

_dvd „authoring“ workshop
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_dvd „authoring“ workshop

This seminar will provide you the basics of designing and producing a DVD-Video. This notes contain general information about DVD and an overview about the production process. Besides the class sessions and for further self teaching I recommend to use the official Apple DVD Studio Pro tutorial and for software relevant questions the Apple DVD Studio Pro manual.

Information about DVD(-VIDEO)

DVD stands for **digital versatile disc** and is due to function and usage a further development of the compact disc (CD). The disc contains of certain kind of layers and - depending on the capacity - of one or two sides. One side and layer can store about 2 hours of video in good picture and sound quality, up to 8 languages and up to 32 subtitles. Compared to the CD the storage capacity is 25 times higher and is also used to store music, computer data or interactive games. There are different kind of DVDs defined by their area of application.

1. DVD-Formats & Terms

Since the introduction of the audio-compact disc (Audio or Music-CD) in 1982 the CD has been used in many different kind of ways to store digital data like music, pc-applications like software, games, databases or photos or video. But the maximum of 700 MB storage capacity have not been enough anymore for the fast increasing amount of data. The CD is not able to store a complete feature film in better audio and video quality than VHS. With these and other demands the digital versatile disc has been developed. Besides the Audio-CD features, now the DVD comes along with further options like the storage capacity for 8 hours of motion picture (DVD-Video) in a quality far ahead from S-VHS. DVD media are used in so called „stand alone“ players together with the TV-set or as application carrier and back up media (DVD-ROM, DVD-RAM, ...) for the PC.

ROM, RAM, VIDEO, AUDIO, ENHANCED, ...

DVD-ROM

the „basic format“ stands for **read-only-memory** and describes a product which is able to store any kind of digital data. It can only be used in a DVD-ROM or DVD-RAM drive with a PC. It is defined as a standard.

DVD-RAM

is a re-writeable cartridge media which can store any kind of digital data. It can only be used in a DVD-RAM drive or burner with a PC. It is defined as a standard.

DVD-Video

is the standard of discs that are able to play audio and video in mpeg-video and Dolby digital ®, mpeg-audio format. But is still a DVD-ROM.

DVD-Audio

since 1999 codified standard for a „audio-only-format“ on DVD.

DVD-Enhanced

is not really a standard but a way to administrate data and means multimedia DVD-ROMs which have been produced in a certain software application like Macromedia Director. The PC-application is able to operate the DVD-Video data and the DVD-Video application is able to start events within the PC-application (on software player only)

DVD Hybrid

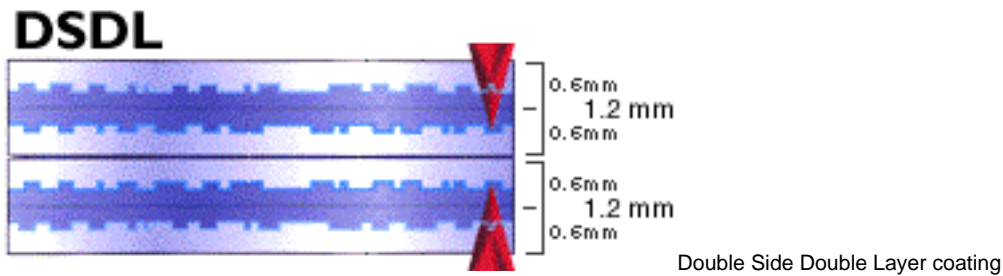
is not a standard but like DVD-Enhanced the kind a kind of structure and data administration on a disc. A DVD-Video application – to use on a stand alone player with the TV set and with the software player on a PC – and in addition to that applications or data which can be read only on

the PC.

2. Storage capacity

How can we reach the storage capacity of a DVD which can be up to 17 Gbytes?

- the wave-length of the laser which reads the data on the disc is much shorter compared with the one for a CD. Due to this fact the digital information (pits) is going to be smaller and they can be stored with less distance. This methods gain a 7 times higher storage capacity (4,7 Gbytes).
- Further on the DVD is coated with four information layers on two sides (double side double layer, DSDL). This increases the capacity by four times (17 Gbytes).



2.1. Video compression

To reach feature film lengths in high quality there has to be special picture and audio compression done to the footage used in a DVD-Video.

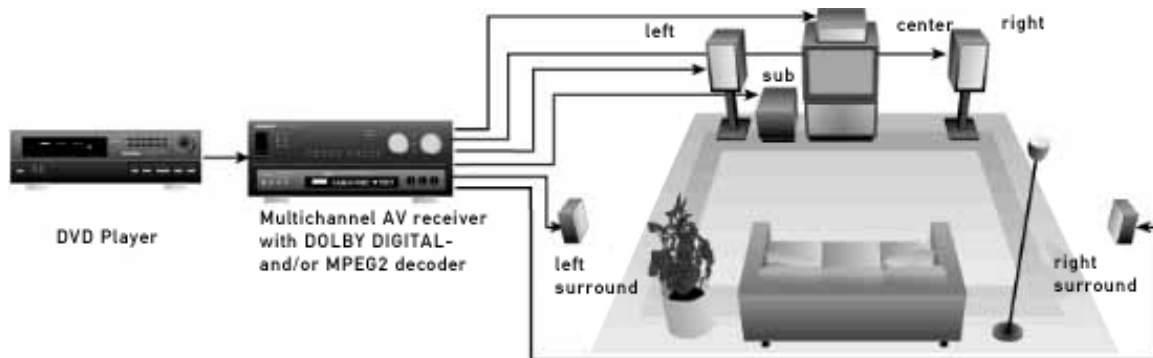
To digitize analog/chemical film this means a lot of technical effort. Several procedures and work steps are necessary to put a Hollywood production on a DVD-Video. It is much more comfortable and easier to handle digital recorded footage. DV or miniDV format video for example suits very well for further processing on a DVD because one of the standard video resolutions (720x576 pixel) of the DVD meets the resolution of DV-Video PAL.

MPEG stands for Moving Pictures Experts Group and is the compression for film and video on a DVD-Video. The MPEG process is very similar to the JPEG compression which you might be more familiar with. Basically this method is based on „dropping of redundant picture information“. In a picture sequence this means that the information of the first picture is stored and from the second picture only the changing information is stored again and so on. MPEG1 is always encoded at a constant bit rate (CBR), so simple and complex scenes require the same amount of data per second. With suitable source material, this yields quality roughly equivalent to VHS tape. Beside MPEG1 there is also the advancement MPEG2 which is at the end responsible for the playtime of a DVD-Video. MPEG2 is downward compatible to MPEG1 and can be played on both players. MPEG-2 gives higher picture quality by allowing data rates up to 9.8 Mbps. DVD-Video can display the picture in a 16:9 aspect ratio, but the number of pixels used doesn't increase. MPEG-2 can be encoded with a variable bit rate (VBR), which means that simple scenes use less space on the disc than complex scenes. This decreases storage requirements while increasing quality in complex scenes. With most video material, VBR encoding makes it possible to record considerably more than the minimum hour's worth of playing time on a DVD.

2.2. Audio

In addition to the video compression the audio also has to go through a compression process to be used on a DVD-Video. In general the sound quality of a DVD can be much better than a CD-audio. On usual CD-audio the sound is provided in 44kHz and 16Bit. The DVD is able to store and play sound with 96kHz and 24Bit resolution. There are three formats to be used: MPEG1-Audio, MPEG2-Audio and Dolby Digital/AC-3. The difference between MPEG1-Audio and MPEG2-Audio is the number of channels available on the DVD. MPEG1 is left/right stereo only and MPEG2 can handle up to 8 sound channels.

With the 8 channels of MPEG2-Audio DVD provides the option of using several languages or digital surround sound. Both formats – MPEG2-Audio and AC3 – have 5 separate audio channels and the so called subwoofer with frequencies up to 120Hz. The system is called „5.1“.



Sketch for a digital surround sound installation.

3. Additional DVD features

3.1 Subtitle

The DVD-Video provides the possibility of using 32 subtitles per media.

3.2. Different languages

DVD-Video provides the option for up to 8 different languages or audio channels. Due to the fact that additional languages require additional storage capacity and further on that the major film producers want to delimit their marketing regions, PAL-DVD-titles are mostly provided only with 2 to 3 languages, 3 to 19 subtitles and some of them with 1 or 2 special subtitles for the hearing impaired. A Warner feature film for example will be available in 3 different language versions in Europe. In general the original version will be on all of them.

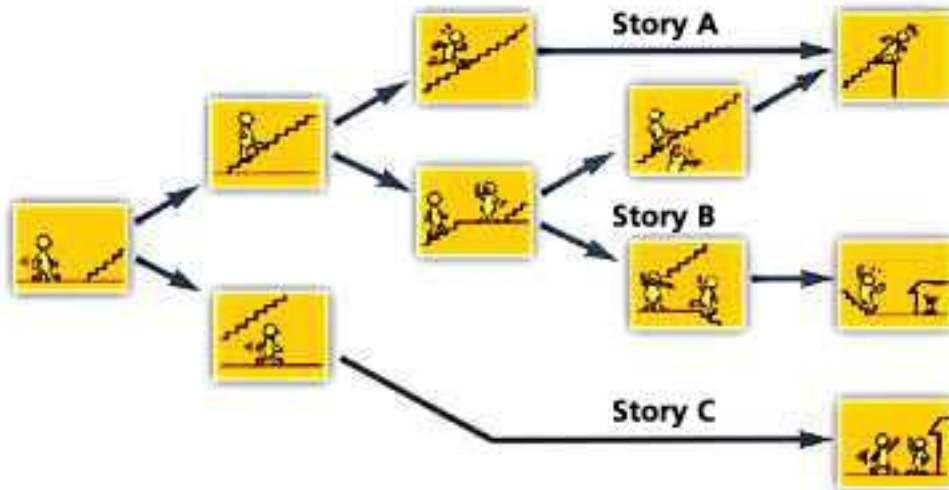
3.3. Different camera angles

There are not many but some DVD-titles (sport, opera) come along with the option of choosing in between different camera angles. This is the so called multi-angle feature. With the remote control or the software controller the user is able to choose nearly without a time gap between the different angles of a movie.

The DVD provides the user – as long it has been considered in the very beginning of the production of the movie – a more interactive way of watching a movie. At the moment I just know about „STAR WARS – EPISODE 1“ as a major title which comes along with that feature in the making of section of the DVD.

3.4. Choosing between different content streams / non-linear plot

Using the multiangle feature not only to provide different camera angles of one and the same sequence but providing parallel plots and different content streams the DVD gives the director of the movie new possibilities and perspectives of narrating a story. The movie can be stopped at predefined markers and one can provide the user via an on-screen menu alternatives to choose from. One option might be to provide different endings for one plot e.g. These options provide fascinating new possibilities but increase the effort according to time and money a lot.



Sketch for selectable alternatives in a non-linear plot.

3.5. Providing additional information

Additional features on a DVD-Video could be: Chapter structure/menu, title menu, making-offs, biographies, filmographies, trailer, production notes, interviews, still pictures, ...

3.6. Function and features of the players

non shaking still picture with even non shaking text parts. Stop motion and frame-by-frame watching, slow motion, frame search with different speed options, replay of pre-marked sequences.

