The State of the Art - Non-Linear Video Editing Software (Sep 10)

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"What makes these programs different from previous generations of video editing software? Much has changed and much is evolving. My dream, since I first began using non-linear editing equipment in the early 1990s, was that I could do anything I wanted in real time, including rendering. Fast forward 20 years and we're still not up to real time rendering, but we are up to real time editing (to a greater or lesser extent) with the three biggest 'brands' of editing software."

What a wonderful thing non-linear editing is! Non-linear video editing allows the person assembling a video from one or more digital clips to access any frame in any given digital clip, no matter where that frame is in the sequence. This makes video editing nearly as simple as using a word processor – the editor can cut, copy, and paste as needed. Non-linear editing software also makes it possible to create effects during editing, including transitions and fades, which were not possible before digital video.

Linear editing came first

Time was that editing involved (you won't believe this) long strips of plastic with a light-sensitive emulsion covering one side. The long strip of plastic was called film, and it had evenly-spaced holes down either edge, so that the camera could feed the film through for exposure. Sometimes the long strip of plastic with holes also had a little stripe of brown metallic/magnetic stuff along one edge. This stuff was, in a fit of reality naming, called mag stripe film.

The function of this analog technology was to allow filmmakers to record sound directly onto a strip of film (instead of recording the sound on a separate device), which could then be edited. Editing was usually done in a linear fashion, from beginning to end. Then the film was "conformed" from the work print to the original negative, then came … Wait! This isn't about the old days (not so good old days either in many ways), but about what the state of the video editing art and its software is today. Where is it? Where did editing software come from? What does the future hold?

Incidentally, if you compare the difficulty of programming for video editing vs. audio editing, video is more than an order of magnitude greater in degree of difficulty. I am not going to discuss audio editing software in this article, even though video production may sometimes require audio editing.

The advent of digital video and non-linear editing

In about 1990 or so, small personal computers started morphing into editing systems. Although videotape had already started to replace film, editing videotape was still an analog process (you had to use tape decks). However, with these editing systems, the tapes were displayed on a computer screen. This required a big investment in a turnkey system. You could do things out of order. Effects, color correction, and transitions other than dissolves and cuts were all possible, but they were time-consuming and difficult to do. You had to render them frame-by-frame using software and hardware that couldn't do anything much in real time.

Fast forward to 2010/2011. The world has changed. So has the hardware and software. With a modest investment in both, you can have real-time video capture and editing capabilities at a professional level. Enough history.

Editing software

You can do a quick Wikipedia search and see how many different kinds of editing software there are. Every single program is listed there, under "List of video editing software." In terms of cost, there's freeware, shareware, and "payware." Some of the software works only on a Mac. Some of the software only works on a PC. Some of it only works with Linux.

But at the end of the day, there are three video editing programs that make up the biggest percentage of the market and they dominate, so I'm not going to concentrate on the products with smaller market share, such as Kino, Magix, or Movani, etc.

The ubiquitous iMovie and Windows Live Movie Maker aren't really robust editors – they don't offer much functionality other than to put clips together. You can't create simple effects or work with multiple video and audio tracks. These simple programs come with their respective OS's and are fine as far as they go. If you can make your video with one track of video and one track of sound, either one of them might be the perfect software to use.

Avid Media composer is a very expensive beast, as is Media 100, which is now part of Boris FX.

If there are fans of these products reading this article, I apologize, but these programs just don't matter in the mainstream view for video editing. In addition, support and support communities are important. The three biggest have large support bases and answers for most problems can be found on-line in various forums. For the three biggest in market share there have been some pretty significant changes in their capabilities.

I want to keep things simple, so I'm sticking here to the Final Cut, Adobe, and Sony families of video editors.

The players

To name the products I'll address, there are Final Cut Studio and Final Cut Express, Premiere Pro CS5 and Premiere Elements, and Sony Vegas Video and Sony Vegas Studio. There is also After Effects, which is technically not an editor, but it is something you can't do without if you are going to do serious work.

So what makes these programs different from previous generations of video editing software? Much has changed and much is evolving. My dream, since I first began using non-linear editing equipment in the early 1990s, was that I could do anything I wanted in real time, including rendering. Fast forward 20 years and we're still not up to real time rendering, but we are up to real time editing (to a greater or lesser extent) with the three biggest "brands" of editing software.

