A ROUGH GUIDE TO MULTIMEDIA

A handbook for students and teachers

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Introduction

The purpose of making a multimedia presentation on a computer is to communicate something using text, movement, images, sound, and music, in such a way that the audience can choose individualized pathways through the material. Presentations which convey pride, enjoyment, and energy are most successful. If these qualities are not present and obvious, no one will get the message.

In the following pages we will present a framework for understanding and using the extremely powerful tools available for making multimedia, in concept, process, and technique. Many skills come into play during the design and creation process; for this reason, it is rarely a solo activity, but rather a team event. A number of individuals, each specializing in one or more aspects of the project, must work collaboratively toward a shared goal. An understanding of the production process can ease detail overload by breaking the big picture down into discrete steps.

Working with multimedia is too big a big topic for such a small handbook. We can't pretend or hope to cover everything in enough detail to be either self-contained or satisfactory to all. As you get into the work itself, please refer to any of the references in the bibliography for more information. In particular, we recommend **Interactivity by Design**, by Ray Kristof and Amy Satran, for an excellent view of the process and design of multimedia creation.

Because this is a text guide, it appears to be in linear form. Please feel free to explore this handbook in the order that makes the most sense to you. You may prefer to start by looking at some examples of how multimedia development can play out in several educational settings. Perhaps you would rather start with an overview of the production process and then look at some of the specific skills necessary. This kind of exploration is a good first step in your developing understanding of the value of multimedia.

Explore. Be patient. Have fun.

1. The Production Process

The following three sections are all part of the production process, each viewed from a different organizational vantage. As well as being an organizational tool, these aspects of the production process should serve as a framework for reflecting on the project and having evaluative/critical discussions before and after completion. Every project and every team will find different variations on these processes, so these descriptions should not be seen as absolute.

Stages of the Production Process

These stages are sequential. Before any serious design or creation work can proceed, everyone involved in the project should have solid agreements about what is to be done and why. Misunderstandings and/or lack of agreement about the motivation(s) for the project can cause escalating problems later in the process. Those basic initial agreements provide a reference point for subsequent decisions and evaluations. After the <u>why</u> has been clarified, the team must come to agreement about <u>what</u> the multimedia product has to do in order to fulfill its purpose (concept and specifications). These two, why and what, inform all of the <u>how</u> decisions: flow chart, storyboards, and media content.

1. Motivation
During this initial <u>why</u> phase of production, basic agreements are made among the production team and between the team and client about the project's purpose and functionality. These agreements, which can be contractual, bind everyone to a common goal. Activities include defining the purpose(s) and audience(s), for example: marketing, community service, artistic creation (having fun!), education, and/or training.

2. Conception and Design
Discussions with the client and among the team define <u>what</u> the product must deliver, in terms of information and function, to meet the desired goals. Activities include interviewing the client, developing a planning document, building specifications for production.

3. Creation of a Planning Document
The team works together to define exactly <u>how</u> the project will look and feel, and how that functionality will deliver the desired messages. Activities include creating and finalizing flow chart, finalizing the functional specifications, time line, and storyboard, and creating a list of needed content and work assignments.

4. Production
   a) Creating the rough layout and interface design;
   b) Acquiring or creating music, other sounds, photography, videography, motion graphics, still images, and text, and assembling the elements into a prototype;
   c) Internal (team) review and critique;
   d) Plugging in "final" polished elements.

5. Product Testing
   Client reviews project for minor changes, trials on other computers and with beta testers.

6. Final Revision
   Based on client and team feedback and the results of beta testing, final revisions include bug fixing, which can include software glitches, sound glitches, typographical errors, visual errors (i.e. some elements don't line up when you move from screen to screen), or a problem with functionality of a particular part of the interface.

7. Distribution
   Packaging the product in its final form for distribution (mastering , duplicating, packaging , and shipping media), publishing on web sites, and/or public presentations.

Members of the Multimedia Team

Each member of the multimedia production team brings a unique combination of skills, strengths, and interests. Everyone is happiest and most productive when they are able to fully utilize their talents and develop their interests by specializing in what they are drawn to. Specialization is as unavoidable as it is natural. It becomes an asset when roles and responsibilities are clearly defined. The three areas of responsibility below also represent different ways of looking at the project as a whole. They are all equally important, not mutually exclusive; the imperatives of each must be well balanced with the others.

Administrative: General administration and overall project management, including budgeting, scheduling, distribution, assigning tasks, acquiring content, and getting help with legal issues.

Creative: Writing, videography and editing, photography, animation, design and layout, illustration, music, sound and editing, prototyping, art direction, producing.

Technical: Programming, testing, media mastering and duplicating, general technical support, web site or network maintenance.

Aspects   of   Multimedia   Design

Design is what carries the messages to the end user. If these three aspects of multimedia design are all working well, the user will perceive the desired content, be able to move around the piece fluidly, and be sufficiently engaged by the presentation to spend time and energy with it.