3.7. Simple usage of „interactive“ features

Navigation around and between the menus of the DVD is done with the remote control on the TV-set and on the PC with the interface of the software controller and mouse and cursor buttons on the keyboard. Both – the remote control and the software interface – have standardized buttons and menu options.

4. Aspect ratio and DVD-Video

The height to width ratio in PC and TV monitors. In DVD-Video, the video display frame can have different rectangular shapes, determined by its recording aspect ratio (4:3 or 16:9). DVD-Video also offers panoramic and letter-box display formats (options). Many feature film productions are recorded in cinemascope or 16:9 aspect ratio. They will be stored on the DVD with anemographic sampling but the DVD player will provide it on a 16:9 TV-set in the highest resolution („widescreen“). There is no loss of picture information with this technique. 4:3 TV-sets with 16:9 option will also have the complete information but in the smaller „letter box“ format. Obviously, not all TV sets offer a 'widescreen' option, and viewing a film using the improper aspect ratio leaves dark (unused) areas or bands in the screen. 4:3 TV-sets without 16:9 option will either have a squeezed picture or the „pan & scan“ format with loss of information on left and right side of the screen.

5. DVD authoring

For self teaching and to get more detailed information about Apple DVD Studio Pro I highly recommend the official Apple DVD Studio Pro manual and tutorial. DVD Studio Pro specific processes which are not documented in this notes will be provided during class time and can be found in the manual or tutorial. Notes in brackets (see below:...) refer to the DVD Studio Pro manual and tutorial as well.

Working with **Apple DVD Studio Pro**

DVD Studio Pro is one of several options to produce a DVD-Video. Edited video and audio files, stills and text files can be combined on a DVD and afterwards shown on a TV-set with stand alone player or on a PC with DVD drive and software player.

5.1. Hard and software requirements

(see: Getting Started With DVD Studio Pro)

Hardware

- Computer with a G4 processor and an Apple-supplied AGP graphics card
- 128 megabytes (MB) of random-access memory (RAM)
- DVD drive
- Display software and hardware capable of 1024 x 768 pixels at thousands or millions of colors

For writing to disc:

DVD-R recorder, DVD-RAM drive, or DLT tape drive You should have at least twice as much hard disk storage space as the size of your project. (For DVD-5, for example, you need 5 gigabytes for the source files, and another 5 GB to hold the multiplexed project.) For best multiplexing performance, dedicate two or three Ultra Wide A/V or Fire Wire hard disks to your project (make sure they contain only your media and no other programs that might fragment the disk and decrease performance). If you have three disks, use one for video files assets, one for audio assets, and the third for the finished files. If you have two disks, use one for source assets and one for final files.

Software

- Mac OS 9.0.4 or 9.1
- QuickTime Pro 4.1 or later (comes with *DVD Studio Pro*)
- *Apple DVD Player* 2.3 or later (installed with the *DVD Studio Pro* software)
- Edited video and audio files in MPEG or AC-3 format; or video creation and editing software, such as Final Cut Pro or any video and audio editing programs that support QuickTime and its component technology
- MPEG encoding software, such as the *QuickTime* MPEG Encoder included with *DVD Studio Pro* or *Media Cleaner Pro*. (You can also use any MPEG encoder, software or hardware based, that produces DVD-compliant streams.)
- *Adobe Photoshop* (4.0 or later) for creating menus and buttons

5.2. Scheme a DVD-Video project

Before going into the production process you should work out a detailed project plan which covers at least the following points:

- range of use: computer, TV-set, target group, region
- narrative structure, general statement, aim and purpose
- formal and content based structure: narrative purpose, navigation concept, flow chart
- amount of data, bit budgeting
- target media (disc), copy process

5.3. Preparing video and audio, encoding and bit budgeting

(see: Preparing Source Material)

You need to create, capture (see: Capturing Video and Audio) edit and assemble your source material before putting it together with DVD Studio Pro. Transitions, special effects, and so on have to be placed in the video editing software. Menus, on scene buttons and stills will be prepared with Adobe. Once your material has been created and edited, you are ready to go on with *DVD Studio Pro*. You will be able to use the following video formats:

- Frame size: 720 x 576 pixels (PAL); 720 x 480 pixels (NTSC)
- Frame rate: 25 fps (PAL); 29.97 fps (NTSC)
- Aspect ratio: 4:3 or 16:9
- Audio Format: 16 oder 24 bits
- Audio Frequency: 48 kHz or 96 kHz

All video and audio which is going to be used on the DVD needs to be *encoded*, that is, converted to DVD-compliant formats. MPEG-2 for video and AC-3 for audio are the formats we are going to use in this seminar (See: Appendix B, "More About DVD," on page 141). To create DVD-compliant streams you can use any software which is able to export MPEG1 or MPEG2 to separate video and audio files. In this seminar we are going to use the Quick Time MPEG Encoder that is provided by DVD Studio Pro. You can either export MPEG2 from Final Cut Pro or directly from Quick Time Pro (See: "The QuickTime MPEG Encoder" on page 59)

You won't be able to do any kind of editing or upcoming necessary adjustments with DVD-Studio Pro on your video and audio files. This means that the designer has to structure and to plan his project accurately in the very beginning. The more complex the navigation and narrative structure of the DVD is going to be the more effort will have to be done in the reproduction of the video and audio material (see: Segmenting Your Material).

5.4. Some things you should consider:

Encode and store the movie in one single file or in several files

this is up to the navigational structure and the possibilities of interaction you want to provide in your project. Further on it depends on the amount of data and connected to that the quality and the character (colors, motion, still, panning, ...) of the footage. If you are going to provide choose-able alternative sequences it might be better divide the movie into different sequences and encode each separately. If you are running out of storage capacity you might be able to save some space with the variable bit rate (bit budgeting). More stilly sequences (Interviews, static shots, e.g.) may be encoded with lower rates (4,5 – 6,5) because the computing intensive changes of information are missing. Sequences with more action (sport, fast cuts, e.g.) may be encoded with higher rates (7 – 9). There is actually no strict rule and you will gain experience with while experimenting with this topic (see: Encoding Video to MPEG Format)

Encoding with MPEG darkens the movie picture!

You might think about doing a little correction with a video editing program to handle that problem.

„Group or Pictures“ (GOP)

in MPEG video, a sequence of pictures defined by a pattern of I-Pictures, B-Pictures and P-Pictures. Or, another way to consider it is that the frames located between a pair of I-Frames is called a GOP. A GOP is the atomic unit of MPEG video access.

If you have divided your movie into several encoding sequences you should consider that the amount of frames of each single file can be divided by twelve. This will prevent the DVD from big time gaps and frame drop outs while switching from one file to another (see: The QuickTime MPEG Encoder). If you want to jump in between a sequence or from a menu to certain points or markers you have to consider that at the marker the video will have a little pause. To cover this unwanted effect one could place around the marker 24 frames of black with a fade-in to the action.

Encoding Audio

After exporting a video (with *Final Cut Pro* e.g.) with audio tracks to MPEG2/encoding you will find 2 different „assets“ in the exporting folder: „.m2v“ and „.aif“. the „.aif“-file contains the audio tracks. For different audio channels (languages e.g.) you are able to encode separate audio files.

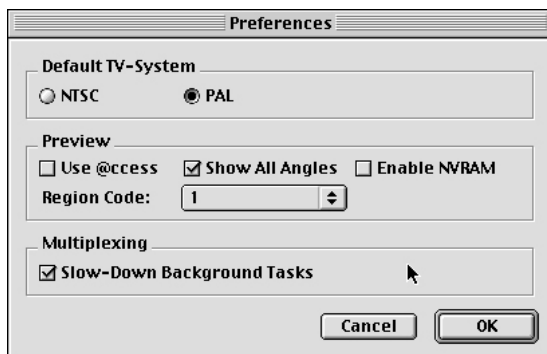
Another more sophisticated way is using *A. Pack* to Encode AC-3 Sound also know as Dolby Digital format (see: Using A. Pack to Encode AC-3 Sound). But in this seminar we do not go into details with that.

After preparing your source material and the project structure it is time to start working on the authoring process. The first thing to do after starting *DVD Studio Pro* is to tune the

5.5. Settings

When you launch a new project you should set up the „Project Preferences“ and the Disc Properties first (see: Setting Preferences for a New Project).

1 Choose “Preferences” from “File” menu.



2 Specify the default TV system (NTSC or PAL).

This setting affects the size of menus. It applies to new projects only. You can change the format for a current project in the disc properties in the Property Inspector.

3 Specify how you will preview projects.

Use @ccess: If you want DVD Studio Pro to open your Web browser to check Web links, turn this option on. If you are checking other aspects of your disc structure, turn this option off so that DVD Studio Pro does not open your Web browser every time it encounters a URL. (You can still add Web links if this option is turned off.)

Show All Angles: Previewing alternate angles on multi-angle tracks may slow down preview. To preview only the base video stream, turn this option off.

Enable NVRAM: If you are authoring a disc to be used on a Philips Professional DVD Player,

which has an additional register allowing enhanced scripting, make sure this option is on.

4 Specify which region code to use during preview (see “Copy-Protection and Region Coding”).

5 Specify a multiplexing option.

You can increase the speed of multiplexing by about 20 percent by selecting “Slow-Down Background Tasks.” This may decrease the performance of other programs while you’re building the disc.

5.6. Disc Properties

For better performance and full debug functionality set up the Disc Properties in the beginning.



1 Select the disc by clicking an empty area of the DVD Studio Pro workspace.

2 If it’s not already open, choose Property Inspector from the Windows menu. Click the triangles to expand and collapse the various areas.

3 Choose specific properties from the pop-up menus. Some property names, such as Region Code, are underlined. You can click underlined items to assign properties using a list window instead of a pop-up menu. **Note:** It is especially important to specify settings in the Disc Menu Settings area and Disc Media and Number Of Sides in the General area at the beginning, because these properties work together to alert you if your project may be getting too big to fit on your disc. A bar in the Graphical View shows you how much space is remaining.

4 After you have created the item that will appear when the disc starts up, specify the Startup Action property in the General area. A startup action is needed to use the Preview Mode of DVD Studio Pro.

(see: Setting Disc Properties for a New Project)

5.7. Remote Control Properties



There are six standard remote control keys on most common DVD players. They are programmed to act in default ways but you can set up your DVD so that these keys perform different functions. To do so, you assign actions to the keys using the Remote-Control area of the Property Inspector. An action can be any item on a disc: track, marker, story, menu, script, slideshow, or single slide. If you do not specify actions for the remote control keys, the default programming applies.

