Remastering Video for Web Distribution

Don Lancaster
Synergetics, Box 809, Thatcher, AZ 85552
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http://www.tinaja.com
don@tinaja.com
(928) 428-4073

Way on back in 1989 or so, I decided to experiment with producing and direct marketing videos. I recently decided to try and make some of these web available as historical records. And then discovered that the conversion of old VHS videos into remastered and electronic distributed web releases could be both fairly easy and reasonably cheap.

But involved many "gotchas" and rude surprises along the way. What I thought we would do here in this **GuruGram** is review just what may be involved in your getting from a crude VHS print to a modern **MPEG-4 file**.

Some results may be seen **here**. Or viewed on **YouTube** as **Part I** and **Part II**.

Some Ancient History

At the time, **PostScript Desktop Publishing** was newly emerging as an unbeatably outstanding opportunity. We first tried recording a Southern Arizona computer club presentation. Which rapidly turned into a total disaster because of some unacceptable hum on the soundtrack. From which we painfully learned that…

> **Video with a bad soundtrack is utterly unmarketable.**
>
> **In any lecture or group presentation, use of a wireless microphone is absolutely essential!**

In those days, amateur video gear was an atrocity. And professional routes were often outrageously expensive. Fortunately, I discovered a rather small rural video production house that was in their off-season from specializing in **vids of people falling off horses**. They were using a format called **Industrial Betamax**, which was intermediate between amateur and full professional. On which it was just barely possible to do such stunning special effects as zooms, wipes, edits, titles, terrible music, and even inserts. The inserts, of course, still looked really bad.

The shoot at Northland Pioneer College was complicated by most of the group invitations never getting out. **There were only three people besides me and the cameraman present during filming.** We got around this by hijacking an entire English class and taping them pretending that they were interested and knew what they were looking at. Crucial placement every now and then during editing made the show look like a "full house".

One of the things we definitely should have done was use a second camera…

> **A "B-Camera" can be extremely valuable to add edit variety and cover goofs. This often can be secondary quality or limited skills.**

A key rule…

> **Any video is an illusion.**
>
> **Rearrange time sequence and content as needed to get the results you are after.**

Sadly, the video house eventually lost the original session tape. Which means the current remastering had to be a second generation VHS copy…

> **When remastering, ALWAYS get as close to the original as you possibly can!**
>
> **VHS generation loss can be staggering!**

Some Fundamentals

Before we begin, a crucial concept…

> **Viewers attention spans are dramatically shorter than they used to be. Especially on the web.**
>
> **ALWAYS crop, shorten, edit, and then simplify again.**

If you try to use uncompressed video, you may find your file sizes ending up many dozens of gigabytes. While not quite as big a deal as this was only a few years ago, it still is highly desirable to get file formats as compact as possible for storage and distribution.

Video compression can be based on first compressing every fourth or fifth frame using math related to the **Discrete Cosine Transform**. Intermediate frames can be highly compressed by recording only the **difference** between them and the key frames. The DCT usually breaks an image up into 8x8 pixel blocks. Blocks that are very similar to each other can be substituted to give various compression values.

An earlier attempt at compressing video was called **MPEG-2** and is used on DVD's. The latest and so far the "best" way to do video compression is called **MP4**, and is otherwise known as **ISO/IEC 14496-14:2003**. MP4 is pretty much the "standard" way of presenting web video today.

Thankfully, most video editors will take care of all compression for you both invisibly and automatically.

There are several different resolutions associated with MP4 delivery. These depend on the size of the final screen, available bandwidths or download times, and the quality of the video you are attempting to distribute. Some of the more useful formats include…

> **320 x 240 Pixels — for iPods and handheld devices**
>
> **640 x 480 Pixels — for "normal" traditional television**
>
> **1024 x 576 Pixels — for "wide" traditional television**
>
> **1920 x 1080 Pixels — for high definition HDTV displays**

At one time, **analog television sets severely overscanned**, wrapping their images around the sides and top of their CRT. This first eliminated any annoying black edge stripes. It also let the cheap scan circuitry get by with poor or no regulation. As a result, **you were supposed to eliminate anything useful around the edges of your scene**. If you can now assume your viewer is using a digital display such as a LCD, these old rules are long gone. And **you can freely use all of your available resolution "wall to wall"**.

