CHAPTER e3

Video Production

With so many bands and solo performers using videos to promote their music, video production has become an important skill for musicians and audio producers to acquire. While this section can’t explain video cameras and editing techniques as deeply as a dedicated book, I’ll cover the basics for creating music videos and concert videos. I’ll use as examples my one-person music videos *A Cello Rondo* and *Tele-Vision*, a song from a live concert I produced for a friend’s band, as well as a cello concerto with full orchestra that I worked on as a camera operator and advisor. It will help if you watch those first:

- Ethan Winer — A Cello Rondo music video: http://www.youtube.com/watch?v=ve4cBOnSU9Q
- Rob Carlson — Folk Music in the Nude music video: http://www.youtube.com/watch?v=eg0LY8kBO08
- Allison Eldredge — Dvorak Cello Concerto fragment: http://www.youtube.com/watch?v=Fgw54_uGDDg

Because video editing is as much visual as intellectual, I created three tutorial videos to better show the principles. The video vegas_basics gives an overview of video editing using Sony Vegas Video, and vegas_rondo and vegas_tele-vision show many specific editing techniques I used to create those two music videos. I use Vegas, but most other professional video programs have similar features and work the same way. So the basic techniques and specific examples that follow can be applied to whatever software you prefer.

**Video Production Basics**

Most modern video editing software works similarly to an audio DAW program, with multiple tracks containing video and audio clips. Video plug-ins are used to change the appearance of video clips in the same manner as audio plug-ins modify audio. And just like a DAW, when a project is finished it’s rendered by the software to a media file, ready for viewing, streaming online, or burning to a DVD.

Modern video production software uses a paradigm called *nonlinear editing*, which means you can jump to any arbitrary place on the timeline to view and edit the clips. This is in contrast to the older style of video editing using tape that runs linearly from start to finish,
where editing is performed by copying from one tape deck to another. This is not unlike the
difference between using an audio DAW program and an analog tape recorder with a
hardware mixing console.

Most music videos are shot as overdubs, where the musicians mime their performance
while listening to existing audio. The music is first recorded and mixed to everyone’s
satisfaction; then the band or solo performer pretends to sing and play while the cameras
roll. When overdubbing this way, the music is played loudly in the video studio or
wherever the video is being shot so the performers can hear their part clearly and maintain
the proper tempo. The cameras also record audio, usually through their built-in
microphones, but that audio is used only to align the video track to the “real” audio later
during editing.

Often, a band will mime the same song several times in a row so the camera operators can
capture different performances and camera angles to choose from when editing the footage
later. If the budget allows having four or more manned cameras, each camera can focus on
a different player or show different angles of the entire band during a single performance.
But many videos are done on a low budget with minimal equipment, and even a single
camera operator can suffice if the band performs the same song several times. Shooting
multiple takes lets a single camera operator focus on one player at a time during each
performance. When editing, video of the guitar player can be featured during the guitar
solo, and so forth. Live video can be cool, with the occasional blurred frame as the camera
swings wildly from one player to another, but editing from well-shot clips is more efficient
and usually gives more professional-looking results.

Of course, it’s possible to video a group during a live performance. In that case, the audio
is usually recorded separately off the venue’s mixing board either as a stereo mix or with
each instrument and microphone recorded to a separate track to create a more polished mix
later in a more controlled environment. Again, each camera’s audio track is used only when
editing the video later to synchronize the video tracks with the master audio. This is the
method I use when recording my friend’s band playing live.

Figure e3.1 shows the main editing screen of Vegas Video. The video and audio tracks are
at the top, and at the bottom are a preview of built-in video effects on the left, the Trimmer
window where video clips are auditioned before being added to the project, and the audio
output section at right. Several other windows and views not shown here are also available,
such as an Explorer to find and import files, and a list of the project’s current media. The
audio window at lower right can also be expanded to show the surround mixer if
appropriate, and so forth.

Unlike an audio DAW where multiple tracks are mixed together in some proportion to
create a final mix, video tracks usually appear only one at a time or are cross-faded briefly
during a transition from one camera to another. Therefore, video tracks require establishing a priority to specify which track is visible when multiple clips are present at the same time. As with an audio DAW, tracks are numbered starting at 1 from top to bottom. The convention is for upper tracks to have priority over lower tracks below. So if you want to add a text title that overlays a video clip, the track containing the text must be above the clip’s track. Otherwise, the clip will block the text.

