EDITING IN MODERN ERA

CONTENT

TUTORIAL

Editing

Editing is the process of selecting and preparing written, visual, audible, and film media used to convey information. The editing process can involve correction, condensation,

organization, and many other modifications performed with an intention of producing a correct, consistent, accurate and complete work.

The editing process often begins with the author's idea for the work itself, continuing as a collaboration between the author and the editor as the work is created. As such, editing can involve creative skills, human relations and a precise set of methods.

There are various editorial positions in publishing. Typically, one finds editorial assistants reporting to the senior-level editorial staff and directors who report to senior executive editors. Senior executive editors are responsible for developing a product for its final release. The smaller the publication, the more these roles overlap.

The top editor at many publications may be known as the chief editor, executive editor, or simply the editor. A frequent and highly regarded contributor to a magazine may acquire the title of editor-at-large or contributing editor. Mid-level newspaper editors often manage or help to manage sections, such as business, sports and features. In U.S. newspapers, the level below the top editor is usually the managing editor.

In the book publishing industry, editors may organize anthologies and other compilations, produce definitive editions of a classic author's works (scholarly editor), and organize and manage contributions to a multi-author book (symposium editor or volume editor). Obtaining manuscripts or recruiting authors is the role of an acquisitions editor or a commissioning editor in a publishing house. Finding marketable ideas and presenting them to appropriate authors are the responsibilities of a sponsoring editor.

Copy editors correct spelling, grammar and align writings to house style. Changes to the publishing industry since the 1980s have resulted in nearly all copy editing of book manuscripts being outsourced to freelance copy editors.

At newspapers and wire services, copy editors write headlines and work on more substantive issues, such as ensuring accuracy, fairness, and taste. In some positions, they design pages and select news stories for inclusion. At U.K. and Australian newspapers, the term is sub-editor. They may choose the layout of the publication and communicate with the printer. These editors may have the title of layout or design editor or (more so in the past) makeup editor.

Technical editing

Technical editing involves reviewing text written on a technical topic, identifying usage errors and ensuring adherence to a style guide.

Technical editing may include the correction of grammatical mistakes, misspellings, mistyping, incorrect punctuation, inconsistencies in usage, poorly structured sentences, wrong scientific terms, wrong units and dimensions, inconsistency in significant figures, technical ambivalence, technical disambiguation, statements conflicting with general scientific knowledge, correction of synopsis, content, index, headings and subheadings,

correcting data and chart presentation in a research paper or report, and correcting errors in citations.

Large companies dedicate experienced writers to the technical editing function. Organizations that cannot afford dedicated editors typically have experienced writers peer-edit text produced by less experienced colleagues.

It helps if the technical editor is familiar with the subject being edited. The "technical" knowledge that an editor gains over time while working on a particular product or technology does give the editor an edge over another who has just started editing content related to that product or technology. But essential general skills are attention to detail, the ability to sustain focus while working through lengthy pieces of text on complex topics, tact in dealing with writers, and excellent communication skills.

Editing services

Editing is a growing field of work in the service industry. Paid editing services may be provided by specialized editing firms or by self-employed (freelance) editors.

Editing firms may employ a team of in-house editors, rely on a network of individual contractors or both.[5] Such firms are able to handle editing in a wide range of topics and genres, depending on the skills of individual editors. The services provided by these editors may be varied and can include proofreading, copy editing, online editing, developmental editing, editing for search engine optimization (SEO), etc.

Self-employed editors work directly for clients (e.g., authors, publishers) or offer their services through editing firms, or both. They may specialize in a type of editing (e.g., copy editing) and in a particular subject area. Those who work directly for authors and develop professional relationships with them are called authors' editors.

Audio editing software

Audio editing software is software which allows editing and generating of audio data. Audio editing software can be implemented completely or partly as library, as computer application, as Web application or as a loadable kernel module. Wave Editors are digital audio editors and there are many sources of software available to perform this function. Most can edit music, apply effects and filters, adjust stereo channels etc.

A digital audio workstation (DAW) consists of software to a great degree, and usually is composed of many distinct software suite components, giving access to them through a unified graphical user interface using GTK+, Qt or some other library for the GUI widgets.