Note: The programming of some set-top player models may override the settings you make for your disc. On those models, navigation may not work the way you specify. The standard remote control keys and their default assignments are listed here:

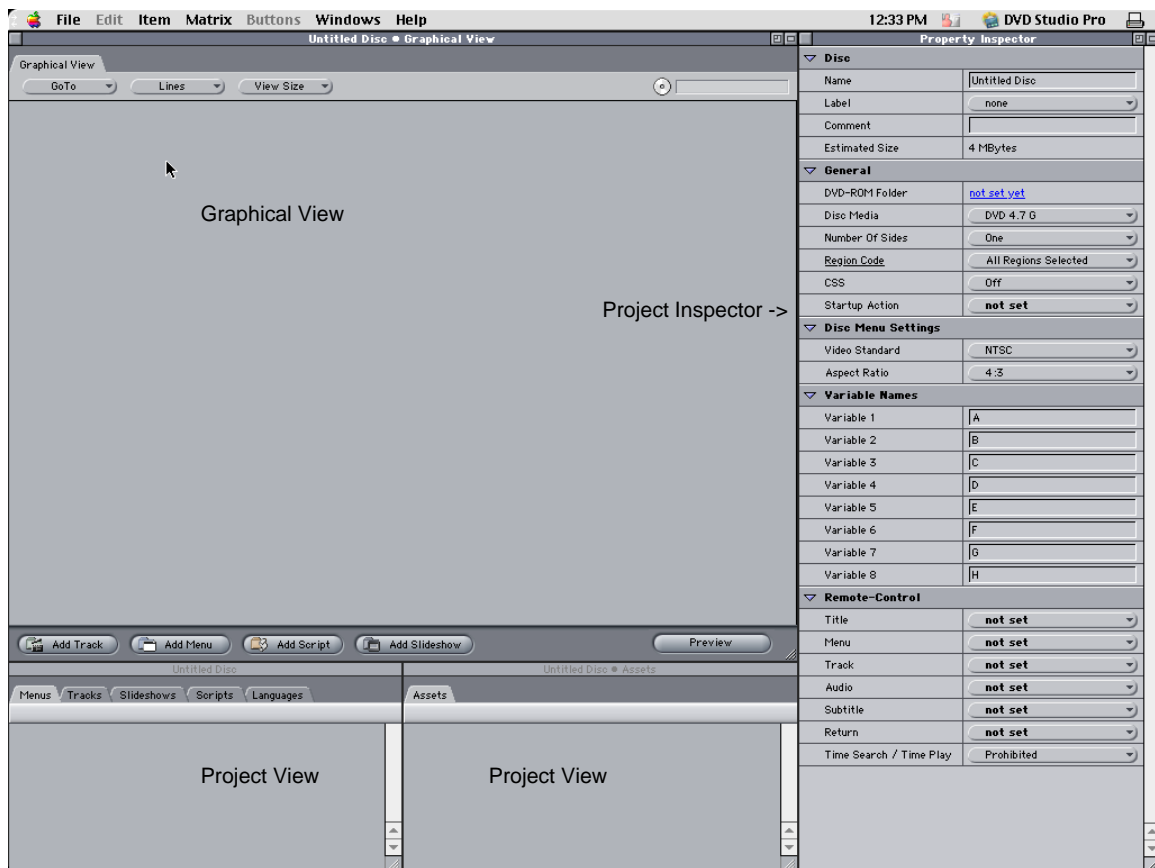
- *Title:* Goes to the main menu of the DVD-Video project. A disc is required to have one and only one title menu.

- *Root (called Menu in the Property Inspector)*: Goes to the main menu for a single title set of a disc. A title set is required to have one and only one root menu.
- *Track*: Displays a selection of the individual clips in a title set. (Optional)
- *Audio*: Allows viewers to change to another audio stream; English to German e.g. (Optional)
- *Subtitle*: Allows viewers to choose subtitles. (Optional)
- *Return*: Usually goes back to the item that was playing before the viewer displayed a menu.

5.8. Views Available in DVD Studio Pro

The DVD Studio Pro workspace has several views and windows to represent the facets of your project. Items in the DVD Studio Pro workspace are color-coded: menus and their assets are blue, tracks are green, slideshows are gray, and scripts are orange.

- *The Graphical View*: Represents your project as tiles and shows the links among items.
- *The Project View windows*: Hold the pieces of your project in folder-like containers, accessible by tabs.
- *The Property Inspector*: Shows the information and settings belonging to a selected item.
- *Editors*: Special windows for creating menus, markers, slideshows, and scripts.
- *Matrix Views*: Allow you to link items together efficiently.
- *Preview Mode*: Shows you how your project looks and works.
- *Troubleshooting windows*: Alert you to potential problems in your project.



(see: The Project View, The Property Inspector, The Editors, Preview Mode, troubleshooting Windows, The Matrix View)

These notes will jump now to a next chapter and will leave some chapters untouched. Information about „ The Project View, The Property Inspector, The Editors, Preview Mode, troubleshooting Windows, The Matrix View, Working With“ will be handled in class time or you may have to look it up in the DVD Studio Pro Manual/Tutorial.

5.9. Still Menus & Motion Menus (Navigation, Typography, Colors)

There are two types of menus: still and motion. Still menus use a Photoshop or PICT file for the background. Motion menus use a video clip for the background.

5.9.1. Still Menus: still images with elements for navigation (Buttons)

- Still Menus can be created with Adobe Photoshop. Using different layers you are able to specify the background and the different states of the buttons (normal, selected and activated). In principle one Photoshop-File can be used for several menus. For organizational reasons it is recommended to create one file for each menu. Layers with Photoshop-Effects cannot be imported. These need to be merged with the particular layer before.
- The buttons can be inserted with any kind of shape.
- The Photoshop-file has to be available in the same resolution and format as the whole project. But the different representations of the pixels on TV (rectangular, not square) and on computer screen (square) needs to be considered. To avoid this the menus for NTSC should be created in the format 720x540 and then being „distorted“ to 720x480. For PAL: first 768 x 576 and distort to 720 x 576 before importing.
- Title Safe: It is important that the elements of the navigation are positioned in the „title safe“ area. Otherwise marginal areas are not being displayed on many TV's. This area can be verified using Final Cut Pro.
- Further on the layers should be named after their function.
(see: Creating Graphics for Still Menus)
- Audio cannot be implemented into still menus.

5.9.2. Some hints:

- Horizontal Lines need to be >1 Pixel, otherwise they are not displayed or just flickering.
- Also very bright or even white graphics should be handled with care. This might result in problems of displaying or to mechanic buzzing of the TV. A slight gray tone leads to better solutions. Slight contrasts – both in dark and bright areas – are not being displayed. Trying and experiencing is the best way to find out the boundaries.
- Typography: basically all kinds of font faces can be used which Photoshop is able to load. For best legibility a size about 16 point and more is recommended. Sans Serifs are easier to read than serifs. Again the use of white text should be avoided.
- To create still menus with audio, a motion menu has to be produced with a video-clip of the appropriate length displaying the still image.

5.9.3. Motion Menus

Motion menus are similar to still menus except that they use a video-clip for the background. So-called *overlay images* (PICT or Psd) are created with Photoshop which are black and white and specify the areas of the buttons. Additionally „Composited Video Clips“ may be useful. Certain areas are used as buttons, playing their own small video clips. In DVD Studio Pro the different states (normal, activated, selected) are defined using „highlight“ colors. In order to achieve a continuous smooth loop effect, it is important to create clips with a number of frames which must be divisible by 12 (see also GOP) and to create a smooth transition between end and beginning of the clip (see: Creating Video for Motion Menus).

5.10. Further options for navigation

You can place buttons on top of tracks (or parts of tracks) that are assigned a video stream. Buttons on tracks are called *interactive markers*. You need to apply an *overlay image* to define the shape and position of the buttons and their highlights. Further on the navigation elements need to be rendered as composited video-clips (see: Creating Video for Interactive Markers).

5.11. Slideshows

Besides tracks, which hold video and audio, a DVD can contain slideshows, which hold sequences of still images or video clips, with or without audio. The still images are created with

Photoshop, always the first layer of a file is displayed. The Files must be the same format as the project. All audio streams used within one slideshow must have the same format (PCM, AC3 or Aif). A slideshow can be set to advance automatically or to wait for the viewer to click the Next Track key on the remote control.

5.12. 16:9 and Photoshop

To ensure that widescreen menu graphics don't look stretched, edit in widescreen resolution (854 x 480 for NTSC or 1024 x 576 for PAL), then resize graphics down to normal resolution (720 x 480 NTSC, 720 x 576 PAL) just before use. The results may look squeezed in DVD Studio Pro, but they will look correct on a DVD player.

5.13. Languages and Subtitles

5.13.1. Languages

DVD Studio Pro automatically creates one untitled language in a new project. The Languages container includes a container for this language and for each additional language (up to 16) you define in your project. Using the language container also enables you to change to other audio-streams like music or other sounds.

If you assign a video stream to a menu, the streams assigned to the other languages must be exactly the same length. The assets used for alternate-language versions of a menu must have the same format and structure (in the case of *Photoshop* files). If you assign a *Photoshop* file, the files assigned to the other languages must have the same number of layers, the layers must be in the same order, and they must have the same names as those in the first file assigned.

(see: Working With Languages)

5.13.2. Subtitle Editor (STE)

The Subtitle Editor (STE for short) is an easy way to create subtitle streams for your video streams. Before you can create subtitles, you need a movie in a QuickTime-compatible format with a frame-rate of 25 fps for each segment of video and audio that you want to create subtitles for. The MPEG2-files are not suitable for this purpose. Your project won't use the movie itself, so you can save storage space by preparing a low-resolution version. If you are just transcribing dialog into subtitles, for example, you can use an audio track or convert a PCM audio stream to QuickTime.

Type the subtitle text according to the image in the STE. Color and position are specified in the "preferences", font face and alignment in the "project settings".

Important: Don't use more than four text colors within a subtitle stream. If you are using more than one subtitle within one track, use no more than two colors (including black and white).

Because of the technical limitations of the DVD-Video standard (and the small amount of memory available on consumer DVD players), using more colors may cause subtitles to display incorrectly during play (see: The Subtitle Editor).

When you're finished creating subtitles, you need to compile them into a subtitle stream that can be used in *DVD Studio Pro* (see: Compiling a Subtitle Stream).

This "Asset" you import like a video stream in *DVD Studio Pro* and assign the matching video track and a language (see: Working With Subtitle Streams in DVD Studio Pro).

Basically the quality of display still leaves something to be desired: the text often appears frayed and uneven.

5.14. Interactivity ("Stories", Remote Control, "PC/Stand Alone", ...)

A DVD player has six standard remote control keys that are programmed to act in default ways. However, you can set up your DVD so that these keys perform different functions. To do so, you assign actions to the keys using the Remote-Control area of the Property Inspector (see: Setting Remote Control Properties for a New Project). An action can be any item on a disc: track, marker (see: Adding Markers), story (see: Creating a Story), menu, script (see: Using Scripts), slideshow, or single slide. If you do not specify actions for the remote control keys, the default programming applies.

The programming of some set-top player models may override the settings you make for your

disc. On those models, navigation may not work the way you specify.

The standard remote control keys and their default assignments are listed here:

- Title: Goes to the main menu of the DVD-Video project. A disc is required to have one and only one title menu.
- Root (called Menu in the Property Inspector): Goes to the main menu for a single title set of a disc. A title set is required to have one and only one root menu.
- Track: Displays a selection of the individual clips in a title set. (Optional)
- Audio: Allows viewers to change to another audio stream; for example, from English to German. (Optional)
- Subtitle: Allows viewers to choose subtitles. (Optional)
- Return: Usually goes back to the item that was playing before the viewer displayed a menu.

The logically consistent arrangement and changing between the different navigation elements is important. On PC the user is able to navigate freely with the mouse. On a stand-alone player one is confined to the linear navigation using the arrow keys. In order to achieve a clear and simple navigation, it should be realized in an intuitive and consistent way (same principle for all menus).