Video editing software also has a Preview window for watching the video as you work. My computer setup has two monitors, and Vegas allows the preview window to be moved to the second monitor for a full-screen view of the work in progress. This is much more convenient than trying to see enough detail on a small window within the program’s main screen. Video editing and processing take a lot of computer horsepower, memory, and disk space. Unless your computer is very fast or you’re working with only a few video tracks and plug-in effects, your computer may not be able to keep up with playback at the highest
resolution in real time. Vegas lets you specify the preview quality so you can watch more tracks in low resolution or fewer tracks at a higher quality. Another option is to render a short section of the project to memory. Rendering a short section may take a few minutes to complete, but it lets you preview your work at full quality. You can also render all or part of the video to a file.

**Live Concert Example**

The project in Figure e3.1 shows a live performance of my friend’s band that I shot in a medium-size theater using four cameras. This song is very funny, describing a concert the band performed at a nudist folk festival! You can see each camera’s audio track underneath its video clip, and the height of every track can be adjusted to see or hide detail as needed. In Figure e3.1, the video tracks are opened wide enough to see their contents, and the camera audio tracks are narrower.

For this show, three cameras were at the back of the room, with a fourth camera to the left in front of the stage. The audio in the bottom track was recorded during the show by taking a feed from the venue’s mixing board to the line input of a Zoom H2 portable audio recorder. I used the H2 because it runs off internal batteries to avoid any chance of hum due to a ground loop. This is the audio heard when watching the video.

Three cameras on tripods were in the rear of the room. One was unmanned, set up in the middle of the rear wall and zoomed out to take in the entire stage. This is a common technique, where a single static camera captures the full scene, serving as a backup you can switch to when editing later in case none of the other camera shots were useful at a given moment. A second camera was off to the right, also unmanned, set up to focus on Vinnie, who plays the fiddle, mandolin, and acoustic guitar. Having a single camera on the second most important player in the group ensures that this camera angle will always be available when needed to capture an instrumental solo or funny spoken comment between songs.

The third camera was also tripod-mounted near the center of the back wall. I operated this camera manually, panning and zooming on whatever seemed important at the moment. Most of the time, that camera was pointed at the lead singer, Rob, though I switched to the piano player or drummer during their solos. The fourth camera was also manned, placed on a tripod off to one side in the front of the room to get a totally different angle for more variety. Both of us running the cameras focused on whoever was the current featured player, free to pan or zoom quickly if needed to catch something important. Any blurry shots that occurred while our cameras panned were replaced during editing with the other manned camera or one of the unmanned cameras.

Speaking of blurry footage, it’s best to use a tripod if possible, especially when zooming way in to get a close-up of something far away. Handheld camera shots are generally too
shaky for professional results, unless you have a Steadicam-type stabilizer. These are very expensive for good models, and they’re still not as stable as a good tripod resting on solid ground. Unlike still photography, where you position the tripod once and shoot, a video tripod also needs to move smoothly as you pan left and right or up and down. The best type of video tripod has a fluid head that can move smoothly, without jerking in small steps. Again, good ones tend to be expensive, though some models, such as those from Manfrotto, are relatively affordable. Another option is the monopod, which is basically a single pole you rest on the ground. This gives more stability than holding the camera in your hands unsupported, but it’s still not as good as a real tripod with a fluid head.

Many bands are too poor to own enough high-quality video cameras to do a proper shoot in high definition, which was the case for this video. I own a nice high-definition (HD) Sony video camera, and my friend who ran the fourth camera is a video pro who owns three really nice Sony professional cameras. But the two other cameras were both standard definition (SD), one regular and one wide-screen. This video project is SD, not HD, so I used my HD camera for the static full-stage view. That let me zoom in a little to add motion when editing, without losing too much quality. If you zoom way in on a camera track after the fact when editing, the enlarged image becomes soft and grainy. But you can usually zoom up to twice the normal size without too much degradation, and zooming even more is acceptable when using a camera having twice the resolution of the end product.