All three are meant for heavy-duty professional video production. Vegas Pro is only available for Windows and Final Cut works only on a Mac running OS X. None of the three run under Linux. Vegas lists for about $600, Premiere Pro for $800 and Final Cut Studio for $1000. All these prices are "suggested retail" and many discounts are available.

Interestingly, all three of these brands have lower-cost versions that retail for $100-200 or so. The lower-cost versions are functional enough for at least 95% of the needs for e-Learning. Wikipedia has a grid (http://en.wikipedia.org/wiki/Comparison_of_video_editing_software) with all sorts of information on it, and although they call Sony Vegas Studio and Adobe Premiere Elements Consumer products and Final Cut Express a Prosumer product, they are functionally almost the same as their big brothers (or sisters, if you prefer).

If you read the online marketing and advertising for all these software flavors, all of it would have you believe that as soon as you install it on your computer, you'll be the next James Cameron. All claim to be the fastest and most powerful, blah, blah, blah. I have some experience with all three. All three have bugs and issues, but all three are robust.

None of these products is a compositing program, however. They are editors. Compositing is a process in video that's quite different than editing. Video compositing is the process of merging of two video tracks, producing a new single image frame from the combined tracks. Compositing is the process editors use to overlay text and titles on video clips. While all the programs will allow you to do some elementary compositing, such as multiple pictures in a frame, none are able to create true overlays, animations, and other things you'll want to do. Compositing is a whole different story and it's an important one for e-Learning video development.

So what's new? What has pushed the state of the art further along? All three product families support just about every video format and codec you can imagine. All have H.264 support in a variety of formats. Why is this important? H.264 has emerged, for the time being anyway, as the leading compression format for delivering streaming media. It's robust and makes really small files.

The difference in these software programs is mainly in the speed of encoding, although that issue is going away. In my experience, Final Cut is the fastest, but Adobe's Media Encoder (supplied with Premiere Pro) is pretty fast too. Vegas can get a little slower, but not by much. While there are dedicated encoding programs that can do multiple encodings of your files, the encoders in Final Cut, Premiere Pro, and Sony Vegas allow you to encode directly from the timeline, just like the high-end Avid. That's a big deal. You don't have to render before you render into multiple formats.

Final Cut Pro/Studio and Final Cut Express

Final Cut Pro/Studio and Final Cut Express started life as Macromedia's answer to Adobe's Premiere. The Final Cut product line was originally created in 1997 or so by the same team that built Adobe Premiere (Macromedia hired them from Adobe). It was named KeyGrip, but it was never released. KeyGrip was then renamed Final Cut before it was shown to anyone, but couldn't be released by Macromedia because of some very complex licensing issues, probably involving sound and video codecs.

Final Cut was built from the ground up to be more professional than Premiere was at the time, so it had some features that were more robust than those in the early versions of Premiere. I bet you didn't know there was so much history in video editing software! History also explains the interface similarities between Final Cut and Premiere Pro.

Final Cut is a terrific program with great functionality. It was last updated in 2009 (Express dates back to 2007), and probably needs a refresh. But it has terrific color correction capabilities, some simple effects (maybe more than you'll ever need) and a host of other functions. In short, if you're committed to the Mac platform, this is an obvious choice. Except for maybe one or two things it's almost as good as anything in the market. A lot of TV shows use Final Cut Studio. Studio can edit in the Red format, although I doubt that any e-Learning video could justify using a Red camera. Red cameras capture video at 4520 by 2540 pixels, which is well over 11 million pixels of information. There isn't a mainstream computer that can push that much around in real time. Most software has a hard time editing HD 1080p in real time, especially when you have seven or eight (or more) video tracks stacked on top of each other. I don't even want to think about rendering.

Sony Vegas

Sony Vegas is PC-only software. It has most of the same features as Final Cut and Premiere Pro, but it handles video a little differently. Usually, video and audio are in separate sections of the timeline. From bottom to top, you might have 10 (or more) audio tracks and however many video tracks. In Vegas, they

can be intermixed. This format is really found in Acid, the Sony software that's used to compose all sorts of nifty sound tracks.

The video tracks are handled somewhat differently too. To do a simple fade-in, you move the cursor from the beginning at a little symbol on the top and drag it as far as you want to make a long or short fade. Effects are handled in a somewhat simpler fashion than either Final Cut or Premiere as well. Color correction (really, a big thing in video editing) isn't as straightforward, but it's functional.