5.15. Previewing, Testing, Building Disc, Multiplexing

5.15.1. „Preview“

During the work on the project or before building the disc you can use the preview option to test menus or other properties. As mentioned before, a start up action must be defined (see: Setting Disc Properties for a New Project) to make the preview available. On certain computers it may occur that projects with markers don't play back video- and audio-stream synchronously. After building the disc they are synchronized again.

Depending on the speed of your processor, you may be able to preview only a limited number of angles in Preview Mode. To see all angles, you may also need to build the disc. Some set-top player models may be programmed slightly differently from Preview Mode. Navigation may not work exactly the same way on those models.

Choose square pixels from the pop-up menu marked with the monitor icon to see how your project will look on a computer screen. Choose rectangular pixels to preview the look of your project on a TV monitor (see: Using Preview Mode).

With the current version of *DVD Studio Pro* it is not possible to connect a parallel TV controller screen to the PC set up. The former Astarte version was able to do so with additional hardware.

5.15.2. Testing and Debugging

You can use the *DVD Studio Pro* debugging feature to locate errors in action assignments, button links, and scripts (see: Debugging).

DVD Studio Pro keeps track of which items on your DVD are not complete. Incomplete items appear in italics. To see what's missing, select the item and view it in the Property Inspector. When you import or add assets to a project, *DVD Studio Pro* checks whether they are valid. If you try to import a video stream with an inappropriate frame rate or an audio stream with an incorrect frequency, the Log window displays an error message.

If you try to delete an item that is linked to other items, you see a message explaining the error and listing the links. Click Show Item to view the item so you can unlink it from other items. (Show Item is not available if the item is not assigned as a property of the disc.) (see: Using Built-in Error Checking)

The Asset Files window shows the name and location of every asset file used in your project. You can use it to locate missing files or to change the source files assigned to particular assets. If you open a saved project and *DVD Studio Pro* cannot locate one or more asset files, the Asset Files window shows a list of the missing files.

To find asset files that haven't yet been assigned to any items see "Finding Unassigned Asset Files".

Before multiplexing you find some important information in the chapter „Tracking the Multiplexing Process” of the manual about possible problems and their solutions.

5.16.1. „Multiplexing“, „Build Disc“

When you're finished putting together and testing your project, it's time to build it. Building combines the files in a process called multiplexing. The finished product are 2 folders called VIDEO_TS and Audio_TS containing all the information needed to write a DVD.

This process you start by Choose Build Disc from the File menu. If the command is not available, there are missing or incorrect settings in your project. Items with incomplete settings appear in italics in the Project View. To see what's missing, select the item and view it in the Property Inspector.

If you have selected a disc medium in the disc properties, and *DVD Studio Pro* estimates that the project will take more space than is available on that medium, you see an error message. The VIDEO_TS and Audio_TS folders should be saved to a different disc or partition. Multiplexing takes from 1/4 to 1/2 the length of all your tracks combined. (see: Building Your Project)

6. Creating Your Disc

After multiplexing is finished, you can create an image file, burn it to a DVD-R or copy your project onto a disc or DLT tape. It is also possible to record the project directly by Build & Format Disc” to the DLT tape drive or a DVD recorder (see: Creating Your Disc).

6.1. Disc Types and Capacity:

- DVD-R
suitable for prototype production and a small number of copies.
Advantage: lower-cost medium with a storage capacity of 4.7 GB.
Disadvantage: limited suitability for glass mastering.
- DVD-RAM
suitable for archiving and testing of projects.
Advantage: rewritable
Disadvantage: only for PC's, DVD-RAM Drive required.
- CD-R/CD-RW
suitable for testing of menus and smaller projects:
Advantage: low-priced
Disadvantage: only for PC's.

Using all these media DVDSPP prototypes can be created, which are readable with a pc with a DVD-Drive and/or with most of the DVD-Players.

6.2. Suitability for Glass mastering/large-scale production:

- DVD-R: limited
- DVD-RAM: limited
- CD: no

Most of the DVD-copying studios need the multiplexed project on a disc or DLT tape. These media are also needed to utilize the full storage capacity of 17 GB.

Physical format	Storage capacity	sides	Layers per side	Max. playtime capacity
DVD-5	4,4/4,7	1	1	ca. 2 h
DVD-9	8,5	1	2	ca. 4 h
DVD-10	9,4	2	1	ca. 4,5 h
DVD-15	17	2	2	ca. 8 h

7. Glossary

5.1

A digital audio recording and playback system for home theater. It includes five channels (left, right, center, rear/surround left and right) plus a subwoofer channel. The major 5.1 channel standards are Dolby AC-3 and Philips Musicam.

16:9

aspect ratio of HDTV (High Definition TV), which is like the widescreen in movie theaters. It is wider than the 4:3 aspect ratio of computer monitors and standard TV. The 16:9 size is also called the "letterbox format." See Aspect Ratio.

4:3

The aspect ratio of the standard computer monitor and TV set. See Aspect Ratio.

525/60

The scanning system of 525 lines per frame and 60 interlaced fields (30 frames) per second. Used by the NTSC television standard.

625/50

The scanning system of 625 lines per frame and 50 interlaced fields (25 frames) per second. Used by PAL and SECAM television standards.

A

AC-3

An audio compression technique developed by Dolby. It is a digital multi-channel surround sound format developed by Dolby used in DVD and HDTV. It includes five channels (left, right, center, rear/surround left and right) plus a subwoofer channel (there are also two channel-versions = Dolby Digital 2/0) See 5.1, Dolby Digital.

ADR

Astra Digital Radio. Digital Radio over satellite, compatible with analog television transmissions. Alternatively the normal TVsubcarriers can be modulated by a MPEG-1 Layer-2 48 kHz 192 kbps signal. Quality is better than analog carriers and only needs half the bandwidth (analog stereo = 2 carrier, digital stereo = 1 carrier).Quality is limited and the data rate can't be increased.

A/D-Converter

Analog-to-Digital Converter. This device is used to digitize audio and video. An ADC for digitizing video must be capable of sampling at 10 to 150 million samples per second (MSPS).

Amaray-Case

An amaray-case is plastic with a window on the outside to hold a printed information sheet. The case opens up, and the disc is held in place in a circular depression with some form of push clip mechanism.

Amplifier

The device used to increase the value of a quantity by means of energy drawn from an external source.

In the case of home theater a device that provides power to a signal, ultimately resulting in powering loudspeakers.

Anamorphic

Widescreen process of recording images, in video and film, so that each frame is horizontally compressed "squeezed" on a videodisc or strip of film. During playback, the image is expanded,

restoring to its original size. Anamorphic film is best viewed in the widescreen format. Brand marks include Cinemascope and Panavision.

This type of display format is optimized for playback on a TV with 16:9 aspect ratio. When widescreen (letterboxed) movies are stored on VHS, Laserdisc, or non-anamorphic DVDs the horizontal scan lines that make up the black bars top and bottom are also stored. This is a waste of resolution because lines that could be used for the picture are being used to store the black bars. With anamorphic DVDs the widescreen picture is “squashed” to fit into a whole frame without black bars. If this were viewed without first “un-squashing”, the picture would be out of proportion e.g. the actors would look tall and thin. The DVD player must expand the picture to get it back to the original proportions and then either send this picture to a widescreen 16:9 TV or add black lines top and bottom for a standard 4:3 TV. Basically, any DVD that is “enhanced for widescreen TVs” or is “anamorphic” will give better picture quality on widescreen TVs where the picture would otherwise have to be “zoomed” to fit the 16:9 frame.

Angle (Multi-Angle)

In DVD-Video, a specific view of a scene, usually recorded from a certain camera angle. Different angles can be chosen while viewing the scene. A DVD-Video is able to store up to 9 video-streams.

ASCII

American Standard Code for Information Interchange. A code for information exchange between computers made by different companies; a string of 7 binary digits represents each character; used in most microcomputers.

Audio (Sound)

The DVD-Video can store up to eight digital audio-streams (e.g. Languages). Each of them can be of one of the following formats:

- **Audio** without compression
Linear-PCM(pulse code modulation) with 48 KHZ/16Bit up to 96 KHZ/24Bit : 2 channels
- **Audio** with compaction
MPEG-1 48 KHZ : 2 channels
discrete multiplay
- Dolby Digital (AC-3): 1 - 5+1 channels
- MPEG-2: 1- 5+1 or 7+1 channels. Stereo MPEG audio is the mandatory audio compression system for 625/50 (PAL/SECAM) DVD-Video.

Other formats like DTS or SDDS are possible. According to DVD standards PAL-DVDs (TV standard) must contain either Linear-PCM, MPEG-1 or Dolby Digital (AC-3) mono or stereo. Further on the described multiplay formats like MPEG-2, Dolby Digital (5.1), DTS, SDDS and others are allowed.

Aspect Ratio

The width-to-height ratio of a television screen, letterboxed image on that screen, or motion-picture theatre screen. Typical TV sets have a 1.33:1(4:3) ratio, while widescreen versions have a 1.77:1 (16:9) ratio. Common aspect ratios for film and video are 1.33:1 (Academy), 1.78:1 (widescreen TV and HDTV), and 2.35:1 (Cinemascope).

Video can be stored on a DVD in 4:3 or 16:9 format. DVD players can output video in four different ways:

- full frame (4:3 video for 4:3 display)
- letterbox (16:9 video for 4:3 display)
- pan & scan (16:9 video for 4:3 display)
- widescreen (16:9 video for 16:9 display)

Letter box is when you have the black bars at the top and the bottom of your TV, Pan and scan is where the picture has been modified to fit your TV, i.e. chopping off the sides of the frame.

See letterbox, pan & scan, widescreen

Audio-CD

Compact Disc Digital Audio. Optical disk storage which has data encoded in a spiral track beginning at the center and ending at the outermost edge of the disc. The spiral track holds approximately 650 MB of data. That's about 5.5 billion bits, which is approximately 74 minutes playtime. Frequency range: 5 - 20.000 Hertz (Hz), sampling rate: 44,1 kHz. (see CD). A standard CD is 120 mm (4.75 inches) in diameter and 1.2 mm (0.05 inches) thick and is composed of a polycarbonate plastic substrate (underlayer - this is the main body of the disc), one or more thin reflective metal (usually aluminum) layers, and a lacquer coating.

B

Bit

A compressed form of 'binary digit.' Therefore, a bit can be a 1 or a 0. A standard byte has eight bits (256 possibilities). Bits are used mostly when dealing with bandwidth rates (bits/sec), graphics resolutions, and related topics. Bytes are used when talking about data and file lengths in general.

1 Byte = 8 Bit

1 Kilobyte = 1.024 Byte

1 Megabyte = 1.024 Kilobytes = 1.048.576 Bytes

1 Gigabyte = 1024 Megabytes = 1.073.741.824 Bytes

Byte

Bytes are strings of bits, operated upon as a unit. The 128 characters of the ASCII character set are represented by 8-bit bytes, (seven plus a parity bit--thus only 128 characters). In DVD, the magnetic 8-bit byte is modulated to a 16-bit optical byte.