**Color Correction**

One of the problems with using disparate cameras is the quality changes from shot to shot when switching between cameras. This includes not just the overall resolution, but the color also shifts unless the camera’s white balance is set before shooting. Modern digital still-image and video cameras can do this automatically: You place a large piece of white paper or cardboard on the set, using the same lighting that will be present during the shoot. Then you zoom the camera way in so the white object fills the frame and press a button that tells the camera “this” is what white should look like. The camera then adjusts its internal color balance to match. But even then, different cameras can respond differently, requiring you to apply color correction later during editing.

The Secondary Color Corrector plug-in shown in Figure e3.2 can shift the overall hue of a video clip, or its range can be limited to shift only a single color or range of colors. This is done using the color wheel near the upper left of the screen by dragging the dot in the center of the wheel toward the outside edge. The closer the dot is toward one edge, the more the hue is shifted toward that color.

The color corrector also has controls for overall brightness, saturation (color intensity), and gamma. If you want a clip to be black and white for special effect, reduce the saturation to
zero. If you want to bring out the colors and make them more vibrant, increase the saturation. The gamma adjustment is particularly useful because it lets you increase the overall brightness of a clip, but only for those portions that are dim. Where a brightness control makes everything in the frame lighter, gamma adjusts only the dark parts, leaving brighter portions alone. This avoids bright areas becoming washed out, as can happen when increasing the overall brightness. This is not unlike audio compression that raises the volume of soft elements without distorting sounds that are already loud enough.

Figure e3.3 shows a scene from a YouTube video I made of my pinball machines before and after increasing the gamma. You can see that the lights on the play field are the same brightness in both shots, but all of the dim portions of the frame were made much brighter in the lower clip.

It's common for recording engineers to check an audio mix on several systems and in the car, and likewise you should check your videos on several monitors or burn a DVD to see it on several TVs, including the one you watch the most. Look for too dark or washed-out
Figure e3.3: The gamma adjustment lets you make dim areas brighter, without making bright portions even brighter. The clip at the top is as shot, and the bottom is after increasing the gamma. If the overall brightness was increased, the play field lights would have become washed out.
images or areas, and for too much or too little contrast. In particular, verify that skin colors are correct. If you plan to do a lot of video editing, you can buy a device to calibrate your video monitor. This attaches to the front face of the display during setup, and the included software tells you what monitor settings to change to achieve a standard brightness and contrast with correct colors. There are also software-only methods that use colored plastic sheets you look through while adjusting the red, green, and blue levels.

**Synchronizing Video to Audio**

Continuing on with the live concert example in Figure e3.1, each of the four camera’s files was placed on its own track. When you add a video file to a project, both its video and audio are imported and placed onto adjacent tracks, so there are really two tracks associated with each camera file. By putting each camera on its own video track, you can add the color corrector or other corrective plug-ins to modify only that track. Vegas also lets you apply video plug-ins to individual clips when needed.

Importing video clips from older tape-based video cameras requires using a *video capture* utility that runs in real time as you play the tape in your camera. This program is usually included with the video editing software, and the camera connects to your computer through a FireWire port. Newer cameras save video clips as files directly to an internal memory card, and the files can be transferred via USB, FireWire, or a card reader much more quickly than real-time playback. A camera that uses memory cards not only transfers video more quickly, but it’s also more reliable by avoiding the drop-outs that sometimes occur with videotape.

The first step, after importing all of the camera files, is to synchronize each camera to the master audio track by sliding the camera clips left or right on the timeline. The camera’s video and audio portions move together unless you specifically ungroup them, so aligning the camera’s audio to the master audio also aligns the video. Figure e3.4 shows a close-up of one camera’s video and stereo audio tracks, with the master stereo audio track underneath. The audio at the bottom was recorded from the mixing console, and the camera’s audio was recorded through its built-in microphone. Once the tracks are visually aligned—zoom way in as needed—you should listen to both audio tracks at once to verify they’re in sync with no echo. Then you can mute the camera’s audio or even delete that track.

Once all of the camera tracks are aligned, you can watch each track one at a time all the way through, making notes of where each camera should be shown in the video. Often, the first shot in a music video will be the full-stage camera so viewers get a sense of the venue. Then you’ll decide when to switch to the other cameras, depending on who should be featured at that moment. It’s also common to zoom in (or out) slowly over time, which adds motion to maintain interest. Ideally, this zooming will be done by the camera operator, but it can also be done during editing as long as you don’t zoom in too much.
Panning and Zooming

Generally, when running a video camera, you’ll avoid zooming in or panning across quickly. Too much fast motion is distracting to viewers, and it can create video artifacts at the low bit-rates often used for online videos. It’s also recommended to avoid “trombone” shots that zoom in and then zoom out again soon after. Do either one or the other, but not both over a short period of time. Of course, it’s okay to zoom in fast to capture something important, but consider switching to another camera when editing to hide the zoom. Understand these are merely suggestions based on established practice and common taste. Art is art, so do whatever you think looks good.

