by the camera.

If you have access to the SPIE Digital Library, you can see an example of this new technology in the first issue of the *Journal of Applied Remote Sensing* [Vol. 1, 012505 (19 January 2007)]. The video in the paper displays a sequence of images from multiple orbits of a radar satellite combined coherently to obtain high-precision measurements of changes in land elevation in the vicinity of Phoenix, Arizona. The author, William Gail of Microsoft (Boulder, Colorado), was able to demonstrate the spatial distribution and temporal variation of subsidence in the area with the video.

So, if there are image sequences that will provide your paper's reviewers and readers with information and insight into your research, take the time (and it will take time!) to assemble an audio or video file for submission as part of the electronic record of your paper. But, until most of us have access to a great deal more bandwidth, a presentation with a full musical score in high definition with visual credits for your research team is a long way off.

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