Regardless…

> **ALL of your titles and inserts and similar artwork must be EXACTLY compatible with your resolution!**
>
> **Images with excessive content will look terrible!**
>
> **JPEG compressed titles will often look awful!**

Naturally, **you should carefully pick your resolution and your distribution goals before you begin any project**.

The Remastering Process

Let's look at some of the steps involved in one possible route to remastering for web delivery. But before we start…

While your final distribution size will typically be "only" a few hundred megs or so, repeated saves and tests pretty much demand that you have lots of "headroom" left on your machine. As we will see, **inserts and artwork will also best be done as bitmaps**. Which also gobble up disk space. Thumb drives can be extremely handy here.

Another gotcha learned the hard way…

Software with free trials is often crippled one way or another.

Only after paying the registration fee will it do the things you really want it to.

Step #1 — Digitize the Source

An obvious first step is to **get your video into digital format**. There are dozens of cables, adaptors, and bunches of software available to do this. But this first step is crucial to preserve what you have without adding much in the way of hum, visual degradation, ghosting, or distortion. Anything crude or cheap is likely to cause you big time problems.

A very good way to do the conversion is by using a combination VHS/DVD-R recorder…

Your VHS to DVD conversion can be done with some newer video DVD-R recorders.

It is essential the device has a "dubbing" feature.

By "dubbing", they mean you can play a VHS tape while recording it to DVD-R.

One example that works well is the **Magnivox ZV427MG9** available from **Walmart** for around $140. Once again, it does not pay to skimp on this essential process.

Step #2 — Convert to MP4 and Internalize

A recorded DVD is normally JPEG2 encoded. Certain MP4 video editors may not be able to accept this format as an input. Thus, a conversion might be needed.

Besides physically getting the vid off your DVD and into your computer.

There is a program called **LEAWO** that can do the JPEG2 to MP4 conversion for you. It is advertised as freeware, but you have to pay for an upgrade to remove ads from your final result. Leawo also lets you crop, which eliminated a bottom line glitch for us in the dubbing of our previous step.

Step #3 — Find and Learn a Video Editor

There are many fully professional fancy video editor packages available. These include **Adobe Premiere**, **NewTek Lightwave**, and the **Avid Media Composer**. All of these easily and elegantly do what is called **nonlinear editing**. Which means that your entire vid can be on disk at once, and that bits and pieces can all be rearranged at any time in any order.

Chances are that a simpler and cheaper editor package may work out well for you. There are many choices available.

One low cost example is called **Videopad**. This one is fairly easy to use but has a fairly steep learning curve. Its special effects are somewhat limited, and the audio processing is awkward at best. Nonetheless, I felt this was a reasonable starting point at a very low cost. Note that their freeware version will **not** let you actually create a MP4 video.

Naturally, it pays to try some simple stuff at first. Especially learning Videopad's multi-step expansion zoom which both gives you the entire vid to view and lets you slice things down to the millisecond. Knowing ahead of time that you are going to restart your project from scratch should give you much better results much faster. **Do not try too much too soon**.

An important rule when using any editor…

> **Avoid cascading MP4 videos while editing!**
>
> **While generation loss is much, much lower with digital techniques, it still exists.**
>
> **Editing an edit of an edit is certain to lead to degraded sound and poor video.**

Thus, one long and complicated video editing session is preferable to building up individual bits and pieces and repeatedly recombining them. If you must combine sessions, strictly limit them to two or three at most.

Step #4 — Edit the Editor and Script the Script

It is important to know exactly how your video editor works. Normally, a **project** simply creates a "to do" list. This list starts with an inventory of your needed clips, goes on to the timeline of exactly when each clip is used with which transitions, and ends up with audio soundtrack details.

A script file that is in a **.VPJ** format in **Videopad** then can get created and saved.

Note that **this .VPJ script file is often an ordinary ASCII text file**. It typically is only a few thousand bytes long. **The actual video gets created from the script only when your editor gets asked to do so.** Different resolutions can thus get created from a single script.

If you want to, **you usually can directly read and edit your project script files**. This might be handy, say, to change the filename or location of a few of your clips. Or otherwise make minor changes early in edit that would take a profound rework of your main editor tasks or sequences. But **you normally should let your editor do the job it was intended to by itself**.