Speaking of zooming, I’m always amused by ads for inexpensive video cameras that claim an impressive amount of digital zoom capability. What matters with video cameras is their optical zoom, which tells how much the lens itself can zoom in to magnify the subject while shooting. Digital zooming just means the camera can enlarge the video while playing back on its built-in screen, and this type of zooming always degrades quality. For example, repeating every pixel to make an image twice as large makes angled lines and edges look jagged. However, digital zooming can have higher quality than you’d get from simply repeating pixels to make an image larger. When done properly, digital zooming creates new pixels having in-between values, depending on the image content. A good digital zoom algorithm will actually create new colors and shades that better match the surrounding

Figure e3.4: To synchronize a video track to the master audio, place the master audio track directly underneath the camera’s audio track, then slide the camera clip left or right until both audio tracks are aligned.
pixels on both sides, giving a smoother appearance. But still, digital zooming always compromises quality compared to optical zooming, especially for large zoom amounts.

**Video Transitions**

Switching between cameras during editing can be either sudden or with a cross-fade from one to the other. You create a transition by dragging one camera’s clip to overlap another, and the transition occurs over the duration of the overlap. This is much like a cross-fade in an audio DAW program, and the two clips can be on the same track or separate tracks. If both clips are on separate tracks, as I usually do, you’ll use fade-in and fade-out envelopes on both tracks, rather than have one clip physically overlap the other. Either way, to create a fast cross-fade, the clips will overlap for half a second or so, or the overlap can extend for several seconds to create a slow transition. The second clip on Track 6 of Figure e3.1 shows a fade-out envelope, which creates a cross-fade to the subsequent clip below on Track 8. Since Track 6 has a higher priority and hides Track 8, there’s no need to apply a corresponding fade-in on Track 8; Track 6 simply fades out to gradually reveal Track 8 over a period of about one and a half seconds. You can also specify the *fade curve*, which controls how the cross-fade changes over time.

Pop music videos are usually fast-paced, often switching quickly from one camera angle to the next, or applying a transition effect between clips. Besides the standard cross-fade, most video editor software includes a number of transition effects such as Iris, Barn Door, and various other wipe and color flash effects. For example, an Iris transition opens or closes a round window to reveal the subsequent clip as in Figure e3.5. Many other transition types are available, and Vegas lets you audition all the types and their variations in a preview window. The included video “vegas_television” shows how that works.

I prefer to cut or cross-fade from one camera to another a second or two before something happens, such as the start of a guitar solo. This gives the viewer a chance to prepare for what’s coming and already be focused on the player in the new perspective before the solo begins. But sometimes one solo starts before the previous one has ended, or a solo starts while the lead singer is still singing. In that case, you can use a slow cross-fade over a second or two to partially show both performers at the same time. Or you can put one camera in its own smaller window on the screen to show both cameras at the same time.

When I do these live videos for my friend, both camera operators focus on whatever seems important to us at the moment. But sometimes neither of us is pointing our camera at what’s most important. Maybe we’ll both think a piano solo is coming and aim there, but it was actually the guitar player’s turn. So by the time we focus our cameras on the guitar player, he’s already five seconds into the solo. This is where the fall-back camera that captures the entire stage is useful. When editing, I’ll switch to the full-stage camera a
second or two before the guitar solo starts, then slowly pan and zoom that camera’s track toward the guitarist in anticipation of the solo. As mentioned, you can usually zoom a clip up to 200 percent (double size) before the quality degrades enough to be objectionable. So I’ll do a slow zoom over a few seconds that doesn’t enlarge the frame too much and at the same time pan toward the soloist to imply what’s coming. Then I finally switch to one of the manned cameras once it’s pointing at the featured player. This is shown in Figure e3.6 in the next section to anticipate a piano solo.