For use with music

Editors designed for use with music typically allow the user to do the following:

The ability to import and export various audio file formats for editing.
Record audio from one or more inputs and store recordings in the computer's memory as digital audio
Edit the start time, stop time, and duration of any sound on the audio timeline
Fade into or out of a clip (e.g. an S-fade out during applause after a performance), or between clips (e.g. crossfading between takes)
Mix multiple sound sources/tracks, combine them at various volume levels and pan from channel to channel to one or more output tracks
Apply simple or advanced effects or filters, including compression, expansion, flanging, reverb, audio noise reduction and equalization to change the audio
Playback sound (often after being mixed) that can be sent to one or more outputs, such as speakers, additional processors, or a recording medium
Conversion between different audio file formats, or between different sound quality levels
Typically these tasks can be performed in a manner that is non-linear. Audio editors may process the audio data non-destructively in real-time, or destructively as an "off-line" process, or a hybrid with some real-time effects and some off-line effects.

Comparison of destructive and real-time editing

Destructive editing modifies the data of the original audio file, as opposed to just editing its playback parameters. Destructive editors are also known as "sample editors".

Destructive editing applies edits and processing directly to the audio data, changing the data immediately. If, for example, part of a track is deleted, the "deleted" audio data is immediately removed from that part of the track.

Real-time editing does not apply changes immediately, but applies edits and processing on the fly during playback. If, for example, part of a track is deleted, the "deleted" audio data is not actually removed from the track, but is hidden and will be skipped on playback.

Advantages of destructive editing

In graphical editors, all changes to the audio is usually visible immediately as the visible waveform is updated to match the audio data.
The number of effects that may be applied is virtually unlimited (though may be limited by disk space available for "undo" data).
Editing is usually precise down to exact sample intervals.
Effects may be applied to a precisely specified selected region.
Mixing down or exporting the edited audio is usually relatively quick as little additional processing is required.

Limitations of destructive editing

Once an effect has been applied, it cannot usually be changed. This is usually mitigated by the ability to "undo" the last performed action. Typically a destructive audio editor will maintain many levels of "undo history" so that multiple actions may be undone in the reverse order that they were applied.
Edits can only be undone in the reverse order that they were applied (undoing the most recent edit first).

Advantages of real-time editing

Effects can usually be adjusted during playback, or at any other time.
Edits may be undone or adjusted at any time in any order.
Multiple effects and edits may be 'stacked' so that they are applied to the audio as an effect chain.

A stack of effects may be changed so that effects are applied in a different order, or effects inserted or removed from the chain.
Some real-time editors support effect automation so that changes to effect parameters may be programmed to occur at specified times during audio playback.

Limitations of real-time editing

The waveform does not usually show the effect of processing until the audio has been mixed-down or "bounced" (rendered) to another track.

The number of effects that may be applied is limited by the available processing power of the computer or editing hardware. In some editors this may be mitigated by "freezing" the track (applying the effect stack destructively).

It is not usually possible to have an effect only on part of a track. To apply a real-time effect to part of a track usually required that the effect is set to turn on at one point and turn off at another.

In multi-track editors, if audio is copied or moved from one track to another, the audio in the new track may sound different from how it sounded in the original track as there may be different real-time effects in each track.
In some applications, mixing down or exporting the edited audio may be slow as all effects and processing needs to be applied.

For use with speech

Editors designed for use in speech research add the ability to make measurements and perform acoustic analyses such as extracting and displaying a fundamental frequency contour or spectrogram. They typically lacks most or all of the effects that interest musicians

Video editing

The term video editing can refer to: The process of manipulating video images. Once the province of expensive machines called video editors, video editing software is now available for personal computers and workstations. Video editing includes cutting segments (trimming), re-sequencing clips, and adding transitions and other Special Effects.

Linear video editing, using video tape and is edited in a very linear way. Several video clips from different tapes are recorded to one single tape in the order that they will appear.

Non-linear editing system (NLE), This is edited on computers with specialized software. These are non destructive to the video being edited and use programs such as Adobe Premiere Pro, Final Cut Pro and Avid.

