DESIDOC Bulletin of Information Technology , Vol. 22, No. 4 & 5, July & September 2002, pp. 3-8

Video Digitization and Editing: An Overview of the Process

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Abstract

Digitizing video is a complex process. Many factors affect the quality of the resulting digital video, including: quality of source video (recording equipment, video formats, lighting, etc.), equipment used for digitization, and application(s) used for editing and compressing digital movies. In this article, an attempt is made to outline the various steps taken for video digitization followed by the basic infrastructure required to create such facility in-house.

1. INTRODUCTION

Technology never stops from moving forward and improving. The future of media is constantly moving towards the digital world. Digital environment is becoming an integral part of our life. Media archival; analogue audio/video recordings, print media, photography, microphotography, etc. are slowly but steadily transforming into digital formats and available in the form of audio CDs, VCDs, DVDs, etc. Besides the numerous advantages of digital over analogue form, the main advantage is that digital media is user friendly in handling and manipulation of data using minimum man and machine *(system)* time. With the evolution of digital technology, time required on editing of one hour cine-film in analogue form has reduced from weeks to few hours. Moreover, the creativity can be extended to any limit within no time for better and better output which may not be possible while working with analogue media. Latest video editing software packages and systems have made the complex and complicated video editing simple and easy.

2. ADVANTAGES OF DIGITIZATION

A digital video movie consists of a number of still pictures ordered sequentially one after another (like analogue video). The quality and playback of a digital video are influenced by a number of factors, including the number of pictures (or frames per second) contained in the video, the degree of change between video frames, and the size of the video frame, etc. The digitization process, at various stages, generally provides a number of parameters that allow one to manipulate various aspects of the video in order to gain the highest quality possible.

Digital video has several advantages over analogue video:

- Flexible interactivity
- Easy to edit
- Multiple copies without quality loss
- Easy to manipulate
- Ease of use in additional features (titling, visual mixing, sound insertion, editing, special effects, transition, etc.)
- Transmission through e-mail
- Video conferencing

♦ Can be used as an impressive way of information dissemination effectively on web sites/multimedia programmes.

Quality of digital video output depends upon various factors such as the source video as Betacam, U-matic, Hi–8. These can give better quality than VHS recording. Some time must be invested to find the best settings for a particular video source. Furthermore, the best settings for one particular video source may not necessarily produce the best results for a different video source.

3. VIDEO DIGITIZATION PROCESS

Steps of video digitization are as follows (Fig.1& 2):

(a) Capturing the source video

(b) Editing the captured video

(c) Assembling of edited video

(d) Special effects like titling, transition, etc.

(e) Sound effects, narration, speech, commentary, music insertion, etc.

(f) Compression and final output.

The analog video signal is normally transferred through an S-Video (or composite video) cable to the input of a digitizer board or to an AV machine with a built-in digitizer. The hard disk speed, whether the hard disk is internal or external (an internal hard disk generally has a faster connection to the rest of the computer), and the speed of the machine and the digitizer board inside the machine will determine the possible number of frames per second and picture size of the movie.

Before starting digitization, the hard disk should preferably be defragmented and the machine should be booted in a minimal system configuration (in particular, network software should be off). There are software utilities, called disk optimizers or defragmenters that defragment a disk. For best system performance, one should defragment the hard disks periodically.

The video capturing software chosen should provide at least few features, like start and stop recording during editing, style titling, sound effects, transitions, audio insertion,

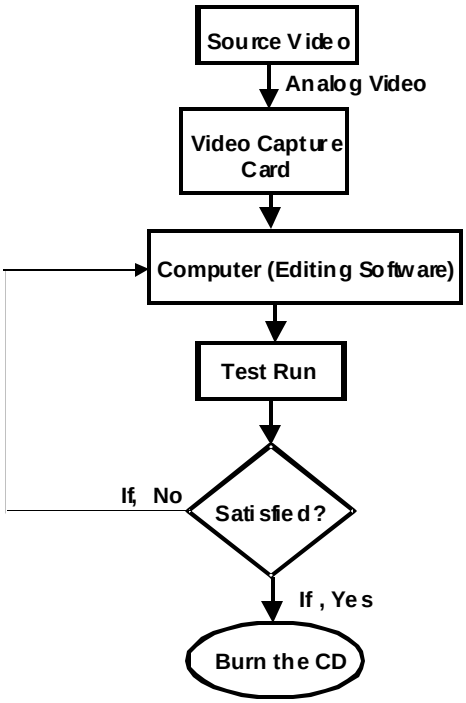

Figure 1. Flow chart representing the video editing process

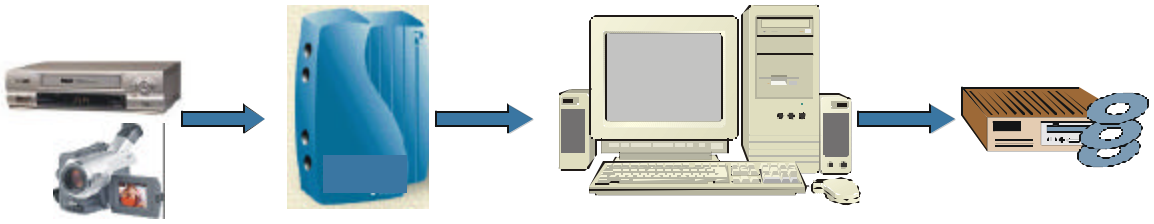

Figure 2. Video editing setup

compression and output in required file formats.