Content and Information. Content could include artwork, sound, text, video, a statistical database, or any information in any form you dream up. Probably you will need to write and design some new, original content, but you may already have a lot of the content you need. What needs to be done to make it all work in a multimedia piece? You may need to acquire and obtain the rights to use existing content from different sources.

An asset list will help organize content creation and acquisition.

Navigation. How will the user get around inside your program? How will the user exit? What is the organizational flow of your program? What are the metaphors, the paradigm (eg. maybe you want your interface to be like an instrument panel, or a 3D environment)? Do you want to use buttons, icons, image maps? Do navigational tools need to exist on every page?

Use a flow chart to provide an overview of all the navigational links necessary and then as a means of double checking when you create the prototype.

Aesthetic Design. Basically, if your program doesn't look good, chances are no one will care to explore the content. We are constantly bombarded with information, and it is sometimes impossible for us to sort through all of it. What does get through is probably presented in a very clear, pleasing, and attractive manner. Find people who are experienced or capable of doing your art direction, design work, screen or page layout, illustration, etc. Even if you, as the project producer, are a designer, it may be better to delegate these tasks. It is virtually impossible to perform every aspect of the multimedia process yourself, and if you do, the results could spell disaster.

Storyboards are a good organizing tool to coordinate all the design, content, and navigational considerations.

Adapting the Production Process
for Educational Purposes

When a teacher uses multimedia production as a vehicle for exploration of a content area, then the professional process needs to be amended. Here are some basic tips and an alternate method to consider.

Tips: Start small. Limit the tool set. Let the students take the technology lead. Stress the content aspects of communication. Remember that you have expertise outside of technology that is critical to theprocess.

Content Immersion. Participants engage in experiences with or research about the project at hand to collect information and gather ideas. Field trips, teacher guided lessons, student research, interviews, observation, and questioning serve as "warm-ups" to the topic(s) selected so that groups have some basic information before brainstorming and planning.

Initial Conception and Design. After collecting initial information, hold a brainstorming session where the whole class or a sub-group defines a tentative approach to the subject and discusses some preliminary design ideas.

Development of a Framework. A modular framework is developed so that pieces can be selected by sub-groups who then develop more specific plans of production. This step is critical because it allows many more students to plan. Whole class planning of details becomes tedious when most of the group sits silently, whereas sub-group planning actively engages more people. It also builds a sense of ownership and team work, rather than a feeling of carrying out the designs of someone else.

Within each group, a storyboard or other planning tool is used to create a specific plan and structure to follow. Often the original storyboard is too complex and gets adapted later.

Preliminary Production. If you and your students are new to multimedia, design a preliminary production phase so that everyone gains experience in production before finalizing ideas about the overall design. Easy pieces are constructed during this period. Ask student groups to create simple slide shows, or something similar such as single Web pages, that can be assembled into an overall piece with navigational choices or links. At this point students need to be given some technological requirements so that the media elements will work together when assembled.

Revision of Initial Concept. Ask the student groups who finish early to build the authoring structure that assembles the group modules. Then, hold a review session to preview the piece so that the entire group gains an overall sense of the presentation. At this point, participants see their work concretely, review their original sketch, and either scale down or improve upon the initial ideas. Groups revise their original planning tool.

Continued Production and Task Specialization. Participants continue work as redefined in the review session. Task specialization occurs so that participants can meet deadlines and explore their particular areas of interest or desired learning. Some groups will decide to continue with their original modules while others are ready to build more complex structures.

Testing. At some point about two-thirds of the way through production, it is a good idea to have users outside of the group creating a module or production act as testers. This brings out broken links, or unclear navigational paths and gives the producers another perspective about the design and function of their multimedia production. If the multimedia production is meant to be distributed (to parents or to the public) then other computers act as testers for the different types of machines that may be found in homes , telling the producers whether or not their product is transferable.

Final Revision. Based on the comments of outside testers, the production is revised for one last time. Small details are attended to such as consistency of fonts or refined placement of images on the screen.

Presentation/Distribution. Planning a formal presentation gives students a chance to share their hard work. Asking them to introduce their presentations and explain how they were made and what was learned during the process also teaches the audience more about multimedia production.

Asset List

Project: _____

Screen Name: _____

File Name	Description	File Type	Created by

Screen name/#number:

Screen description

Soundtrack:

Sound FX:

voice-overs:

Images/Graphics

Comments/Additional Information

Storyboard #number:

Flow   Chart

# 2.	The Tools: Overview

Get the right tool for the job.

The world of computer graphics, animation, video, audio, and authoring can be daunting to the newcomer, and even to the experienced user of these tools. There are so many possibilities and variables that the whole experience can quickly become overwhelming. To help alleviate that, we will present brief overviews of how each of the digital media works and what some of the commonly used terms and tools are. This will necessarily be a broad overview that aims to provide you with the language and resources to delve farther into what you need for your particular project.

Most of these tools work in ways that are similar to their physical counterparts. This is one common source of confusion and frustration. Computer media tools are similar to, but far from the same as, natural media tools. The similarities were designed for familiarity, comfort, and ease of use. Frustrations may arise when a tool doesn't work the way you expect that it should. There may be many reasons for this. Nevertheless, you are bound by the rules established by the program's creator.