**Figure e3.5:** Most video programs offer a large number of transition types, including the Iris shown here that opens a round window over time to expose the subsequent track. In this example, the singer’s track transitions to the mandolin player.
Figure e3.6: Key frames indicate points on the timeline where something is to change. This can be a pan and zoom as shown here or changes in color, brightness, text size, or literally any other property of a video clip or plug-in effect.
The venue where this live concert was shot is not huge, with about 300 seats. Since I recorded the audio from the house mixing board, the sound was very clean and dry—in fact, too dry to properly convey the feel of a live concert. To give more of a live sound, I added the audio recorded by the two cameras in the rear—one each panned hard left and right—mixed in very softly to add just a touch of ambience. This also increased the overall width of the sound field, because instruments and voices from the board audio were mostly panned near the center.

**Key Frames**

One of the most powerful features of nonlinear video editing is *key frames*. These are points along the timeline where changes occur, such as the start and end points of a zoom or pan. Figure e3.6 shows the Pan/Crop window that pans and zooms video clips. The top image shows the full frame, which is displayed initially at the start of the clip. The large hollow “F” in the middle of the frame is a reference showing the frame’s size and orientation. Video software can rotate images as well as size and pan them, so the “F” lets you see all three frame properties at once.

You can see three markers in the clip’s timeline at the bottom marked Position: one at the far left, another at the four seconds marker, and the last at eight seconds. In this case, the full frame is displayed for the first four seconds of the clip because both key frames are set the same. The lower image shows that a smaller window is displayed at the eight seconds mark. Since a smaller portion of the clip is framed, that area becomes zoomed in to fill the entire screen. When this clip plays, Vegas creates all the in-between zoom levels to transition from a full frame to the zoomed-in portion automatically. The other timeline area marked “Mask” is disabled here, but it can be used to show or hide selected portions of the screen. The video “vegas_basics” explains how masks are used.

As you can see, key frames are a very powerful concept because you need only define the start and end conditions, and the software does whatever is needed to get from one state to the next automatically. If you want something to change more quickly, simply slide the destination key frame to the left along the timeline to arrive there earlier. Again, key frames can be applied to anything the software is capable of varying, including every parameter of a video plug-in.

Most video runs at 30 *frames per second* (FPS), which is derived from the 60 Hz AC power line frequency. In most US localities, the frequency of commercial power is very stable, so this is a convenient yet accurate timing reference for the frame rate. The timeline is divided into hours, minutes, seconds, and frames, with a new frame every 1/30 of a second. The PAL video format used in Europe divides each second into 25 frames, because AC power
there is 50 Hz. NTSC video uses a frame rate of 29.97 Hz (the explanation is complicated, but the simple version is it allowed making TV sets cheaper).

Blu-ray disks run at 24 frames per second, so when creating those, you have to shoot at 24 FPS, or your software will convert the data when it burns the disk. The process is similar to audio sample rate conversion, dropping or repeating frames as needed. Many professional HD video cameras can also shoot at 60 FPS. This is not so much to capture a higher resolution but to achieve smoother slow motion when that effect is used. If you slow a 30 FPS clip to half speed, each frame is repeated once, which gives a jerky effect. If you shoot at 60 FPS, you can slow it down to half speed and still have 30 unique frames per second.

**Orchestra Example**

Pop music videos often contain many quick transitions from one camera to another, sometimes with various video effects applied. But for classical music, a gentler approach is usually better, especially when the music is at a slow tempo. In the orchestra example linked at the start of this chapter, you’ll see that most of the cross-fades from one camera to another are relatively slow, and with slower pieces, camera cross-fades can span four seconds or even longer. You’ll also notice that many of the camera shots constantly zoom in (or out) slowly on the players and soloist, as described earlier. This video was shot in high definition using four cameras, with full 5.1 surround sound, though the YouTube clip is standard resolution and plain stereo.

My friend and professional videographer Mark Weiss was at the front of the balcony at the far right, and I was also in the balcony but at the far left. This way Mark could capture the faces of players on the left side of the stage and the cello soloist’s left side. My position let me do the same for players on the right of the stage and zoom in on the cellist’s right side. Another camera operator was on the main floor near the front to the right of the audience. A fourth unmanned camera was placed high on a ledge at the side of the stage pointing down toward the conductor. Having a dedicated camera lets Mark switch to the conductor’s face occasionally during editing, which is not possible from in front where the camera operators were stationed. The three of us have shot many videos for this orchestra, though for some videos the third camera operator was on the stage itself, off to one side, to get better close-ups of the players.