In any elaborate editing project, **you may also want to create your own personal reminder script**. This would simply be a "dear diary" style ASCII textfile that kept track of what has to get done when. **It is particularly important to place all the starting, ending, and duration times of inserts in any such script**.

Any old word processor or editor can be used for this task.

Step #5 — Combine the Big Lumps First

The original VHS video was an hour long. It included a number of different topics to increase its value to the buyer. It was cut down to **PostScript** specifics for the remastering. Other parts might be used later for future tightly focused videos.

One removed scene was also somewhat redundant and might have raised an IP rights issue. And some rearrangement made sense after the initial cutting and splicing was completed.

Your first goal should be to get "most" of the major sequences all in order and properly cut to size. Followed by details such as inserts, titles, transitions, and a final reduction of glitches.

Step #6 — Know when to unlink your sound

The **timeline** of any video sets what is going to happen in which order.

Normally, the sequence of video clips determines your timeline. **Each individual clip is initially tightly locked to its own sound**. **Videopad** also can give you the ability to **unlink** your sound. Where the soundtrack now newly determines the timeline…

With LINKED sound, the video clips determine your timeline and sound sync is fully preserved.

With UNLINKED sound, the sound track determines the timeline. This can be useful for changing or adding inserts to a voiceover lecture. Or for putting music under a title or closing sequence.

A very important rule…

When using unlinked sound, the start, end, and the length of inserts MUST be EXACTLY controlled to within ONE millisecond of timing.

Otherwise lip sync may be lost on ongoing scenes.

When unlinked, what you insert MUST exactly match what your remove to make room for that replacement.

During editing **it is usually a good idea to keep your sound linked for as long as you can**. The only way I have found to relink is to create a new MP4, which may raise generation problems. This clearly should be avoided.

Videopad lets you have an arbitrary number of sound tracks. These all will later get combined together. It is a good idea to **have ONE single purpose for each of your soundtracks**, rather than trying to reuse them. Normally, only one soundtrack should be active at a time, unless you are adding background sounds or other **Foley effects**.

Step#7 — Add or Improve Inserts

Our original **PostScript** inserts were pretty much mesmerizingly awful in Industrial Betamax and got much worse when trying to work with a second generation VHS copy. Fortunately, we still have and still use most of the original **PostScript Show and Tell** cards. These remain in device independent arbitrarily high resolution. So, all the original mangy old inserts were replaced with greatly improved new ones.

PostScript was originally a black and white world driven by the LaserWriter and similar printers. So the first thing we did as **add color tints to the inserts when and where useful**.

Unfortunately, **any video format sets strict limits on the resolution and quality you can deliver on still images**. If there is too much high frequency content or too many fine lines or too much detailed typography in your image, the results are **guaranteed** to look awful.

Here are some of my top secret techniques that may be used to create credible low resolution images from higher resolution input content…

1. **Crop to subject as tightly as possible. Minimize the image message.**

2. **Reduce size to exactly FOUR TIMES your final resolution, or 1280 x 960 in the case of 320 x 240 iPod resolution.**

3. **Use Imageview32 or a fancier program to add a significant amount of blur. Four or five clicks is not unreasonable.**

4. **Reduce the image precisely 4X so it EXACTLY matches your final resolution.**

5. **Add a bare minimum of sharpening. perhaps one click at most. Use only what works.**

6. **Test your results with an actual video at your target resolution. Readjust if needed.**

The main reason for adding lots of blur is to try and **darken** and **widen** any fine lines. If done properly, this high frequency energy reduction should minimize ghosting and dropouts. But any given resolution ultimately sets a limit to exactly what you can display in which manner.

Always try to work with Acrobat PDF files converted to bitmaps. JPEG files will add artifacts that, when combined underneath the MP4 artifacts, may end up looking awful.

If some needed insert flat out will not reduce, **fake it as necessary**. Ferinstance, we had a perspective image of a building with many thousands of bricks in it. No way can this be shown at low resolution, but it was an important part of the video content.

The first try Moire patterns were totally unacceptable. So, all of the bricks were replaced with a uniform and nondescript mottled background. We could alternately have shown a highly magnified detail of the original instead.

Step #8 — Add the Transitions

Suddenly changing from one scene to another is called a **jump cut**. These are often visually jarring and normally should be avoided. Although they intentionally can be used to create stress or excitement in your viewers. Instead, some **special effect** called a **wipe** or a **fade** or a **transition** should be added instead.