A good way to approach a new program and unfamiliar tools is to use equal measures of play and preparation. Read parts of the manual while looking at the program's tools. Do a couple of the tutorials to get a feeling for the logic and functioning of the program. Then play for a while, somewhat aimlessly, trying out various combinations of techniques and tools. You will be pleasantly surprised at what you discover. Then return to your project, with some specific tasks in mind, and use the manual to find the procedures you need.

Above all, don't be afraid or too shy to ask questions. No question is irrelevant. Everyone gathers learning in different ways.

Graphics   programs   and
image   formats

All images on a computer screen are made up of tiny squares called pixels, which can be assigned any one of a specific number of colors. The smaller the pixels, the more of them there are, and the higher the resolution. Higher resolution means the capability to display finer lines, finer detail. It also requires more memory to display, process, and store such images, and more CPU (central processing unit, or the core brains of the computer) power. In other words, the higher the image's resolution, the harder the computer has to work to display that image; when computers have to work hard at something, they don't sweat, they slow down.

The number of colors that can be displayed affects how the image looks. Take a minute to look at your hand. How many separate colors can you pick out? If you can see between 5 and 15, you are both right and wrong. In between each larger block of color there are transitional zones where the colors slowly blend from one shade and level of intensity to another. If those transitional zones were not there, your hand would look blotchy and mottled, like tree bark with a fungus.

We can perceive many millions of colors, but we cannot always pick out where one starts and another stops. This poses a problem for some computer graphics applications. "True color" on computers, also called 24-bit color, can display up to 16.8 million colors and achieve a photo-realistic quality, however it takes a lot of processing power and a lot of storage space to do this. Lower resolutions are often more practical and quite acceptable for many purposes. Computer programmers studied how we see and perceive colors and images and came up with a solution to simulate higher resolutions, a mathematical process called dithering. Basically, this mixes fewer colors at the transitional zones to simulate the blending, and lets the eye do the actual blending. Using well-constructed dithering methods, it is possible to display a 24-bit, or true, color image at a resolution using only thousands of colors with almost no perceptible difference. This can save a large amount of storage space and speed up displays.

Two terms you will hear in graphics discussions are painting and drawing. They may sound somewhat interchangeable, but really represent two different methods of displaying and working with graphics on the computer screen. Painting programs work with "bitmapped" graphics. That means that they can display and edit images on a pixel by pixel basis (if necessary). When you draw a

straight line in pale blue on an image in a paint program, what you are actually doing is turning each of the pixels that makes up that line to that pale blue color. The computer remembers the color (a combination of numbers) for each pixel in the image. As we said above, the lower the resolution, the larger the pixels and the more coarse and blocky the line. You can see this by opening up an image in Adobe Photoshop and zooming in to a magnification of 400%. At that magnification level, you can easily see and change individual pixels.

In a drawing program, the image is not made from pixels, but vectors, mathematical descriptions that tell the program to draw a line of a specific thickness and color from point A to point B. When the program receives these instructions, it draws such a line onto the screen, coloring in the pixels as necessary. The important difference is that the program stores this information as a set of instructions, not as a map. The user never has to deal with formulas to use a drawing program; all that is behind the scenes. The advantage of drawing programs is that each line or element they generate can be moved, resized, or recolored without distortion. Remember that if you magnify a bitmapped image, it shows up blocky; that doesn't happen in a vector-based (also known as object-oriented) drawing program. A smooth curve stays a smooth curve no matter how large or small it is made. These programs are also called illustration programs, as they are geared toward output on Postscript printers.

Since virtually all of the authoring programs on the market are set to display only bitmapped graphics, that is the format we will be using.

Paint programs contain tools for all sorts of painting, retouching, and image processing (see below). Many of these tools work very much like their natural media counterparts, and they function in similar ways from program to program. The best way to get a handle on how your specific paint program works is to go through the tutorials that introduce you to each tool and its functions and variables, and then play for a while. All of the tools are set with built-in defaults. As you learn to manipulate the programs better, you should consult the manual to learn how to use the options. For example, if you want to paint a thinner line, you must choose a smaller brush. If you want to draw a semi-transparent line over an existing line or image, you must choose that setting from the controls; each program has you make these selections in a different way.

When the image is complete, or when you just need to store it for a while, you must save it. This sounds obvious, and the program will almost always prompt you to do this before closing the image or quitting the program, but the choices can be somewhat confusing. Virtu-

ally every program has its "native" format, which saves the image with all the program-specific options and commands the program can offer. In Photoshop, for example, this includes floating layers (different elements of the image which can be repositioned and edited further before final composition). If you are at an intermediate stage in the completion of an image, you should save it in the format native to the program you are working in. This will always be the assumed choice when you choose Save from the File menu.

In addition to its native format, most programs offer the possibility of saving in one of many different formats designed to facilitate interchange between programs.