Figure e3.7, taken from the stage looking up toward the balcony at the rear of the hall, shows the surround microphone rig Mark built for these orchestra videos. This consists of a metal frame to which five microphone shock-mount holders attach. It’s hung from thin steel wires 18 feet in the air, centered above the third row of the audience. The microphones are connected by long cables to a laptop computer with a multichannel FireWire interface in a room at one side of the stage.
Cello Rondo and Tele-Vision Examples

The demo “vegas_rondo” shows many of the editing techniques I used to create that video, but it’s worth mentioning a few additional points here. The opening title text “A Cello Rondo” fades in, then zooms slightly over time, using two key frames: one where the text is to start zooming and another where it stops at the final larger size. Likewise, the text “By Ethan Winer” uses key frames to slide onto the screen from left to right, then “bounces” left and right as the text settles into its final position.

There are three ways to apply key frames to change the size of on-screen text. If you use the Scaling adjustment in the text object itself, or resize the frame in the Pan/Crop window, each size is generated at the highest resolution when the video is rendered. You can also size and move video clips using a track’s Track Motion setting, but that resizes the text after it’s been generated, which lowers the resolution and can soften the edges.

As mentioned, the order of tracks determines their priority for overlapping video clips, with tracks at the top showing in front of lower tracks. Figure e3.8 shows part of the video where two players are on-screen at the same time. In this case, the track for the player on the left is above the track for the player on the right, which in turn is above the track.

Figure e3.7: These five microphones are placed high up over the audience. Three of the mics point forward and down for the left, center, and right main channels, and two more mics point toward the rear left and right to capture a surround sound field from the back of the hall.
holding the textured background. The result looks natural, as if one player’s bow is actually behind the other player’s arm, with both players in front of the background.

Figure e3.9 shows a portion of the video with nine separate elements: five cellists, my cat Bear, a halo over Bear’s head that’s automated using key frames to follow his head movement, a white spotlight that sweeps across the screen via key frames, and a static photo of my cello used for the background. I used a *green screen* to create what looks like a single performance from all of these video elements, letting me keep just the players and strip out the wall behind me. A green screen lets you remove the background behind the

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**Figure e3.8:** In most video editing software, lower-numbered tracks appear in front of higher-numbered tracks. Here, the player on the left is on Track 7, the player on the right is on Track 11, and the background is on Track 24.

**Figure e3.9:** Each of the nine elements in this scene is sized and positioned individually, with the halo and spotlight programmed to move via key frames.
subject and “float” the subject on top of a new background. This is explained further in the “vegas_rondo” demo video.

**Backgrounds**

Vegas includes a large number of effects plug-ins, including a very useful “noise” generator. This creates many different types of texture patterns, not just snow, as you’d see on a weak TV station, which is what video noise really looks like. The Vegas noise patterns include wood grain, clouds, flames, camouflage, lightning, and many others. I used every one of those for my Cello Rondo video, but I wanted something more sophisticated for Tele-Vision. Many companies sell animated backgrounds you can add royalty-free to your projects, and I chose a product called Production Blox from 12 Inch Design. These backgrounds are affordable and far more sophisticated than anything I could have created myself using the tools built into Vegas.

One goal of a music video is to add interest by doing more than is possible with only audio. In a live concert video you can switch cameras to change angles and show different performers and use transitions and other special effects. When creating a video such as Tele-Vision that’s compiled from many different green screen clips, you can also change the backgrounds. Not only can you switch between backgrounds, but you can change the background’s appearance over time using key frames. The Production Blox backgrounds are already animated, but I spent a lot of time varying the stock Vegas backgrounds, such as making a checkerboard pattern change color and rotate, and animating cloud patterns. I even created an entire animated disco dance floor from scratch. A big part of audio mixing is sound design, and likewise an important part of video production is thinking up clever ways for things to change over time to maintain the viewer’s interest.