C

CD

Compact Disc. Was developed by Philips and Sony, and was first implemented commercially 1982 for storing digital audio data (CD-Digital Audio). The physical specifications for the 12cm disc, since known as CD, were issued in the now famous Red Book. The CD is made up of a polycarbonate substrate, a thin reflective metallic layer (the mirror-like is aluminum), and a lacquer coating. The encoded data track is a continuous spiral track of about 1.6 to 2.2 microns wide, and the pits are about 0.6 microns wide. Essentially, any other size or type of disc is not a CD.

CD-Extra

A format that includes data and/or graphics in Track 1--addressing most of the problems of the Mixed-mode disc. A variation of the Enhanced CD.

CD-i

Compact Disc Interactive was developed by Philips and Sony, who issued the specifications in 1986, in what is known as the Green Book. CD-I employs the CD, with a sector structure similar to CD-ROM-XA, and addresses issues of synchronization to implement interleaved data, compressed audio, different character sets, still frames, full-motion video, and special effects, complying with the ISO 9660. CD-I was advertised as the upcoming interactive multimedia platform, but current CD-I products aim mainly towards business and education-multimedia interactive applications. A mayor drawback was that CD-I uses proprietary hardware, operating system (OS9), and data compression solutions- -mainly MPEG-1. The keyboard-less CD-I drives range from the basic player to the professional set, and can display to NTSC and PAL monitors. CD-I players can play CD-Audio and Bridge discs (Kodak Photo CDs, and Video CD) compliant with the White Book. PCs, with a special add-on board, can read CD-I discs.

CD-R

Compact Disc Recordable. A write-once version of CD-ROM. CD-Rs can hold about 650 megabytes of data. They are very durable and can be read by normal CD-ROM drives, but once data has been written it cannot be altered. Standard prerecorded CDs have their information permanently stamped into an aluminium reflecting layer. CD-R discs have a dye-based recording layer and an additional golden reflecting layer. Digital information is written to the disc by burning (forming) pits in the recording layer in a pattern corresponding to that of a conventional CD. The laser beam heats the substrate and recording layer to approximately 250 C. The recording layer melts and the substrate expands into the space that becomes available.

CD-ROM

The Compact Disc-Read Only Memory is the standard 12cm CD formatted according to the ISO 9660 and can also hold about 650 Megabyte (MB). Although the physical characteristics and track structure of a CD-ROM are the same as that of CD-Audio, a CD-ROM is used to store computer data (text, graphics). The logical volume and file structure of CD-ROM, specified in the ISO 9660 allows it to be used in the computer arena. Therefore, a CD with computer data that is not structured according to the ISO 9660 is not a standard CD-ROM

CD+RW

A rewritable version of CD-ROM. A CD-RW drive can write about 650 megabytes of data to CD-RW media an unlimited number of times. Most CD-RW drives can also write once to CD-R media. CD-RW media cannot be read by CD-ROM drives built prior to 1997 due to the reduced reflectivity (15% compared to 70%) of CD-RW media. CD-RW drives and media are currently more expensive than CD-R drives and media. CD-R is sometimes considered a better technology for archival purposes as the data cannot be accidentally modified or tampered with, and encourages better archival practices.

Standard prerecorded CDs have their information permanently stamped into an aluminium reflecting layer. CD-WR discs have a phase-change recording layer and an additional silver (aluminium) reflecting layer.

A laser beam can melt crystals in the recording layer into a non-crystalline amorphous phase or anneal them slowly at a lower temperature back to the crystalline state. The different reflectance of the areas make them appear as the 'pits' and 'lands' of a standard CD. Currently, CD-RW can not be read by CD-ROM and CD-R drives, because CD-RW media has much lower coefficients of reflectivity (15-25 compared to 65-70%). But, while drives with multiple heads are considered one solution, the industry is working towards a 'single-head multiread drive.' Nevertheless, CD-RW phase change drives seem poised to challenge the CD-MO drives, and the optical 5.25in products as well.

Channel

A part of an audio track. Typically there is one channel allocated for each loudspeaker.

CGMS

Copy guard management system. A method of preventing copies or controlling the number of sequential copies allowed. CGMS/A is added to an analog signal (such as line 21 of NTSC). CGMS/D is added to a digital signal, such as IEEE 1394.

Codec

Derived from **COder-DECoder**, a Codec is a software program that implements algorithms that are central to compression- decompression packages, especially those that deal with digitized streams produced from analog video source. Most of the reliable codecs maximize their power by using specific compression decompression boards (such as "MPEG boards"), especially since pure software compression-decompression packages have hardware requirements beyond what comes in standard PCs.

Component Video

A video system containing three separate color component signals, either red/green/blue (RGB) or chroma/color difference (YCbCr, YPbPr, YUV), in analog or digital form. The MPEG-2 encoding system used by DVD is based on color-difference component digital video.

Composite Video

A single video signal that contains brightness, color, and timing information. If a video system is to receive video correctly, it must have several pieces of the puzzle in place. It must have the picture that is to be displayed on the screen, and it must be displayed with the correct colors. This piece is called the active video. The video system also needs information that tells it where to put each pixel. This is called sync. The display needs to know when to shut off the electron beam so the viewer can't see the spot retrace across the CRT display. This piece of the video puzzle is called blanking. Now, each piece could be sent in parallel over three separate connections, and it would still be called video and would still look good on the screen. This is a waste, though, because all three pieces can be combined together so that only one connection is needed. Composite video is a video stream that combines all of the pieces required for displaying an image into one signal, thus requiring only one connection. NTSC and PAL are examples of composite video. Both are made up of active video, horizontal sync, horizontal blanking, vertical sync, vertical blanking, and color burst. RGB is not an example of composite video, even though each red, green, and blue signal may contain sync and blanking information, because all three signals are required to display the picture with the right colors.

Compression

The large file size of audio, graphics and video files for CD-ROM applications reinforced the development of hardware and software compression-decompression procedures. Most compression algorithms are designed with specific types of files in mind (text, audio, video, graphics, etc.). Some of them involve intraframe compression (reducing the size of an individual frame), and interframe compression (reducing the amount of repetitive information from one frame to the next). There are even products that aim to compress the entire contents of a CD-ROM before mastering and, decompress when accessed-- 'on-the-fly'. Current compression CD-based products have implemented various options, indeed. But, in DVD, the compression options have been narrowed down--and they are specified in the DVD Books.

Controller

Device in electronical systems.

CPPM

Copy Protection for Prerecorded Media. Copy protection for DVD-Audio.

CPRM

Copy Protection for Recordable Media. Copy protection for writable DVD formats.

CPU

Central Processing Unit. The integrated circuit chip that forms the brain of a computer or other electronic device. DVD-Video players contain rudimentary CPUs to provide general control and interactive features.

CSS

The Content Scrambling System is used on DVDs to encrypt the data so that only licensed DVD players can decode it.

D

D/A-Converter

Digital to Analog Converter. A device which takes a digital value and outputs a voltage which is proportional to the input value. Typical uses include digital generation of audio signals.

DAB

Digital Audio Broadcast, also known as digital radio. Terrestrial Broadcasting. Compared to VHF there are no interferences neither in the mountains nor in "canyon" streets.

DAT

Digital Audio Tape, generally high-quality 4mm magnetic tape in a cassette, with capacities up to over 1 Gigabyte, that has been used in the computer arena mainly as an archival and back-up medium. For CD-ROM, it is used as a transfer medium. For DVD, which deals in gigabytes, DAT has been replaced by DLT.

Datarate

The volume of data measured over time; the rate at which digital information can be conveyed. Usually expressed as bits per second with notations of kbps (thousand/sec), Mbps (million/sec), and Gbps (billion/sec). Digital audio data rate is generally computed as the number of samples per second times the bit size of the sample. For example, the data rate of uncompressed 16-bit, 48-kHz, two-channel audio is 1536 kbps. Digital video bit rate is generally computed as the number of bits per pixel times the number of pixels per line times the number of lines per frame times the number of frames per second. For example, the data rate of a DVD movie before compression is usually $12 \cdot 720 \cdot 480 \cdot 24 = 99.5$ Mbps. Compression reduces the data rate. Digital data rate is sometimes inaccurately equated with bandwidth.

DCC

Digital Compact Cassette. Digital compact cassette. A digital audio tape format based on the popular compact cassette. Abandoned by Philips in 1996.

Decode

To reverse the transformation process of an encoding method. Decoding processes are usually deterministic.

Digital

Representing information as numbers with discrete (i.e. non-continuous) values, usually expressed as a sequence of binary digits.

Digitize

The process of turning an analog signal into digital data (data and information (in paper, analog sound tracks, graphics, etc.) into binary coded files for use in computers.) Text can be key stroked or OCR'd, graphics are scanned, analog video signals are digitized, sound is sampled and quantized, and so on.

Digital Video

In general, digital video is a coded binary string that is read by a computer (PC or other device) to produce and display the pixels that make up the frames of a video sequence. In general, the higher the frame rate the better the motion; and the higher the bits per pixel, the better the quality of color.

Discrete surround sound

Audio in which each channel is stored and transmitted separate from and independent of other channels. Multiple independent channels directed to loudspeakers in front of and behind the listener allow precise control of the soundfield in order to generate localized sounds and simulate moving sound sources.

Divx

Digital Video Express. A short-lived pay-per-viewing-period variation of DVD.

Dolby Digital

A perceptual coding system for audio, developed by Dolby Laboratories and accepted as an international standard. Dolby Digital is the most common means of encoding audio for DVD-Video and is the mandatory audio compression system for 525/60 (NTSC) discs.

Dolby ProLogic

The technique (or the circuit which applies the technique) of extracting surround audio channels from a matrix-encoded audio signal. Dolby Pro Logic is a decoding technique only, but is often mistakenly used to refer to Dolby Surround audio encoding.

Dolby Surround

The standard for matrix encoding surround-sound channels in a stereo signal by applying a set of defined mathematical functions when combining center and surround channels with left and right channels. The center and surround channels can then be extracted by a decoder such as a Dolby Pro Logic circuit which applies the inverse of the mathematical functions. A Dolby Surround decoder extracts surround channels, while a Dolby Pro Logic decoder uses additional processing to create a center channel. The process is essentially independent of the recording or transmission format. Both Dolby Digital and MPEG audio compression systems are compatible with Dolby Surround audio.

dual-layered

Refers to a DVD disc that has two layers on a side. DVD players can read video and audio data from both layers by simply re-focusing its laser, and therefore manually "flipping" of the DVD disc is not required. A single-sided, dual-layered DVD can hold nearly four hours of video and audio, and is known as a DVD-9. A double-sided, dual-layered DVD can hold nearly eight hours of video and audio, and is known as a DVD-18. DVD-18s requires you to manually "flip" the disc when you want to see materials encoded on the other side of the disc, although some DVD players can do this automatically.

double-sided (DS)

Refers to a DVD disc that has data on both sides of the disc. To play the other side of the DVD, you usually have to manually "flip" the disc manually. Also see DVD-10 or DVD-18.

DSD

Direct **S**tream **D**igital) Direct Stream Digital. An uncompressed audio bitstream coding method developed by Sony.

DTS

Digital **T**heater **S**ound is a competing sound system to Dolby Digital. Created by Steven Spielberg and used first in Jurassic Park, DTS holds the same 5.1 channels as DD. However, DTS has a far lower compression of the data storing the sound information and so typically has a better quality of sound than Dolby Digital. Often, however, the improvement is very subjective rather than obvious.