When preparing files for authoring, be sure to check the file type supported by your specific authoring program and <u>save</u> your finished file <u>as</u> the type required. Each file type has its strengths and weaknesses for accuracy, portability, and file size. Here are the most common file formats along with a description of their strengths and weaknesses:

R e m e m b e r :

While working on an image, save it in the native file format of the program you are working in. When it comes time to export it to your authoring program, be sure to *save as* the file format appropriate for your authoring program.
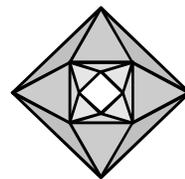
EPS: Encapsulated Postscript files are primarily intended for output to printers, and contain vector-based lines and a low resolution PICT (bitmapped) preview. Their main purpose is not for screen display, so most times what you see on the screen when you open an EPS file is the low resolution PICT preview. Not generally recommended for multimedia work.

GIF: Graphics Interchange Format was originally introduced by the CompuServe network to serve as a universal image exchange format. It has become popular recently for use on World Wide Web pages because it includes a file compression scheme which automatically (and transparently) shrinks the file size down to a relative minimum. The drawback is that it is limited to 256 colors, or 8-bit color. Unless you are authoring for the Web, GIF is not really recommended for multimedia.

MOVIE: Apple's QuickTime movie file format, designed for storage of dynamic collections of video, animations, and sound. These need a specialized program like Premiere or MovieShop to edit, although Painter and Photoshop can edit QuickTime movies on a frame by frame basis. See below.

PICT: One of the two standard mainstay Mac image formats. Its main drawback is that there can be shifts in the color palettes when moving images between programs, yielding unexpected (and unwanted) color changes. Supported by every image program, PICT is a recommended saving format.

MPEG: A set of compression standards developed by a computer industry committee, the Moving Pictures Expert Group (MPEG) specifically for moving images. A lossy scheme which can yield excellent image quality and relatively small file size, MPEG is quite widely used in satellite broadcasts and CD-ROM production.

JPEG: This is not really a file format, although it is often presented as a save option just like a file format. It is a compression scheme, best for large 24-bit (true color) images, that is extremely effective (results in quite small files) and virtually lossless (images look the same after compression as before). Along with GIFs, JPEG images are universal files visible on the World Wide Web.

Video

Several years ago, Apple introduced a system standard for storing and displaying dynamic (changing) files, video, animation, and sound called QuickTime, which has more recently evolved into a standard for the Windows platform as well. QuickTime movies can be captured from a live camera or from video tape, using special hardware and a software control panel or a specialized program.

Since video takes a lot of memory, captured video is always compressed, just to make the file size and display manageable. Unfortunately, there are no hard and fast rules about which compression codec (Compressor/Decompressor) to use, as each codec has its strengths and weaknesses (see below). Consult the manual and experiment. Keep track of each setting you try so that you can accurately compare quality and file size.

One of the basic rules of video capture is Garbage In, Garbage Out, or GIGO. Since making a QuickTime movie involves a lot of behind the scenes processing of the captured video to make it playable on the computer, and since some of this (compression) may degrade the image, it is vitally important that your video source be as good as absolutely possible. If you try to capture video from a poorly lit, shaky source, the resulting movie will be far worse than acceptable. Always be sure that the camera is steady, the connectors clean and secure, and the image well lit and in focus. Use S-video as the capture source whenever possible. Be prepared to experiment a bit to find the optimal settings for your purpose. Keep in mind that for most purposes, QuickTime movies work best at quarter-screen (320 x 240) size, for the sake of file size and smooth playback. If they are much bigger, the file will play back at too slow a frame rate (fps, or the number of frames per second—the higher the rate, the smoother the movement). Also keep in mind that more movement (changes from frame to frame) means larger files, so try to avoid panning the camera unless it is absolutely necessary.

You need a special program to edit QuickTime videos and their accompanying soundtracks. The most popular commercial program is Adobe Premiere.

The same general rules apply for working with video as we discussed for working with single image files. Capture at the highest quality possible, save in the capture program's native format until you are ready to export it to the authoring program, and then export it at the quality you need to use in the presentation (see below).

some general tips for capturing and working with video:

Plan. Plan ahead as you shoot; keep in mind what shots you will need for your final project. Think of how each shot needs to be framed, what sorts of camera movement (if any) need to happen, and what variety of shots you will need to cover the particular subject. If working from a tape, review the tape thoroughly and take note of the location of the shots you want to capture.

GIGO — Garbage In, Garbage Out. Work from the highest quality source images, whether live or taped. Use the S-video input. If live, make sure the subject is well lit, the camera is on a tripod, camera movements are kept to a minimum, and connections between camera and computer are clean and solid. If working from a tape, make sure the tape is first generation and not a copy, the playback is clear (if not, clean the tape machine heads and path), and the connections are secure.

Pay attention to the sound. If you will be capturing sound as well as video, or even just sound (see below), make sure you have a way of monitoring the source, preferably with headphones. Pay careful attention to microphone placement, sound levels, and background sounds that may distract from the primary source. Check these things before recording by doing a trial recording. It's easier to fix bad sound than bad video, but it is also easier to record unfixable sound.