3.1 Capturing Source Video

The process of creating a movie starts with capturing source video clips. Before capturing, spend some time to decide which part of the video is to be digitized, better note down the approximate counter reading of the source player. Connect the *source* to the digitization machine, and establish the digitization parameters within the appropriate program. We can set the desired frame rate and picture size according to the desired output quality. If audio components are not required, one can turn off the audio component, so that any audio contained in the source video will not be digitized. To digitize the video, one starts recording in the capturing software program (for example, Pinnacle Studio MP10 (fig 3), Adobe Premiere, etc.). Once the source video frames are captured, these are ready for further video editing. Image quality of the captured video can be improved by changing the following parameters:

- Video bit rate
- Inputfilter/sharpness
- Using S-video output.

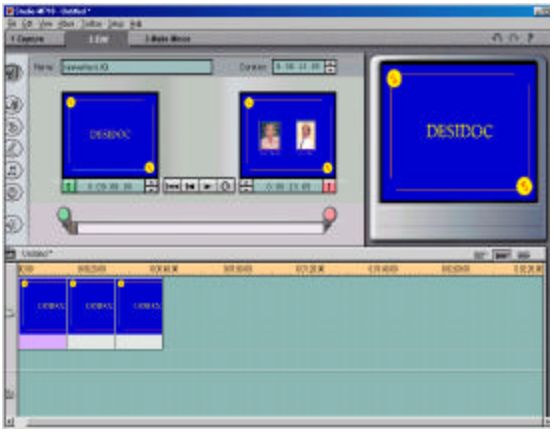

Figure 3. Editing screen of studio MP 10

3.2 Editing of Video

There are two types of video editing:

- Linear editing
- Non-linear editing

In linear editing, the editing is performed directly from one tape to another. In this case, PC only controls the source and recorder. In non-linear editing, sequences to be edited are transferred back to tape. Here the video capture card transfers the video to the PC's hard disk and the editing is then performed entirely within the PC.

Normally, editing involves few or all of the following steps:

- Working with video scene
- Opening the captured video
- Reviewing video scenes in the album
- Trimming scenes
- Splitting clips
- Combining and subdividing scenes
- Re-detecting scenes.

3.3 Assembling

After opening the captured video, we may review the scenes and make adjustments before placing them on the video track. we can decide to combine, split or detect new scenes within specific scenes.

One can select and/or combine the best video frames or can drop unwanted frames.

3.4 Special Effects

Videos can be made more impressive by using features like transitions, titles, sound effects, etc.

3.4.1 Titling

'Titling' is an integrated title editor program of the editing software that allows quick and easy creation of professional quality titles and graphics. Titles can contain words, shapes, background colors, and photos or graphics imported from other programs. This feature offers a preset, professionally developed styles for quickly making titles, along with virtually endless custom styling. Titles can be modified by adding transitions for a wide variety of effects, such as, fading in sliding, and adjusting duration of the title appearing in the movie. Overall the title should be informative, describing the contents of the movie and awaken interest.

3.4.2 Adding Transitions

Transitions are used according to the content of the video. Properly used transitions subtly reinforce the meaning of the movie and how it plays without the audience becoming aware that a transition is used. In professionally produced video on television, one can see many ways to improve tapes. Generally, it is advisable to refrain from overusing transitions that tend to cause abrupt changes or otherwise draw attention to themselves. There is a big difference between a subtle dissolve from one clip to the next, and employing a heart-shaped wipe.

3.5 Working with Audio

While appropriate music can add touch to a movie, a professional finishing and can do a lot to reinforce the message of a video. The music selected, however, should always be appropriate to the massage of the film. This is sometimes a time consuming matter and a challenge, but it is worth the effort, since well chosen music is usually greatly appreciated by the viewer. A great deal of polishing and depth can be generated by adding background music, recording voice-overs, and inserting audio effects such as applause, bells, seawaves, etc. Such sound effects can be picked up from clip art gallery supplied with editing software. A huge number of pre-recorded or created sound effects are available as sound files in clip art CDs. Similarly the music audio files stored in hard disk in sound file format can be inserted along with the videos or we can import audio directly from an audio CDs. In addition, the audio track of all video clips is captured along with the video, and is always available which can be manipulated according to the visual demand.

Voice-overs and other audio can be recorded into the movie directly from computer, (any length and type of background music can be inserted).