DVB

Short for **d**igital **v**ideo **b**roadcast, a method of transmitting digital audio and video (SDTV or HDTV resolution), based on MPEG-2. There are several variations: DVB-T for terrestrial broadcasting (ETSI EN 300 744), DVB-S for satellite broadcasting (ETSI EN 300 421), and DVB-C for cable broadcasting (ETSI EN 300 429). Both MPEG-2 and Dolby Digital compressed audio are supported.

DVB-S uses the QPSK modulation system to guard against errors in satellite transmissions caused by reduced signal-to-noise ratio, with channel coding optimized to the error characteristics of the channel. A typical set of parameter values and 36 MHz transponder gives a useful data rate of around 38 Mbps.

DVB-C uses Quadrature Amplitude Modulation (QAM), which is optimized for maximum data rate since the cable environment is less prone to interference than satellite or terrestrial. Systems from 16-QAM up to 256-QAM can be used, but the system centers on 64-QAM, in which an 8 MHz

channel can accommodate a physical payload of about 38 Mbps. The cable return path uses Quadrature Phase Shift Keying (QPSK) modulation in a 200 kHz, 1 MHz, or 2 MHz channel to provide a return path of up to about 3 Mbps. The path to the user may be either in-band (embedded in the MPEG-2 Transport Stream in the DVB-C channel) or out-of-band (on a separate 1 or 2 MHz frequency band).

DVD

Digital Versatile Disc. An optical storage medium with improved capacity and bandwidth compared with the Compact Disc. DVD, like CD, was initially marketed for entertainment and later for computer users.

A DVD can hold a full-length film with up to 133 minutes of high quality video, in MPEG-2 format, and audio. The first DVD drives for computers were read-only drives ("DVD-ROM"). These provide over seven times the storage capacity of CD-ROM (4.7 GBytes). DVD-ROM drives read existing CD-ROMs and music CDs and are compatible with installed sound and video boards. Additionally, the DVD-ROM drive can read DVD films using an advanced (MPEG-2) video board, required to decode the high resolution video format.

The first drives, using a single-layer disc of 4.7GB, were expected to be available during the second half of 1996 from Toshiba, Philips, Sony, Hitachi and others. In 1997, dual-layer discs were expected to increase the disc capacity to 8.5 GB. Double-sided, dual-layer discs will eventually increase the capacity to 17 GB.

Write-once DVD-R ("recordable") drives record a 3.9GB DVD-R disc that can be read on a DVD-ROM drive. The first DVD-R drive was expected by mid 1997.

By the end of 1997, the rewritable DVD-RAM (by false analogy with random access memory) drive was expected to become available. DVD-RAM drives read and write to a 2.6 GB DVD-RAM disc, read and write-once to a 3.9GB DVD-R disc, and read a 4.7 GB or 8.5 GB DVD-ROM. Also, it was expected that a DVD-RAM disc would be readable on both the DVD-R and DVD-ROM drives.

DVD-5

Refers a DVD that is single-sided and single-layered, which holds up to two hours of video and audio (i.e., 4.7 GBytes of data, MPEG-2). SS/SL = Single Side/ Single Layer.

DVD-9

Refers a DVD that is single-sided and dual-layered, which holds up to four hours of video and audio (i.e., 8.5 GBytes of data), without having to manually "flip" the disc. (MPEG-2); SS/ul = Single Side/ Double Layer.

DVD-10

Refers a DVD that is double-sided and single-layered, which holds up to four hours of video and audio (i.e., 9.4 GBytes of data). However, since there are two sides, you have to manually "flip" the disc with most DVD players. This construction is usually used to put a 16x9 widescreen version on one side and a full-frame version on the opposite side. So depending on which aspect ratio you want to view, you put the disc in with that aspect ratio's label facing up (and in this case you don't have to "flip" the disc). DS/SL = Double Side/ Single Layer

DVD-18

Refers a DVD that is double-sided and dual-layered, which holds up to eight hours of video and audio (i.e., 17.0 GBytes of data). If there is different material on each side of the disc, you will have to manually "flip" the disc with most DVD players. To date, DVD-18 are still rare since few DVD production lines are able to accommodate this type of DVD. Some DVD-18 were produced for the "Terminator 2: Judgment Day (Ultimate Edition)" DVD. (To meet the tremendous demand for this title, some packages feature two DVD-9 discs.) DS/DL = Double Side/ Dual Layer.

DVD-Audio

Two types: Audio sampled at 48 KHz, 20 bit samples, and 8 channels for 96 minutes per layer, and audio sampled at 96 KHz, 16 bit samples, and 8 channels for 86 minutes per layer. Both can

be output as Dolby AC-3, Subcode, or LPCM. The DVD-Audio players will have MPEG2/Dolby AC-3 decoder boards, and it is expected that all DVD-players will have the capability to play DVD-Audio--at least in the second generation models.

DVD-Enhanced

DVD Video plus ROM-readable data on the same discs (also known as DVD-Hybrid).

DVD-Forum

Now DVD Forum, this is the broad industry group that achieved the compromise DVD specifications in 1995. It includes: Hitachi, Matsushita, Mitsubishi, Philips, Pioneer, Sony, Thompson, Time Warner, Toshiba and JVC. They were required a serious capital contribution, and continue the work on the specifications. The Consortium, through its members (mainly Philips, Thomson & Toshiba), also licenses the specifications. Encryption technologies (Matsushita), copy-protection technologies (Macrovision), and other technologies are generally licensed free of charge to hardware manufacturers (others pay).

DVD-Hybrid

see DVD-Enhanced

DVD+RW

This format is supported by Sony, Philips and Hewlett-Packard. Working examples have not yet been seen, but the plans are for the format to carry about 3 GB of data without a cartridge, and it is proposed that normal DVD video players will be able to read the discs.

DVD-R

A write-once recordable DVD with a capacity of 4-4.7 GB. No caddy or cartridge is required, and a DVD-R disc can play in most DVD video players.

DVD-RAM

This is essentially a rewritable disc, using phase change technology. The capacity of DVD- RAM is at about 2.58 GB per side. While double-sided products are promised, current phase-change technology seems to preclude double-layer implementation. Although the first DVD players may not be able to read DVD-RAM, the industry expects second and later generation players to read both DVD-R (Recordable) and DVD-RAM.

DVD-ROM

Read Only Memory. The format of DVD disc used for storing information for PC computers. Capacity is usually 6.4 GB.

DVD-Video

DVD-Video supports high quality full motion MPEG-2 video of 720x480 pixels/frame, at 30 frames/sec (NTSC), and 720x576 pixels/frame at 25 frames/sec (PAL). It provides for high quality audio (MPEG-2, 7-1; Dolby AC-3, 5-1; or Linear PCM), with up to 32 sub-picture elements such as captions and stills (to a TV monitor). In addition, it offers the user choices of languages, various navigation and interactive controls (including random access for interactive games), and regional coding, copy protection and other features demanded by the movie industry. DTS compressed audio may also be used as an option. Linear PCM audio can be sampled at 48 or 96 kHz, 16, 20, or 24 bits per sample, and 1 to 8 channels. The maximum bitrate is 6.144 Mbps, which limits sample rates and bit sizes in some cases. For Dolby Digital audio, the bitrate is 64 to 448 kbps, with 384 kbps being the normal rate for 5.1 channels and 192 kbps being the normal rate for stereo. The channel combinations are (front/surround): 1/0, 1+1/0 (dual mono), 2/0, 3/0, 2/1, 3/1, 2/2, and 3/2. The LFE channel (0.1) is optional with all 8 combinations. For DTS audio, the bitrate is 64 to 1,536 kbps. The channel combinations are (front/surround): 1/0, 2/0, 3/0, 2/1, 2/2, 3/2. The LFE channel (0.1) is optional with all 6 combinations.

E

Encode

To transform data for storage or transmission, usually in such a way that redundancies are eliminated or complexity is reduced. Most compression is based on one or more encoding methods. Data such as audio or video is encoded for efficient storage or transmission and is decoded for access or display.

Euro-AV

See Scart

F

Frame Rate

Commonly, frame rates are used to imply video speeds, and the higher the frame rate (video speed) the better the motion (30 frames/sec as opposed to 8 frames/sec). But, users must be aware that a video clip involves two frame rates: a compression frame rate and a display frame rate, and these can be different due to hardware, type of video, and other variables.

Frequency

The number of repetitions of a phenomenon in a given amount of time. The number of complete cycles of a periodic process occurring per unit time.

G

Gigabyte (GB)

1 GB = 2^{30} Byte or 1024^3 Bits (binary number system).

Gbyte

1 Gbyte = 10^9 Byte or 8×1.000^3 Bits (decimal number system).

Goof

A film production fault which disturbs, inhibits, or undermines the reality effect. Most famous goof: the wristwatch of a roman legionnaire in "Spartacus"; almost legendary are also the telegraph poles in "Quo Vadis".

Group of Pictures (GOP)

in MPEG video, a sequence of pictures defined by a pattern of I-Pictures, B-Pictures and P-Pictures. Or, another way to consider it is that the frames located between a pair of I-Frames is called a GOP. A GOP is the atomic unit of MPEG video access.

H

Hertz

A unit of frequency measurement. The number of cycles (repetitions) per second.

HiFi

High Fidelity. The reproduction of sound with little or no distortion, difference between original version and reproduction is not hearable anymore but only measurable.

I

I-Frames

In MPEG-2, pictures that are encoded using intra-frame compression and contain all the information needed to reconstruct an individual frame of video. They are the building blocks for the encoded data stream. I-Frames are encoded independently of other frames. They are equivalent to key frames in other video compression processes. The complete frame is divided

into macro blocks, using a technique similar to that of JPEG. The blocks are transformed mathematically using discrete cosine transformation (DCT). The results are quantified and compressed using simple statistical procedures.

Interactive

A term describing a program whose input and output are interleaved, like a conversation, allowing the user's input to depend on earlier output from the same run. The interaction with the user is usually conducted through either a text-based interface or a graphical user interface.

Interface

A boundary across which two systems communicate.

In computers, a user interface is that software component that the user sees, interacts with, and employs to control and navigate the application.

J

Jewel Case

A type of case for storing DVD discs which is very much like a CD case. A jewel case is made from fragile clear plastic, and has movie information on a separate slip-in booklet which slides into the front cover. There are two different types of jewel cases. One is the same size as a normal CD case, and is predominantly used in the Asian region. The other is called the super jewel case and is larger and was used in the UK, but has almost totally now been taken over by the Amaray cover and the Snapper.

K

Kilobyte

K or KB. 1 KB = 1024 Bytes.

L

Languages

This feature allows up to eight different audio tracks to be mastered on a single DVD. The user can then select the language track desired.

Laserdisc

A 12-inch (or 8-inch) optical disc that holds analog video (using an FM signal) and both analog and digital (PCM) audio. A precursor to DVD.

Layer

The plane of a DVD disc on which information is recorded in a pattern of microscopic pits. Each substrate of a disc can contain one or two layers. The first layer, closest to the readout surface, is layer 0; the second is layer 1.