Optimize the hard disk you will capture to. Successful video capture (no dropped frames, smooth playback) depends largely on the computer being able to record the information fast enough. One of the ways to ensure this is to capture video to a dedicated, external hard disk that has a lot of contiguous free disk space. In other words, it takes a lot longer if the computer has to put bits of the video file in various places all over the disk, because there are scattered bits of other files in the way. Before capturing video, use a utility like Norton Speed Disk (in the Norton Utilities package from Symantec) to defragment and optimize the hard disk you will be capturing to.

Make sure that there is no other system activity when capturing. Turn off any networking and/or file sharing and make sure no other programs are running in the background. Such system activities take up memory and slow down processing time.

Capture short clips and edit them together rather than capturing long clips and only using part of them. Conserve disk space.

Check each clip after digitizing. Look for smooth playback, clear image and audio, no dropped frames. Play each clip several times after capture to make sure it is good enough and looks as you want it to. Remember: GIGO.

Capture movies at the specifications of your final movie (image size and frame rate). We recommend a maximum size of 320 by 240, a frame rate of 15 fps, and 16-bit color depth. This will look good played back on most systems. If you capture at this rate, you can resize during editing if absolutely necessary, but this can sometimes introduce unwanted artifacts and degrade the image. If you know you will only need an image that is 240 by 120, capture it at that size to start with.

Experiment with different frames-per-second (fps) rates. A capture rate of 15 fps may yield high image quality, but choppy motion. A capture rate of 30 fps may show smooth movement but poor image quality. Be clear about which are the most important factors for your purpose and then experiment with fps settings to decide which rate is lowest for your needs.

Experiment with different codecs. They each have strengths and weaknesses under certain conditions. It is generally best to stick with the same codec when capturing and editing. Some common codecs are: Animation (primarily for computer-generated graphics); Cinepak (generally best if the project will be delivered on CD-ROM, but often produce compression artifacts); Video (plays well of the widest range of machines).

Capture in 16-bit color if possible. In general, 16-bit color (thousands of colors) movies can look just as good when played back as 24-bit color (millions). They will play back more smoothly as well. The eye tends to blur the transitional colors, and this fact is heightened when the images are in motion.

Scanning   and   digitizing

Scanning and digitizing are two methods for bringing still images into the computer's memory. Often these two words are used interchangeably, and they are similar techniques, but they have distinct differences. Scanning is done with a machine that looks and works like a photocopier. The image is put into digital form by the scanner (usually a flat-bed device), controlled by software that comes with the scanner itself. It is usually possible to scan the image directly into Photoshop for further image processing (see below). The scanner software contains controls that allow you to preview the image and only scan the area of the image you wish to use (thus saving time and file space), to preadjust for contrast and coloring, and to scan in gray scale or as line art (just black and white), depending on your needs.

Most computer monitors display at resolutions between 72-90 dots per inch (dpi). We have found it generally best to scan at about 75 dpi resolution for multimedia projects. This yields an image that shows enough detail without taking up too much disk space. Using Photoshop, you can always resize the image to a lower resolution later, if necessary. 75 dpi is just a general rule; for certain types of images, such as pencil sketches, a dpi of at least 150 is recommended. Ultimately, the decision for dpi depends upon whether you intend to display the image on a computer screen or print it. Printing requires a higher dpi than computer display.

Digitizing is generally done with a video camera or from videotape. The process is much like capturing QuickTime movies, except that only one frame (rather than a series of frames) is captured. Video sources are captured at the computer screen's resolution (72 dpi). They allow the flexibility to capture images that are 3-D, like sculptures and building projects, or images that are larger than the scanner bed. The new digital cameras can also capture still images, but they vary greatly in quality, especially among less expensive units.

Image   processing

Image processing programs or parts of programs do just that: they apply various processes to all or part of a picture. These processes can include enhancing or affecting the image to change contrast, brightness, colors, sharpness, size, resolution, and many other factors. They can add a wide variety special effects to an image. They can place text on an image or composite (blend) two or more images together.

The best known and most popular commercial image processing program is Adobe Photoshop, an almost indispensable tool. There are other very capable, if slightly more basic, image processing tools available as shareware, such as Graphics Converter, available at most archive sites on the Internet and in the software libraries of on-line services such as America Online and Compuserve.

Lately, there has been a trend to include image processing functions in paint programs, such as Painter, and to include more and more paint functions in traditional image processing programs.

Experimentation is the best way to get to know how to use image processing tools and filters.

Audio

Sound is the most often overlooked ingredient in presentations; the quality of the audio track can either make or break the show. When we speak of audio, we include voice, sound, and music as equally important elements, if the piece warrants them. If a picture can be worth a thousand words, then a few well-chosen and well-spoken words can take the place of pages of text on a screen. Fortunately, getting good quality sound on a most new computers is pretty simple. 16-bit audio (CD quality) is standard on most recent machines; no additional hardware is needed to record or play back sound. Audio can be recorded from a built-in CD player, from an external microphone, or from a line level source such as a cassette deck or video camera.