In general, I really like Vegas, but … it can get bogged down with certain kinds of stacks of video. One thing that Vegas does well is handle multiple video formats, HD and SD, in the same file. I can't really say that about Final Cut or Premiere Pro. It's one of the things I really do like about Vegas.

Premiere Pro CS5

The Adobe software suite has undergone a major upgrade this year to CS5, so it's a little more advanced than Final Cut or Vegas.

Adobe's big claim to individuality may be threefold: First, Adobe has a feature called dynamic linking. You can place a Photoshop file on the timeline as a dynamic link, then go to the file and edit it in Photoshop, save it and return to the timeline in Premiere Pro and voila! It's changed on the timeline. I find this particularly useful when I animate titles in After Effects. I add the After Effects composition as a dynamic link on the timeline. The composition takes up only as much time on the timeline as the length of the composition in After Effects. You can right click and go immediately to that composition in After Effects, change it and return to Premiere Pro. Just about anything that Adobe makes, whether it's Illustrator, Flash, Photoshop, or Captivate (especially terrific for e-Learning), can be dynamically linked to the other products.

The second advantage in Premiere Pro is that the new version is only 64-bit. Vegas and Final Cut both live in the 32-bit world. Why is this important? Reading information in bites of 64-bits is a lot faster than 32-bit software can be. Additionally, the 64-bit OS coupled with the 64-bit software can theoretically handle vast amounts of memory. A 32-bit OS can only "see" 4GB of RAM, and I need to say that the more memory the merrier. My new laptop has 16GB of RAM and I'm very happy with it.

The third difference in Adobe Premiere Pro software is the biggie in my opinion. That's the inclusion of the new Mercury Rendering Engine in the new version of Premiere Pro. The Mercury Rendering Engine uses the video card to render … uh, video. On the fly. In real time. The only caveat is you need the right video card to use the hardware part of the engine. Right now, only certain nVidia cards are supported. The list is currently very limited, but promises to grow. Current Quadro cards are generally supported and one or two GeForce cards are supported, but if you don't have a card that's on the list and your card has at least 1GB of RAM, there are some hacks out there so you can use your unsupported card. The hacks are easy to implement and they work.

OK, what makes the Mercury Rendering Engine so great? (MRE sounds too much like an Army meal, so I'll continue to use the long version.) Since it renders video on the fly, it saves you from rendering previews of your timeline. Rendering a timeline is different than rendering the completed timeline for your project.

I can tell you from personal experience that the rendering works really well. The video never slows down. Final Cut and Vegas can get slow and not play back video in real time when there are a lot of clips on the timeline or stacked video or lots of fades and other effects. Color correction? Forget playing your timeline until you render the preview. Premiere Pro CS4 used to get really slow as I started to add dissolves and stack tracks. I'd have to render again, do a few more things, and render again, then wait until it was done so I could play the video at normal speed without stuttering (just like CS4, the other two programs do this).

This is no longer the case for Premiere Pro CS5. I can stack as much video as I can on the timeline and it never slows down. I'm working on a project now that has 15 video tracks stacked on top of each other and I've added lots of effects, color correction, fades, dissolves, etc. and I haven't had to stop my editing and render once. Not one time. This feature alone puts Premiere Pro CS5 at the top of my go to pile of software. Add that and the interoperability of Premiere Pro with Photoshop and After Effects and it's my software of choice.

One more thing before I go

There's one other thing I need to address. It doesn't have anything to do with the software discussion, and that's the hard drive. It wasn't until I got my first SSD (solid state drive) that I realized that one of the bottlenecks is really the hard drive in our systems. SSDs are amazing devices. The SSD in my laptop can boot from zero to log in in 20 seconds. You're reading that correctly. Twenty seconds. Time your computer with spinning platters and drivers and see how long it takes to get to the log in screen. I'll bet it's more than 20 seconds. Time from cold to editing an existing large and complex video is less than two minutes. My "old" and very fast laptop takes over four and a half minutes to give me a screen ready to edit my video. It's amazing, but it has nothing to do with the software as described above.

Amazing times

Video editing software is advancing. It gets better with each change of version, and as computers get more powerful, the editing experience is even more amazing. Four processor cores aren't enough. Lots of RAM isn't enough. My old saying, that you can't get a fast enough processor or enough RAM in your system, still holds true even today, but as video becomes more and more mainstream, and the hardware and software used to create video becomes more and more powerful … you get the picture.