Subject: Animation formats revisited
Posted by Mark Hadfield on Fri, 05 May 2006 02:44:26 GMT
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This post follows on from the discussion in the "6.3 reactions" thread on the new Motion JPEG2000 format and the alternatives, but it is moving OT for that thread so I am starting a new one.

Thanks for the info about MJPEG2000 and the Morgan Codec, Haje. I see that it costs $20, with free evaluation for 60 days. I may try it, out of curiosity, but obviously it's going to be a long time before MJPEG2000 is a format I can expect anyone else to read.

Thanks for the pointer to the SWF Tools, Reimar. Up to now, I haven't been able to test SWF, as I haven't had a way to make them. I downloaded the tools and tried them out with one of my test animations. More below.

I have an HTML page discussing animation issues. This is currently available only on the NIWA Intranet, but from time to time has made an appearance on the Internet. Perhaps it could be exposed to the outside world again, but I'm a bit worried about bandwidth, as some of the examples are rather large.Oh all right, here's the page:

ftp://ftp.niwa.co.nz/incoming/m.hadfield/animation/index.htm l

but I'm afraid most of the files it links to are missing.

On this page I link to several animations that I have implemented in a variety of different formats for comparison purposes. The formats include:

- AVI (several different codecs)
- FLC
- MPEG
- MNG
- animated GIF
- PNG sequence managed by Javascript code
- PNG sequence managed by the AniS Java applet
- FLC file managed by the fliplay Java applet
- SWF (as of today)

My favourite by far is AVI with either the MS Video 1 or MS RLE codecs, to be played by a viewer like Imagen (Windows), Quicktime or Xanim (Linux). But *not* Windows Media Player.

Those of you who know about this subject will point out that the MS Video 1 & MS RLE are *old*, dating from some time in the Stone Age (ie the early 1990s). Surely there are much better codecs available these days, like DivX, Microsoft MPEG-4, MJPEG2000. Well you might think so,

but IMHO you'd be wrong. The reason is that scientific animations of the sort I'm talking about (and I haven't really said what that is yet) tend to have characteristics & requirements that are quite different from what the modern codecs are designed for. These include:

- Modest number of colours, often < 256
- Lots of sharp detail and lines
- Large blocks of uniform colour
- Accuracy required in representing primary colours
- The fraction of the scene changing from frame to frame is small
- Ideal playback speed usually 5-15 fps, not 30 fps
- Random access navigation important: jump to specific frame, scroll backwards

This last is the most important of all. Watching movies is all very well, but scientific animations are about exploring data.

My favourite test case is an animated plot of sea surface height and sea surface temperature around NZ, using pseudo-colour plots and contours to represent the data. There are 139 frames; you can (probably) see the first one here:

ftp://ftp.niwa.co.nz/incoming/m.hadfield/animation/example2/ example2.000.png

You can also look at the AVI file (MS Video 1 codec, quality 85%), 10.5 MiB in zipped form

ftp://ftp.niwa.co.nz/incoming/m.hadfield/animation/example2/ example2-msvc.avi.zip

It's a very faithful likeness to the original PNG sequence and it plays very nicely with a decent viewer.

I've tried several more modern codecs (DivX, Microsoft MPEG-4 codec v2) and formats (SWF). File sizes are usually somewhat smaller, but they tend to suffer two problems which (for this animation) are killers:

- Lossy compression, even at high quality, degrades the image. In particular, the left-hand panel has white contours, but they are degraded by colours bleeding into them.
- Primary colours are degraded by the YUV colour system that is almost universally used. (A bit surprising this one.) In particular the reds in the upper left-hand corner of the left-hand panel come out muddy.

As an example, here's an animation with MS MPEG-4 codec v2:

ftp://ftp.niwa.co.nz/incoming/m.hadfield/animation/example2/ example2-mp42.avi

Well, it's not as bad as I remember it, but you have to admit: muddy colours.

I tried a SWF prepared with avi2swf (starting wih an lossless original). Even at 100% quality the result is muddy and grainy.

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