Letterbox (LB)

The process or form of video where black horizontal mattes are added to the top and bottom of the display area in order to create a frame in which to display video using an aspect ratio different than that of the display. The letterbox method preserves the entire video picture, as opposed to pan & scan. DVD-Video players can automatically letterbox a widescreen picture for display on a standard 4:3 TV.

LFE

Low Frequency Effect Channel or simply Subwoofer channel.

M

Macrovision

An antitaping process that modifies a signal so that it appears unchanged on most televisions but is distorted and unwatchable when played back from a videotape recording. Macrovision takes advantage of characteristics of AGC circuits and burst decoder circuits in VCRs to interfere with the recording process.

Megabyte

MB or Mbyte. = $1024 \times 1024 = 1,049$ Mio. Bytes.

Megahertz (MHz)

One million (10⁶) Hz (see Hertz)

MLP

Meridian Lossless Packing. A lossless compression technique (used by DVD-Audio) that removes redundancy from PCM audio signals to achieve a compression ratio of about 2:1 while allowing the signal to be perfectly recreated by the MLP decoder.

Menu

A list from which the user may select an operation to be performed. This is often done with a mouse or other pointing device under a graphical user interface but may also be controlled from the keyboard.

Minidisc

A music medium designed by Sony as a portable replacement for music Compact Discs. In 1994 Sony announced a data version which can hold 140 MB or about 100 MB using error correction. These will be competitive with 128 MB magneto-optical disks. Mini Discs may be either a re-writable or mass-produced read-only type. Sony have also announced a standard data format. The transfer rate is similar to CD-ROM which is slow compared to the current magneto-optical drives (which are similar to an old hard disk, with writing noticeably slower than reading). Access times of about 300 ms and data transfer rate of about 150 kb/s. Pre-recorded read-only Mini Discs can be mass manufactured on a modified CD press - this and the standard format mean it could take off as a software distribution medium.

MPEG

A Codec adopted by ISO's **Motion Pictures Expert Group** for compression and playback of full-motion video and audio streams-- often referred to as 'MPEG video.' MPEG-1 is now an open standard (ISO/IEC 11172, 1991)--which establishes the structure for a standard MPEG file, and specifies a transfer rate of 1.5Mb/sec, with a resolution of 352x240 at 30 fps. MPEG-2 accepts transfer rates up to 15Mb/sec, with a high resolution of 720x480 at 30 fps, and it also requires a 2MB buffer. Today, most of the demands of multimedia and full-motion video are met by various MPEG add-on boards. Incidentally, CD-I uses MPEG-1, and Video CD was promoted as the first MPEG-1 optical disc for multiple platforms. MPEG add-on boards use special chip sets for compression and decompression--but there are various software-only MPEG decoding programs. High-end hardware solutions claim compression ratios up to 50 to 1. But, since MPEG is lossy, such high compression rates often signify lower quality playback at 30 fps. MPEG-2 (ISO 13818-1, 1994) offers higher quality and speeds than MPEG-1. In certain circles, it is considered a temporary solution in the wait for a software solution (which will require CPUs to provide code streams above 10 Mbits/sec). DVD, however, uses MPEG-2 primarily, and all DVD-players will include hardware to handle MPEG-2 contents.

MPEG Audio

Audio compressed according to the MPEG perceptual encoding system. MPEG-1 audio provides two channels, which can be in Dolby Surround format. MPEG-2 audio adds data to provide discrete multichannel audio. Stereo MPEG audio is the mandatory audio compression system for 625/50 (PAL/SECAM) DVD-Video.

MPEG2 Multichannel Audio

MPEG2 multichannel audio is one of the digital surround sound system available on DVD discs, another option for Dolby® Digital. It is a compatible extension of the MPEG1 audio coding which enables the transfer of mono, stereo, or multichannel audio in a single bitstream. It can operate at data rates from 32 kb/s up to more than 1 Mb/s, and supports sampling rates of 32, 44.1 and 48 kHz. For stereo, a typical application would operate at an average data rate of 128-256 kb/s. A multichannel movie soundtrack requires an average bit rate of 320-640 kb/s, depending on the number of channels (5 to 7, plus a sub woofer channel) and the complexity of the encoded audio.

Musicam

A name for MPEG-1 Layer 2 used for broadcasting. Common data rates are 192, 224, and 256 kbps.

N

NTSC

The **National Television Standards Committee** supports the NTSC signal and display technology used in the TV industries of North America, Japan, and a few other countries. It specifies 525 lines/screen, and 29-30 frames/sec.

O

Operating System

Generally, an operating system refers to the set of internal (kernel) and external commands and subroutines that allow the computer to manage its components. Most operating systems require (cards or software) interfaces to deal with peripheral devices (MS-DOS, Mac, OS/2, Unix, etc). CD-ROM drives, and most other optical devices, are usually packaged with the necessary interface card and drives for the operating system. SCSI CD-ROM drives either come ready to connect to a 'standard' SCSI-2 card, or come with a SCSI card of their own--for the appropriate operating system.

Optical disc

Technically, optical discs are those that are 'written' (encoded) and read using a laser optical device. In the computer arena, the optical industry is clearly divided; with the mastered and mass-reproduced 12cm CD-ROM implementations in one camp, and all the other discs in the 'optical' camp. Some types of discs are mastered and mass-reproduced (i.e. CD-Audio and CD-ROM), and others are produced individually by the appropriate drive (i.e. Write-Once, Rewritable, and CD-Recordable).

See Laserdisc

Original format

or original-motion picture format. For or better comparison the width to height proportion for cinema movies is usually given compared to one. Most common is 1,85:1. So-called Cinemascope-movies are recorded at 2,35:1. In general European movies are recorded in 1,67:1; 70-millimeter-movies in 2,2:1. 16:9-TV-format dose not meet any of these but with 1,78:1 it meet a good compromise.

P

PAL

Phase Alternation Line is used by European, Asian and some Latin American Countries. It specifies 768 pixels/line, 576 lines/screen and 25 frames/sec.

Pan & Scan

A Pan & Scan version of a film is one which has been edited from its original form to better fit on a different aspect ratio, usually 4:3. The process involves cropping a widescreen image by

zooming in on it, and therefore losing picture information from the sides to make the image the standard 4:3. The name pan & scan is used because the person carrying out the process then moves the frame of vision left and right across the whole widescreen picture so that the appropriate part of the image is visible at any particular time.

Parental Lock

An optional feature of DVD-Video that prohibits programs from being viewed or substitutes different scenes within a program depending on the parental level set in the player. Parental control requires that parental levels and additional material (if necessary) be encoded on the disc.

PCM

Pulse **C**ode **M**odulation is used to sample analog audio into digital code (generally, 8000 samples/sec), and to structure the analog signal that is produced by the digital-analog converter of the CD-Audio player. PCM makes it possible to hear the various instruments, their different ranges and depth of sound, etc. It was the basis for ADPCM, which was implemented in CD-ROM-XA and CDI. A PCM-audio stream has two digital channels, but provides compared to Audio-CD different levels of quality, ranging from simple stereo to Dolby Surround. The DSD-method (Direct Stream Digital) developed by Sony and Philips is an alternative.

Photo-CD

This product, was introduced by Kodak and Philips, in 1992. The Photo CD is a hybrid disc that uses the CD-ROM XA Form 1 sector structure to store up to 100 35mm photographs in one disc, in one or more sessions. The photographs are scanned into digital files (18 MBytes--compressed to about 4.5 MBytes, each), in five different resolutions. The Kodak Photo CD player displays on a TV monitor, but a multi-session CD-ROM XA drive, with appropriate software, can display on a PC monitor. When issued as a Bridge Disc, it can be played by Photo CD and CD-I drives connected to a TV set. Photo-CD allows multisession recording, with one TOC per session (Orange Book, Part II, Hybrid disc). CD-ROM XA players need an appropriate interface (or a software patch) to display multi-session contents. Kodak also licensed a consumer product that takes film rolls (or color photos), and processes them into a Photo CD.

Pits

During optical encoding, pulses of a high power laser beam 'burn' microscopic 'pits' on the recording layer. The untouched spaces between such pits are called 'lands.' During the read process, the laser light focuses on the spinning spiral track, and since the pits reflect light less intensely, the read head detects the changes in reflectivity, and those changes are processed as 1s to produce a binary data stream. In CD-ROM, the track pitch is 1.6 microns, and the pits are 0.83 microns wide. In DVD, the track pitch is 0.74 microns, and the pits are 0.4 microns wide.

Power Amplifier

An audio component that amplifies the audio signal to drive the loudspeakers. When using a power amplifier, a pre-amplifier is used upstream to perform input and output switching and multi-channel decoding.

Pre-amplifier

An audio component that performs input and output switching, acts as a tuner, and performs multi-channel decoding. When using a pre-amplifier, a power amplifier is used downstream to amplify the audio signal to drive the loudspeakers.

Q

R

RAM

Random **A**ccess **M**emory.

Also known as 'system memory,' is that amount of physical memory that is addressable by and directly accessible to the CPU--chips on the motherboard, or on an add-on board on the bus. RAM in DVD-RAM stresses the random access capability of this rewritable product--mainly to differentiate it from other 'rewritable' products, and to compete with magnetic hard drives.

Receiver

Receiver and amplifier in one.

Region code

When the DVD standard was set, the DVD Committee under pressure from the Hollywood studios to protect their precious staggered world film releases agreed to split the globe into different areas for DVD releases. Players will be coded by region, and these players will not play DVDs coded for a different region. It is expected that only first release DVD-Video titles will have those codes. DVDs with no regional codes will be played by any DVD player.

9 DVD regions were created, which are:

Region 1 - North America and Canada;

Region 2 - UK, Europe, South Africa and Japan;

Region 3 - Southeast and East Asia, Hong Kong;

Region 4 - Australia and New Zealand, the Pacific and Central and South America;

Region 5 - Russia, India, Africa and some limited Asian countries;

Region 6 - China;

Region 7 - Not currently in use;

Region 8 - Special use e.g. Aircraft and oil rigs;

Region 0 - Unrestricted.

Resolution

This is the basic measurement of how much information is visible for an image. It is usually described as "h" x "v". The "h" is the horizontal resolution (across the display) and the "v" is the vertical resolution (down the display). The higher the numbers, the better, since that means there is more detail to see. If only one number is specified, it is the horizontal resolution.

Displays specify the maximum resolution they can handle, determined by the display technology and the electronics used. The actual resolution will be the resolution of either the source or the display, whichever is lower.

Vertical resolution is the number of white-to-black and black-to-white transitions that can be seen from the top to the bottom of the picture. The maximum number is the number of active scan lines used by the image. The actual vertical resolution may be less due to processing, interlacing, overscanning, or limited by the source.

Horizontal resolution is the number of white-to-black and black-to-white transitions that can be seen from the left to the right of the picture. For digital displays, the maximum number is the number of active pixels used by a scan line. For both analog and digital displays, the actual horizontal resolution may be less due to processing, overscanning, or limited by the source. Compared to TV and other media the DVD has the best horizontal and vertical resolution.

	DVD-Video	VHS	S-VHS	Laserdisc	Video-CD	TV
Horizontal resolution	500 lines	240 lines	400 lines	420 lines	350 lines	320 lines
Vertical resolution	576 lines	576 lines	576 lines	576 lines	280 lines	576 lines

RGB-Signal

Video information in the form of red, green, and blue tristimulus values. The combination of three values representing the intensity of each of the three colors can represent the entire range of visible light.