**Time-Lapse Video**

Although not directly related to music videos, a common special effect is time-lapse video, where several minutes or even hours elapse in just a few seconds. If you need to speed up a clip by only a modest amount, Vegas lets you add a Velocity envelope to a video clip to change its playback speed. You can increase playback speed as much as 300 percent or slow it to a full stop. You can even set the Velocity to a negative value to play a clip backward, as shown in the “vegas_rondo” demo. If 300 percent isn’t fast enough, you can increase the speed further by Ctrl-dragging the right edge of a clip. Ctrl-dragging its right edge to the left compresses the clip to play up to four times faster. You can also Ctrl-drag to the right to stretch it out, slowing down playback to one-fourth the original speed. By setting the Velocity to 300 percent and Ctrl-dragging fully to the left, you can increase playback speed as much as 12 times.
If that’s still not fast enough, Vegas lets you export frames from a video clip to a sequence of image files. You specify the start and end points of the clip to export and how much time to skip between each frame saved to disk. For one of my other music videos I wanted to speed up a clip by 60 to 1, where each minute passes in one second. So when exporting the image sequence, I kept one frame for every 59 that were discarded. Then I imported the series of still images into Vegas, which treats them as a new unified video clip. Rather than describe the steps here, I created the YouTube tutorial http://www.youtube.com/watch?v=ibE-tviIxUg, to show the effect and describe the procedure in detail.

Media File Formats

Audio files can be saved as either original Wave or AIFF files, or in a lossy-compressed format such as MP3 or AAC. Lossy compression discards content deemed to be inaudible, or at least less important, thus making the file smaller. Raw video files are huge, so they’re almost always reduced in size using lossy compression. An uncompressed high-definition AVI file occupies nearly 250 MB of disk space per second! Clearly, compression is needed if you hope to put a video longer than 18 seconds onto a 4.7 GB recordable DVD.

Where lossy audio compression removes content that’s too soft to be heard, video compression instead writes only what changes from one frame to the next, rather than saving entire frames. For example, with a newscaster in front of a static background, most of the changes occur in just a small part of the screen where the speaker’s mouth changes. The rest of the screen stays the same and doesn’t need to be repeated at every frame. This is a simplification, but that’s the basic idea. Video in North America and many other parts of the world runs at 30 frames per second, so not having to save every frame in its entirety can reduce the file size significantly.

As with audio, lossy video compression is expressed as the resulting bit-rate for the file or data stream. Most commercial DVDs play at a bit-rate of 8 megabits per second (Mbps), though high-definition video on a Blu-ray disk can be up to 50 Mbps. One byte of data holds eight bits, so each second of an 8 Mbps compressed DVD video occupies 1 MB of disk space. Therefore, a single-layer recordable DVD holds about 78 minutes at 8 Mbps. You can reduce the bit-rate when rendering a project to store a longer video or use dual-layer DVDs. Note that the specified bit-rate is for the combined video and audio content, so the actual video bit-rate is slightly less. You can also specify the compressed audio bit-rate when rendering videos to balance audio quality versus file size.

As with audio files, variable bit rate (VBR) encoding is also an option for compressed video. VBR changes the bit-rate from moment to moment, depending on the current demands of the video stream. A static photo that remains on screen for five seconds can get away with a much lower bit-rate than a fast action scene in a movie or a close-up of a
basketball player rushing across the court or a shot where the camera pans quickly across a crowd. Since lossy video compression encodes what changes from frame to frame, motion is the main factor that increases the size of a file. With VBR compression, the maximum bit-rate is used only when needed for scenes that include a lot of motion, so VBR video files are usually smaller than constant bit-rate (CBR) files.

The file format for DVDs that play in a consumer DVD player is MPEG2, where MPEG stands for Moving Picture Experts Group, the standards outfit that developed the format. If you plan to put your video onto a DVD, this is the format you should export to. Vegas includes a render template for this format that is optimized for use with its companion program DVD Architect. Video that will be uploaded to a website can use other file formats, but don’t use a format so new or exotic that users must update their player software before they can watch your video. Windows Media Video (WMV) is a popular format, as are Flash (FLV) and the newer MP4, which works well for uploading to YouTube. But the popularity of video file formats comes and goes, and new formats are always being developed. What works best for YouTube today might be different next year or even next week.

I usually render my videos as MP4 files at a high bit-rate so I can watch them on my TV in high definition, and then I make a smaller Flash version to put on my websites. I use the excellent and affordable AVS Video Converter software to convert between formats. There are other such programs, including those that claim to be freeware, though some are “annoyware” that add their branding on top of your video until you buy the program. Also, this is one category of program that’s a frequent target for malware. Video conversion and DVD extraction are popular software searches, and unscrupulous hackers take advantage of that. Beware!