At the most basic level, you can use a system level utility, supplied with your computer, to record sound and export it to the authoring program (see below) for use in your presentation. There are a number of shareware sound recording programs that do the job better and provide for editing unwanted bits off the originally recorded sound. These can be found at archive sites on the Internet or on most of the commercial on line services. At the professional level, for more complex audio needs, Premiere, our video editing program, allows for precise editing, special effects and processing to change and/or improve the sound quality, and multiple layers or tracks.

Recording audio on the computer is done digitally, by sampling the sound a certain number of times per second. The higher the sampling rate, the better quality the sound is (and the more memory it takes). Sometimes one can hear the difference, sometimes not. For the most part, the finished sound to be played in your presentations can be 8 bits, sampled at 22 kilohertz (Khz.). As with scanning images, it is often advisable to record at a higher sample rate, edit, then downsample for the final product. Also, remember the GIGO rule.

Generally, recording is as simple as connecting a source, setting the input level and sample rate, and clicking on the record button. It is very important to monitor (listen to) the sound as you record or immediately afterward, to make sure you are getting what you want and that the sound levels are not too high (distorted).

But before you can record anything, you have to know what you are going to record. And that means thinking about the role of sound and music in your presentation. Volumes have been written on the subject, but briefly:

Music helps set a mood, establish a rhythm, create an atmosphere. Even if it is in the background, it has a powerful effect on our emotions and perceptions. It can be used to highlight a particular activity, or even to reassure the viewer that something is in fact happening when nothing in particular is on the screen (as, for example, when the program is loading). Aggressive use of music in a presentation or video will have a powerful effect, though not necessarily the desired one, which brings us to the use and need for silence. People need to reflect on what they are being shown, and silence can create the space for them to do that. There is a symbiotic relationship between the elements of music and silence: one cannot exist and have effect without the other. Consider carefully your use of music in a presentation, and make sure you have permission to use it. Musicians work hard to produce their pieces, and while they are often very generous if asked, they generally don't appreciate unapproved use.

Sounds are quite definitely something we take for granted. We get a lot of information about what we are seeing from the sounds that go along with it. Consider: you are watching a baseball game, see the batter swing, watch him run, but don't hear the crack of bat against ball. Or: same situation, but what you hear is not a solid whack, but a little thud. How does each of those scenes strike you? When using sound in your presentations, it must be clear enough to have the desired effect. A voice describing a painting has little or no effect on the viewer if the voice is so muffled that it is hard to understand.

Therefore, keep music and sound in your plans as important elements, giving them equal consideration with visual elements. Make sure when you use them that the music and sound is clearly recorded, audible, and properly placed. Premiere can allow you to edit the soundtrack of a QuickTime movie, if necessary.

Authoring

Authoring programs are the glue that binds presentations together. By various methods, they allow for timed and sequenced presentation of sounds, images, text, and QuickTime movies. Using an authoring program is really a form of programming: giving the computer specific instructions on how to do various tasks. But relax, the point of authoring programs is that they are set up to make the task as easy and friendly as possible. To varying degrees, they succeed.

There are basically two varieties of authoring programs. The first is based on the "card" metaphor. Each action or group of actions is represented, during the creation process, as a card or slide. Each slide can have any of the media discussed above; the presentation can be interactive and contain branching choices and all manner of user control. HyperCard and SuperCard are two examples of this type of program, both capable of producing a wide variety of presentations, though limited to images with thousands of colors.

The other model for authoring programs is a more open, object-oriented form. This means that you can choose to have pages presented in sequential order, or user chosen order, or have all the action happen on the same screen or backdrop. The "programming" is done by connecting little modules that perform specific actions, like show a picture or play a sound or wait. This model of authoring program is much more flexible, but also more complex. Macromedia Director and Authorware are examples of this type of authoring program.

Most authoring programs can generate a stand-alone presentation that can be played on any computer, regardless of whether the creation program is present. This is done by putting the presentation into a self-running program,sometimes called a package, or by providing a freely distributable player program.

3.   Conclusions

There are a number of factors that will contribute to the success of a multimedia project:

Cooperation. As mentioned above, cooperative working is key to successful completion of multimedia projects. The atmosphere of co-operative learning and production must be fostered throughout the entire production process, at all stages, by encouraging mutual support, critiques, and questioning. This applies to teachers and students alike.

Focus. The demons and angels of multimedia are the vast wealth of possibilities. It is up to the project leader, teacher, to keep the projects focused on the possible and doable. Conversely, it is important that the producers, while making their initial flow charts, be given free rein to dream and imagine the wildest (if they wish) possible schemes for their projects. These plans must then be looked at critically to find the middle ground between the dream and the possible. As the production time nears an end, it is important to remember that some sort of completion and/or closure is as important as an evocative program design.

Support. Creating multimedia involves learning many new skills and techniques; success requires adequate and free flowing support. Teachers and students alike should know where to turn for help. They must feel comfortable asking even the most basic, seemingly stupid, question. No question in this work is too basic, since everyone learns and practices the requisite skills in a different order and way. Support must come from peers, teachers, students, consultants, in a timely and generous manner.