ROM

Read Only Memory. The term originally applied to read-only memory chips used in computers. With the growth of optical storage, the term read-only memory now applies to compact disc products (CD-ROM, CD-I, CD-ROM XA, CD-Recordable, etc.). In the case of WORM, now referred to as Write-Once, after a recording session, the disc is essentially a read-only disc.

RS-DL

Reverse Spiral Dual Layer. This is a description of a type of disc where the data is held in two different layers on the disc's surface. The laser of the DVD player can read each layer, depending on how it is focussed. An RSDL disc is created so that the first layer is read by the laser in one direction (i.e. from hub to edge), and when it reaches the end of that layer, the beam is re-focussed to the second layer and begins to work in the opposite direction.

S

Sampling

Converting analog information into a digital representation (film, cinema to video) by measuring the value of the analog signal at regular intervals, called samples, and encoding these numerical values in digital form. Sampling is often based on specified quantization levels. Sampling may also be used to adjust for differences between different digital systems (see resampling and subsampling).

Three methods of sampling are possible: Anamorphic Transfer, Letterbox- and Pan&Scan.

Sampling Frequency

The sampling frequency is usually specified as the number of samples per unit time; the number of samples taken of a signal per unit time.

Sample Rate

The number of times a digital sample is taken, measured in samples per second, or Hertz. The more often samples are taken, the better a digital signal can represent the original analog signal. Sampling theory states that the sampling frequency must be more than twice the signal frequency in order to reproduce the signal without aliasing. DVD PCM audio allows sampling rates of 48 and 96 kHz.

Scart

Syndicat des Constructeurs d'Appareils Radio Recepteurs et Televiseurs. This is a 21-pin connector supported by many consumer video components in Europe. It allows mono or stereo audio and composite, s-video, or RGB video to be transmitted between equipment (also known as Euro-AV).

SDDS

Sony Digital Dynamic System. A perceptual audio-coding system developed by Sony for multichannel audio in theaters. A competitor to Dolby Digital and an optional audio track format for DVD.

Secam

Séquentiel Couleur à Memoire. A composite color standard similar to PAL, but currently used only as a transmission standard in France and a few other countries. Video is produced using the 625/50 PAL standard and is then transcoded to SECAM by the player or transmitter.

Single-Sided (SS)

refers to a DVD disc that has data on one side of the disc. A single-sided DVD may still have one layer (i.e., single-layered) or two layers (i.e., dual-layered) of information, holding two hours and four hours of video information, respectively. Either way, single-sided DVDs requires no "flipping" of sides. Also see DVD-5 or DVD-9.

Single-Layered (SL)

Refers to a DVD disc that has one layer of information per side. A single-layered DVD may still have one side (i.e., single-sided) or two sides (i.e., double-sided) of information, holding two hours and four hours of video information, respectively. The double-sided, single-layered disc requires manual "flipping" of sides. Also see DVD-5 or DVD-10.

SMPTE

Society of Motion Picture and Television Engineers. International Organization for research and standardization.

Snapper-Case

The snapper is commonly used by Warner Brothers in the UK, and consists of a cardboard case with plastic spines. The front cover closes, and is then held in place by the plastic spine clipping into place. The film information is printed directly onto the cardboard cover.

Subpicture

Graphic bitmap overlays used in DVD-Video to create subtitles, captions, karaoke lyrics, menu highlighting effects, and so on.

Subtitles

A textual representation of the spoken audio in a video program. Subtitles are often used with foreign languages and do not serve the same purpose as captions for the hearing impaired. See subpicture.

DVD Video format allows up to 32 different language subtitles to be stored on a disc, which can be selected during the playback from the menu on your TV.

Subwoofer

A highly specialized speaker designed to produce sounds far lower than most other normal speakers – often down to the lowest boundaries of human hearing or even below it (about 20Hz). A sub-woofer is a vital integrated part of the Dolby Digital standard and allows more faithful of full range material such as music, or more bass-centric material such as large explosions.

Surround-Sound

Generally refers to the use of multi-channel audio tracks and multiple speakers to re-create a 3-dimensional sound field for reproducing movie soundtrack and music.

Surround sound refers to the use of multiple audio tracks to envelop the movie watching or music listening audience, making them feel like they're in the middle of the action or concert. The surround sound movie soundtrack allows the audience to hear sounds coming from all around them, and plays a large part in realizing what movie makers call "suspended disbelief".

"Suspended disbelief" is when the audience is completely captivated by the movie experience and is no longer aware of their real-world surroundings.

True surround sound formats rely on dedicated speakers that literally and physically surround the audience. There is one center speaker which carries most of the dialog (since the actors usually speak while making their on-screen appearance), and part of the soundtrack. There are left and right front speakers that carry most of the soundtrack (music and sound effects), and may carry parts of the dialog (when the director wants to intentionally off-set the source of the dialog to either side, from its default dead-center screen location). There is a pair of surround sound speakers that is placed to the side (and slightly above) of the audience to provide the surround sound and ambient effects. Finally, a subwoofer can be used to reproduce the low and very low frequency effects (LFE) that come with certain movies (e.g., the foot-stomping bass effects in "Jurassic Park" and "Godzilla").

There are *virtual* surround sound algorithms (e.g., Sound Retrieval System [SRS] and other proprietary algorithms) that make use of only two left and right speakers and psycho-acoustics effects to emulate true surround sound formats. While we think the result is a more expansive soundstage with better ambiance, we have not heard a virtual surround sound implementation that comes anywhere close to resembling a *true* surround sound system. Dolby Surround is the

most basic surround processing system from Dolby Laboratories. Dolby Surround uses a 3 channel system to offer front stereo (which attempts to produce a phantom-effect center speaker using stereo imaging) and a mono rear surround channel.

The DVD even is able to provide digital surround sound: five full bandwidth channels, front left, front right, center, surround left, and surround right, for true surround sound quality. A low frequency effect (LFE) channel is included that provides the sound needed for special effects and action sequences in movies. The LFE channel is one-tenth of the bandwidth of the other channels and is sometimes erroneously called the subwoofer channel. This multichannel scheme is known as 5.1 channel. Three systems are available: Dolby Digital (AC-3), DTS und SDDS.

Because not everyone has the equipment needed to take advantage of Dolby Digital's 5.1 channel sound, developers included a downmixing feature that ensures compatibility with any playback device. The decoder in the playback device delivers the audio signal specific to that particular device's ability. For example, a 5.1 channel audio signal is delivered to a mono television. The playback device's decoder downmixes the 5.1 channel signal to a mono signal allowing the television to use the received audio signal. Because the playback device does the downmixing, producers do not have to create multiple audio signals for each playback device.

S-Video

Separate video, also called Y/C video. Separate luma (Y') and chroma (C) video signals are used, rather than a single composite video signal. By simply adding together the Y' and C signals, you generate a composite video signal.

T

Television standard

Technical standard for broadcasting. There are several standards used in different regions of the world: PAL, Secam, NTSC. The differences lies in the specifications of the pixels per line, the lines per screen and the frames per sec.

THX

is an exclusive set of technical standards established by the THX company - founded by *Star Wars* creator George Lucas. THX is as well a quantitative measure of quality that works in conjunction with the different surround sound formats (e.g., Dolby Digital and DTS) to bring the quality of the sound presentation to the highest standards.

U

UDF

The **Universal Disc Format** was promoted by the Optical Storage Technology Association (OSTA), as a single file system for interchange of information in the computer arena. It is referred to as a subset or domain of ISO/IEC 13346/ OSTA aimed to develop a UDF-based file format for CD-ROM, write-once and rewritable products, including multi-surface sets. UDF is expected to eliminate the addressing limitations of the ISO 9660, the file-size limitations of redirectors (MSCDEX & CDFS), provide for cross-platform products, and also help eliminate the broad incompatibility among CD and DVD mass-reproduced and write-once and rewritable applications.

UDF-bridge

Allows a link between ISO 9660 and UDF. Using UDF Bridge one copy of a set of data can be put on a piece of media and both ISO 9660 compatible readers and UDF readers be able to access the information. Also known as CD-UDF or CD-RW.

V

VHS

Video Home System. VHS is the most prevalent videocassette format since the mid 1980's.

Video-CD

Compact discs that hold up to about 90 minutes of digital audio and video information. MPEG-1 video is used, with a resolution of 352 x 240 (29.97 Hz frame rate) or 352 x 288 (25 Hz frame rate). Audio uses MPEG-1 layer 2 at a fixed bit rate of 224 kbps, and supports two mono or one stereo channels (with optional Dolby pro-logic). Fixed bit-rate encoding is used, with a bit rate of 1.15 Mbps. The next generation, defined for the Chinese market, is Super VideoCD.

XVCD, although not an industry standard, increases the video resolution and bit rate to improve the video quality over VCD. MPEG-1 video is still used, with a resolution of up to 720 x 480 (29.97 Hz frame rate) or 720 x 576 (25 Hz frame rate). Fixed bit-rate encoding is still used, with a bit rate of 3.5 Mbps.

In terms of picture quality, it is about the same or slightly better than VHS. Most feature length films spans two Video CDs, and therefore swapping Video CD discs in the middle of a movie is usually required

W

Watermark

Information hidden as “invisible noise” or “inaudible noise” in a video or audio signal.

Widescreen

A video image wider than the standard 1.33 (4:3) aspect ratio. When referring to DVD or HDTV, widescreen usually indicates a 1.78 (16:9) aspect ratio.

Also may refer to a TV screen with 16:9 aspect ratio (or 16x9 aspect ratio). The width of the screen is 16 units wide compared to the height of the screen which is 9 units. Widescreen TVs are optimized for viewing anamorphic widescreen DVDs and the wider high-definition TV (HDTV) signal. See 16:9 aspect ratio.

X , Y, Z

Resources:

<http://www.dvddemystified.com>

Jim Taylors standard about DVD. Here you will find all technical orientated information about this media and a rich link list.

<http://www.dvdmadeeasy.com>

<http://www.dvdmadeeasy.com/glossary/>

„Technical Information and Training“

<http://www.streamingmedia.com/>

Information about Streaming content (Audio/video, ...)

<http://video-demystified.com/>

Reference covers the essentials of analog and digital video

http://www.cdpage.com/Compact_Disc_Glossary/glossarym.html

„Glossary of CD and DVD technologies.“

<http://timefordvd.com/glossary/index.shtml>

„Glossary & Acronyms. Helping you understand DVD & home theater technology in layman's terms“

<http://www.dvddept.com/DVDGlossary.asp>

„Glossary of DVD Terms“

<http://www.dvd.reviewer.co.uk/info/faq/default.asp?Category=227>

Glossary

<http://www.uni-koeln.de/~ame02/pppf.htm>

“A Guide to Narratological Film Analysis”

<http://www.cinelab.com/glossary>
Glossary of Motion Picture Terminology

You may also download from my website <http://www.tideguide.org/dvdseminar/uts/index.html>
- Apple DVD Studio Pro Manual/Tutorial
- these notes
- DVD links

Any inquiries regarding the seminar or these notes to: tideguide@gmx.net