An important rule...

Beyond the jump cut, the simplest transition is called a **fade**. **Videopad** lets you directly fade from scene to scene with controlled timing. You can also fade through white or black.

Fades can vary from a few tenths of a second to a few seconds, depending on how significant or how major you want to make your scene change.

There's some simple additions you can make to **Videopad** that greatly improve your fades. Create a single frame blank title background, fade to it, then fade to the next title. This usually looks a lot better than a direct fade. Your first title "goes away" before the next one "starts appearing". Instead of overlapping.

In our video, the usual background was a tan wooden paneling. Creating a single frame matching solid tan color clip solved a lot of scene transitions. In which you faded to tan and then faded to the new scene. This is especially useful should your new or old sound overlap any changes in video. Or if there is a sudden shift in the talent's position or demeanor.

Step#9 — Create Titles and End Credits

These are normally spliced on to the beginning or the end of your actual video content. It can be a good idea to **do all your titles and end credits as separate short projects**. And only later combine them.

Firstoff...

Titles of the wrong size or resolution can end up looking really bad...

Newer versions of **Acrobat** let you start out with an infinite variety of fonts and directly convert to a **bitmap** of an exactly specified resolution. Once again, **avoid using JPEG image compression on your titles or credits!**. Blotchiness from the double compression is likely to result.

I instead chose to use my **Bitmap Typewriter** which directly lets you put most any **PostScript** font onto an existing bitmap with exceptional clarity and resolution. The title backgrounds got extracted from our web page in an attempt to preserve and project similar vibes.

As we've seen, **it can be useful to create a new blank title background and then fade through it**. This way one title fades out before the next one fades in.

One of the characteristics of MP4 is that **several fields will be needed to build up any sudden change**. This is normally not noticeable. But if your video is displaying its first frame and not yet running, **only partial and awful looking lettering may be present**. The workaround is to create a single solid color frame at the start of your video and then fade into your title background only when the vid actually starts running.

A final end credit suggestion…

> **Be sure to give FULL credit to EVERYBODY that was involved in ANY way with your project!**
>
> **Yes, that includes your third assistant safety director makeup supervisor best boy.**

Step #10 — Deal with any music

The title and trailer music on my VHS original was just plain awful and clearly had to go. Another key rule…

> **Music rights owners can be extremely fussy over your use of their stolen material.**
>
> **Make CERTAIN any music you use is public domain or else has been properly and specifically paid for.**

One source of legal tracks you can buy is the **Musicmatch Jukebox**. I was instead going to hire some students from a community college jazz band to do all of the backgrounds for me. But I discovered that one track of the sample music provided by **Windows XP** was seldom used, little known, and felt it to be a really good fit.

Step #11 — Upload to the Web

Except for its length, uploading a .MP4 file is pretty much the same as uploading any other file. Use a **.FTP program** for your website or follow the instructions that you will find on **Youtube**.

A reminder to **be sure your ISP is willing to deal with video** in the way you want to. Just uploading the file means your viewers have to download it before playing. This may take several minutes and exceed bandwidths. Any video-on-demand takes special ISP services that may not be available, may involve extra charges, or may raise throttling issues. Using **Youtube** for distribution clearly avoids all these hassles. Besides adding convenient search features.

Step #12 — Proof and Remove any glitches

There almost always will be some minor problems remaining in your video. Have someone else **view it online** and critique it. It is a good idea to keep your vid unannounced and "secret" till you are reasonably happy with the current cut.

Specific things to watch out for are continuity, preserving sound sync, and any transition glitches in the video or the soundtrack. And, of course, the big picture of **whether your product actually delivers your intent**.

At this writing, I still am not completely happy with the results. A few JPG titles remain and are somewhat blotchy. Some minor glitches are still there. And now that I know I can do low res iPod delivery, I'll likely upgrade back to 4x better television resolution. And some skill building clearly remains.

For More Help

Once again, the vids can be downloaded **here** or viewed **here** and **here**. Much more on image postproc appears **here**. One version of the bitmap typewriter can be found **here**.

Sourcecode for this **GuruGram** appears **here**.

Custom consulting is available. Additional info on similar topics can be found on our **PostScript**, **Acrobat**, and **Captain Video** libraries. You can also **email us** or you can call (928) 428-4073 for further help.