Access. In order to make these projects, producers must have generous and easy access to the computers and peripherals. It takes time to learn the skills and techniques, and time to experiment. Large and comfortable blocks of time must be made available to producers, and they must be made to feel free, secure, and supported in using and experimenting with the equipment.

4.　　Glossary　of　terms

8-bit color: display systems that allocate 8 bits of memory to define the color levels of each pixel and show 256 distinct colors at the same time.

8-bit sound: sound recording and playback systems that use 8 bits of memory for each digital sample and give playback slightly better than AM radio.

16-bit color: display systems that allocate 5 bits of memory for the red and blue components of each pixel and 6 bits to the green components and show 65,536 distinct colors at one time.

16-bit sound: audio created and/or played back using 16 bits of memory (64,000 possible levels) for each digital sample. This is the standard for audio compact discs.

24-bit color: display systems that allocate 8 bits for each of the red, blue, and green components of the color of each pixel, showing up to 16.8 million possible colors. This mode is also known as "true color."

analog video: video that is recorded and played back using changes in magnetic levels, e.g., the video we see when we watch a videocassette.

animation: a video or film sequence that gives the illusion of movement by presenting a series of slightly differently drawn or photographed frames.

authoring program: a programming environment that allows for the creation of multimedia programs.

bit: the smallest unit of computer memory.

bitmapped: video displays and graphics output made up of individual dots, each one individually controlled by a bit of memory.

CD: compact disc, an optical recording system popular for audio and data.

CD-ROM: a subset of CD standards (ROM stands for "read only memory"); holds about 600 MB of data.

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chroma: the color component of a signal or image.

chroma key: a color-based video matte (overlay) system that drops all areas of a selected color, usually blue, of a foreground image and replaces them with the corresponding areas of a second image.

composite:
      1) the combination of several images into one;
      2) the system of analog video where the color (chroma) and brightness (luma) signals are combined into one waveform.

compression: translating data into a more compact form by discarding redundant information, then reconstructing the data to its original form; can be either lossless or lossy.

digital signal processing (DSP):   a specialized computer chip designed for fast and complex operations on signals representing waveforms, such as audio or video.

digital video: a method of representing moving images by number values instead of by varying magnetic levels (analog video).

dither: placing black, white, or color pixels in an image to soften an edge, smooth a jagged line, or simulate a color transition.

down sampling: to reduce the amount of data in a file by selecting only parts of the original information.

dub: a copy.

fidelity: trueness of the received or recorded copy to the original; in video or audio. There is usually a trade-off between fidelity and file/storage size.

field: for a video signal, a set of lines produced by one sweep down the screen. For interlaced video (what we watch on TV), it takes two such fields to make one frame (complete image).

filter:

    1) a partially transparent material that passes or blocks certain light colors;

    2) an electronic circuit or unit that passes or blocks signals of a particular type or frequency;

    3) any circuit or device (hardware or software) that shapes or conditions a signal or information. Adobe Photoshop uses filters to perform certain image processing operations.

frame:

    1) to compose a shot in video or film, to make the image fit into the "frame" of the screen;

    2) a complete video image, composed of two fields.

full motion video: video presented at the normal frame that video is broadcast (in USA, 30 frames per second).

General MIDI: a standard configuration for MIDI digital music systems that assigns instruments and sounds to specific channels.

hypermedia: a system or document that presents multiple pathways that the user can select and follow, rather than simply proceeding from beginning to end. It may include text, graphics, sound, and other types of data.

hypertext: a system or document that provides multiple pathways (links) through a collection of text that a user can follow, rather than just going from beginning to end.

interactive video: the integration of video and computer technologies in which a video program (moving images and sound tracks) and computer programs run together so that the user's choices affect the program's outcome.

JPEG: stands for "Joint Photographic Experts Group," which developed a standard for compressing still images.

key:

    1) in lighting, short for key light, the principle (usually brightest) light used to illuminate the main subject;

    2) to switch between two or more video sources using a control signal;

    3) an image whose color or brightness is used to determine the switching between two or more video signals.

    4) in animation, short for a key frame, or an image used as a starting, ending, or reference point.

line level: in audio, a signal level likely to be the output of a cassette deck or CD player as opposed to that of a microphone.

link: the connection between items of information(sometimes referred to as nodes) in a hypermedia system.

lossless compression: compression methods that produce files that decompress into an exact copy (no loss of quality) of the original information.

lossy compression: compression systems that produce files that decompress to produce files that are only an approximation (to varying degrees) of the original, often of acceptable quality.

luminance: the brightness or intensity of an image, in particular the brightness without regard to color.

microphone level: a high sensitivity audio input intended for low level signals, such as a microphone.

MIDI: stands for Musical Instrument Digital Interface, an industry standard connection and system of communication for the digital control of musical instruments (synthesizers).