**Lighting**

Entire books have been written about lighting, and I can cover only the basics here. The single most important advice I can offer is to get halogen lights that are as bright as possible. Newer LED lights are also available; they don’t run nearly as hot as 1 kilowatt of halogen lighting, and they use less electricity. But at this time they’re quite expensive and are a good investment only if you do a lot of video work. Halogen lamps produce a very pure white light, so colors will be truer than when using incandescent or fluorescent bulbs. As with most things, you can spend a little or a lot. Inexpensive halogen “shop” lights work very well, though professional lights have better stands that offer a wide range of adjustment for both height and angle. Some pro lights also offer two brightness settings. Regardless of which type of halogen light you get, buy spare bulbs and bring them with you when doing remote shoots.
When lighting a video shot in a home setting, it’s best to point the lights up toward the ceiling or at a nearby wall. This diffuses the light and avoids strong shadows with sharp edges. Direct light always creates shadows unless you have a lot of lights placed all around the subject, with each light filling in shadows created by all the other lights. Placing lights to avoid problems with interaction is a bit like placing microphones. Figure 18.9 from Chapter 18 shows a product photo I took in a friend’s apartment. I used two professional 650-watt halogen lights on stands, with the lights several feet away from the subject, raised to about two feet below the ceiling and pointing up. With video, having an additional light behind the subject is also common, often set to point at a person’s head to highlight his or her hair, which adds depth to the scene. Watch almost any TV drama or movie, and you’ll notice that many of the actors have a separate light coming from one side or behind, pointed at their head.

Earlier I mentioned that modern cameras include automatic white balance, which is a huge convenience for hobbyists who don’t have the time or resources to become camera experts and learn how to set everything properly manually. To get the best results, however, it’s important to use the same type of lights throughout on a set rather than mix halogen, incandescent, and fluorescent lights. Each bulb type has a different color temperature, which affects the hue the camera captures. If the colors of some parts of a room or stage vary compared to others, the colors will shift as the camera pans to take in different subjects. Don’t be afraid to turn ordinary room lights off when setting up the lighting for your video shoot.

Summary

This chapter explains the basics of video production, including cameras, editing, media file formats, and lighting. Besides the four example music videos, three demo videos let you see video editing in action in a way that’s not possible to convey in words alone. Modern video software works in much the same way as audio DAW programs, using multiple tracks to organize video and audio clips. And as with audio, video plug-ins can be used to change the appearance of the clips or to add special effects. But unlike audio mixing, video tracks are usually shown one at a time, with tracks at the top of the list hiding the tracks below.

Most music videos are performed as overdubs, where the players mime their parts while listening to an existing audio mix. If you don’t have enough cameras available to capture as many angles and close-ups as you’d like, you can use one or two cameras and have the band perform a song several times in a row. Then for each performance, the cameras will feature one or two different players. It’s common to dedicate a single unmanned camera to take in the entire scene to serve as a backup in case all the other camera shots turn out flawed at a particular moment. However, when using disparate cameras, the quality and color can change from shot to shot, especially if the cameras vary in quality. Thankfully,
many cameras can set their white balance automatically before shooting to even out color differences. Besides being able to adjust color after the fact, a gamma adjustment lets you increase the overall brightness of a clip, without washing out sections that are already bright enough.

Once you’ve imported all of the video files from each camera, they need to be synchronized with the final audio track. After that’s done, the camera audio is no longer needed, so you can mute or delete those tracks. Switching between cameras during editing can be abrupt or with a cross-fade, and most video software includes a number of transition effects. When editing video, one of the most powerful and useful features is key frames that establish the start and end times over which a change occurs, and the software creates all the in-between points automatically. Key frames can vary anything the software is capable of, including video plug-in parameters.

This chapter also explained that video files are always reduced in size using lossy compression, though the resulting degradation is not usually a problem unless you compress to a very low bit-rate. Proper lighting is equally important. Using halogen lamps that are bright and white and are diffused by bouncing the light off a wall or ceiling is a good first step to achieving a professional look. But no matter how good you think your video looks, it’s useful to verify the quality and color balance on more than one monitor or TV set.