Audio clips are selected and placed on their tracks in the same way as video clips. Once an audio clip is placed on its track, it can be edited in the same way as a video clip like play duration, volume adjustment, trimming, beginning or end, dissolve, fade-in, fade-out, etc.

3.6 Video Compression

Video compression is the process of reducing the file size of digitized video by removing the redundancy. To reduce the amount of space needed to record or transmit the information, compression is a must. Uncompressed video and audio data take a lot of memory. PAL (Phase Alteration by Line) has a resolution of 768X576 pixels and is transmitted at 25 (full) screens per second. Thus one second of PAL video requires 768X576X25X2 bytes, that is approximately 22MB. This means that 30 seconds of uncompressed video will fill up a CD (650 MB). 30 seconds of CD-quality audio would amount to 176 KB. Reducing the video resolution to one-fourth (SIF) or even one-sixteenth of full resolution would still result in a data stream of more the 1 MB.

The technology by which video compression is achieved is known as a 'Codec' an abbreviation of compression/ decompression. 'Codecs' can be

implemented in hardware and software or a combination of both. Hardware codecs are generally more powerful. They are used to compress multimedia files for transfer and storage and then to reverse the process for playback. Codecs are constantly being upgraded for higher compression without loosing quality during playback. In plain terms codec is just another module of the multimedia control interface (MCI) and the MCI makes it available to other software. There are number of audio compression codecs and video compression codecs.

For compression, streams of symbols are transferred into codes. If the compression is effective, the resulting stream of codes will be smaller than the original symbols. Video is compressed using a process called *variable bit rates* encoding which allots a changing number of dots to enhance resolution in a given scene. Scenes with lots of light or little action require less bits than dark scene or those with lots of action. The case where information is relayed more efficiently and recovered exactly as it was before compression with no loss of fidelity is called 'lossless compression', as opposed to lossy compression, in which same information is irretrievably lost during encoding, decoding process. Lossless compression discard only redundant information. The higher the compression ratio, the worse the resulting image.

Some compression formats are; AVI, MPEG, CINEPAK, IVI, INDEO and RLE. Different compressors are capable to compress the data from 2:1 to 200:1. Commonly used formats are AVI and MPEG.

The MPEG file format is supported on all Windows 95, 98, NT. In some instances, one may wish to output the movie in AVI file format. Generally AVI files are larger and not of as high quality as MPEG files. There may be two reasons for using AVI format because one may require importing the video into the application that doesn't support MPEG files or some viewers will be running Windows 3.1.

Despite its age and numerous problems, the AVI format is still used in semi-professional video editing cards. Many TV cards and graphic boards with a video input also use AVI format. These are able to grab video clips at lower resolution (mostly 320X240 pixels). The compressed video files are ready for playing, saving on CD, sending via e-mail, using on web, inserting in multimedia presentations, etc.

4. TIPS FOR VIDEO EDITING

- Do not string together scenes in which camera is moving.
- Dialogue should always be shot alternately from varying angles of view.
- Make cuts when persons are in motion.
- Make harmonious cuts, avoid visual disjunction.
- Shots with less movement should be of shorter duration and shots with fast movement can be longer.
- Long shots have more content, so they should be shown longer.
- Do not edit a video file after compressing it as the editing process may cause degradation of the video data.

5. BASIC SET UP FOR VIDEO EDITING

Minimum System Configuration:

- Intel Pentium 133 MHz or equivalent processor
- Windows 95 or Windows 98 OS
- VGA card, DirectX 5.0-compatible; 256 colour minimum
- At least 32 MB of RAM
- Hard disk with sufficient free space for studio software and MPEG files (30 MB to install software, and 100 to 300 MB for every 10 minutes of captured audio/video)
- CD-RW drive
- Parallel interface support for ECP or EPP-mode
- Sound card, DirectX 5.0-compatible
- Speakers
- Microphone to record voice-overs
- Video capturing card (internal or external) with latest video editing software.

Video Equipment

- Any source with a composite or S-video output (e.g. camcorder, VCR, laser disc, or TV tuner)

6. CONCLUSION

In digital media, the creativity can be extended to any limit within no time for better output. However, few factors certainly effect the final outcome, like availability of free space on hard disk, defragmentation, and RAM, etc. There should be sufficient space in the hard disk, it should be defragmented frequently, and minimum RAM should be 128 MB.

Adding effects like transition, titling, etc., give realistic beauty to the video. The file format chosen is very important, but it also depends on the application where the final edited video files are to be used. Commonly used formats are 'AVI' and 'MPEG'. But, now a days 'dat' format is widely used.

Video is a very important part of multimedia presentation as it gives effectiveness to the show. A lot of video editing software are available in the market. Let us hope, in future, we will have more and more video editing software which will give more flexibility in editing to make our video more impressive.

It is hoped that the topic discussed in this article will be well received and critically examined by other experts in the profession. Possibly some useful comments will be forthcoming, so that in due course of time good amount of literature is available to us for following new and up-to-date methods for video digitization and editing.

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