MPEG: stands for "Moving Pictures Experts Group," a standard for compressing moving images.

nonlinear editing: video editing methods that record source clips on a hard disk, allowing the user to assemble the clips into any order and see the result without shuttling through the tape from beginning to end.

overdub: to add a signal or channel to existing material, especially audio.

overlay: to show one image (still, moving, or text) on top of another image.

pan: moving the camera or point of view horizontally.

parameter: a limit, boundary, or defining term.

PICT: a common file format used to pass images back and forth between Macintosh applications.

picture depth: the amount of storage allocated per picture element, usually expressed in numbers of colors or bits. The deeper the image, the more colors it contains.

pixel: picture element, the smallest part of a picture that can be addressed or changed in a digital image.

posterize: to transform an image to a more stark form by rounding all tonal values to a smaller number of possible values.

QuickTime: Apple's architecture for making digital movies.

render: to draw an image as it would appear in final form rather than as a blueprint or schematic.

resolution: a description of the detail in an image or a sound. Image resolution is described in pixels per inch (ppi) or dots per inch (dpi) and picture depth or bit depth. Sound resolution is described in terms of sampling frequency (kHz.) and bit depth. The higher the numbers, the greater the possible detail.

sampled sound: sound that has been captured and converted to digital form (sampled).

sampling frequency: the number of times per second that a sopund's waveform is captured and converted to digital form, expressed as kiloHerz (kHz.).

score:
      1) the written form of a piece of music;
      2) writing down a piece of music;
      3) the musical part of the soundtrack for a film or video.

shot: a single continuous run of film or videotape.

signal: an electrical current that transmits video or audio information.

source: the original, used to make copies. In video, the original footage that is either edited by copying or digitizing. In software, the original programming code that is converted into a form that can be read by a computer.

Standard MIDI File (SMF):   a format for placing the data from a MIDI data stream into a file that can be exchanged and read by different applications.

storyboard: a set of images representing the flow of a video or film project, made for planning purposes.

synthesized sound: sound that is created from a set or series of parameters, rather than replayed from a sampled sound.

synthesizer: a musical instrument, circuit, or module that creates sounds electronically based on changeable settings or parameters.

TIFF: an image file format good for cross platform (Macintosh and PC) exchange and printing.

true color: usually refers to 24-bit color, enough colors available to make continuous tones and realistic representation.

value: when speaking of color, the degree of lightness or darkness.

vector graphics: images and drawings made up of lines and other geometrical forms created by mathematical representations rather than individual dots or pixels.

videodisc: a standard format for 12-inch optical discs that carry analog video signals.

zoom:
   1) to change the size of an area selected for display to provide either a more detailed view or more of an overview;
   2) for a camera shot, to change the distance relationship between the camera and subject.

5.

Reference List

BOOKS

Interactivity by Design, by Ray Kristof and Amy Satran, Adobe Press, 1995. ISBN: 1-56830-221-5.

As the title says, an excellent and inspiring presentation of a process for designing interactive materials.

MacWorld Photoshop 5 Bible, by Deke McClelland, IDG Books, 1998. ISBN: 0-7645-3231-6.

Very thorough reference and tutorials to Photoshop, a mainstay for image processing. Comes with a CD-ROM containing filters, auxiliary programs, and reusable stock images and movies.

Multimedia Demystified, by Apple Computer (various authors), Random House/New Media, 1994. ISBN: 0-679-75603-5.

A guide to developing multimedia products and services, this book spends most of its space dealing with production organization, project forming and the teamwork necessary to make multimedia projects. There are also references to tools and good sources for more information. Well organized in a quasi-hypermedia format.

Television Production Handbook (5th Edition), by Herbert Zettl, Wadsworth, 1992. ISBN: 0-534-14826-3.

Everything to do with making video, from technology to shot composition, lighting, sound, editing, and special effects.

Sight Sound Motion: Applied Media Aesthetics, by Herbert Zettl, Wadsworth, 1990. ISBN: 0-534-07952-0.

An excellent, if dense, source book, with great pictures, about the effects of different sorts of media compositions, pictures, sound, graphics, etc.

MAGAZINES

A/V Video: a journal of presentation and production technology. Published monthly by Montage Publishing, 701 Westchester Ave., White Plains, NY 10604. Free to qualified professionals or $53/year.

Digital Video: coverage of all aspects of digital video and multimedia, all platforms. Published monthly by Active Media (IDG), 600 Townshend St., San Francisco CA 94103. $29.97/year.

MacWorld: published monthly by MacWorld Communications, 501, Second St., San Francisco CA 94107. $30/year, special deals available.

Videography: coverage of all areas of the video industry, analog and digital. Published monthly by PSN Publications, 2 Park Avenue, Suite 1820, New York, NY 10016. $30/year or free to qualified professionals.

Wired: journal of reportage, fashion, design, philosophy and industry news and trends. Published monthly by Wired Ventures, LTD, 520 Third Street, Fourth Floor, San Francisco CA 94107. $39.95/year.

Addresses and locations

(Use this space to keep track of the Internet addresses of useful resource sites.)