Offline editing is the process in which raw footage is copied from an original source, without affecting the original film stock or video tape. Once the editing has been completely edited, the original media is then re-assembled in the online editing stage.

Online editing is the process of reassembling the edit to full resolution video after an offline edit has been performed and is done in the final stage of a video production. Vision mixing, when working within live television and video production environments. A vision mixer is used to cut live feed coming from several cameras in real time.

Video editing is the process of editing segments of motion video production footage, special effects and sound recordings in the post-production process. Motion picture film editing is a predecessor to video editing and, in several ways, video editing simulates motion picture film editing, in theory and the use of linear video editing and video editing software on non-linear editing systems (NLE). Using video, a director can communicate non-fictional and fictional events. The goals of editing is to manipulate these events to bring the communication closer to the original goal or target. It is a visual art.

Early 1950's video tape recorders (VTR) were so expensive, and the quality degradation caused by copying was so great, that 2 inch Quadruplex videotape was edited by visualizing the recorded track with ferrofluid and cutting with a razor blade or guillotine cutter and splicing with video tape. The two pieces of tape to be joined were painted with a solution of extremely fine iron filings suspended in carbon tetrachloride, a toxic and carcinogenic compound. This "developed" the magnetic tracks, making them visible when viewed through a microscope so that they could be aligned in a splicer designed for this task.

Improvements in quality and economy, and the invention of the flying erase-head, allowed new video and audio material to be recorded over the material already recorded on an existing magnetic tape and was introduced into the linear editing technique. If a scene closer to the beginning of the video tape needed to be changed in length, all later scenes would need to be recorded onto the video tape again in sequence. In addition,

sources could be played back simultaneously through a vision mixer (video switcher) to create more complex transitions between scenes. A popular 1970-80s system for doing that was the U-matic equipment (named for the U-shaped tape path). That system used two tape players and one tape recorder, and edits were done by automatically having the machines back up, then speed up together in synchrony, so the edit didn't roll or glitch. Later, 1980-90's came the smaller beta equipment (named for the B-shaped tape path), and more complex controllers, some of which did the synchronizing electronically.

Editor in linear VCR suite

There was a transitional analog period using multiple source videocassette recorder (VCR)s with the EditDroid using LaserDisc players, but modern NLE systems edit video digitally captured onto a hard drive from an analog video or digital video source. Content is ingested and recorded natively with the appropriate codec which will be used by video editing software to manipulate the captured footage. High-definition video is becoming more popular and can be readily edited using the same video editing software along with related motion graphics programs. Video clips are arranged on a timeline, music tracks, titles, digital on-screen graphics are added, special effects can be created, and the finished program is "rendered" into a finished video. The video may then be distributed in a variety of ways including DVD, web streaming, QuickTime Movies, iPod, CD-ROM, or video tape.

Home video editing

Like many other technologies, the cost of video editing has declined by an order of magnitude or more. The 2" Quadruplex system cost so much that many television production facilities could only afford a single unit and editing was a highly involved process requiring special training. In contrast, nearly any home computer sold since the year 2000 has the speed and storage capacity to digitize and edit standard-definition television (SDTV). The two major retail operating systems include basic video editing software - Apple's iMovie and Microsoft's Windows Movie Maker. Additional options exist such as more advanced commercial products, as well as there are free opensource video-editing programs. Automatic video editing products have also emerged, opening up video editing to a broader commercial audience of amateurs and reducing the time it takes to edit videos.

Film editing

Film editing is a creative and technical part of the post-production process of filmmaking. The term is derived from the traditional process of working with film which increasingly involves the use of digital technology.

The film editor works with the raw footage, selecting shots and combines them into sequences which create a finished motion picture. Film editing is described as an art or skill, the only art that is unique to cinema, separating filmmaking from other art forms

that preceded it, although there are close parallels to the editing process in other art forms such as poetry and novel writing. Film editing is often referred to as the "invisible art" because when it is well-practiced, the viewer can become so engaged that he or she is not aware of the editor's work.

On its most fundamental level, film editing is the art, technique, and practice of assembling shots into a coherent sequence. The job of an editor is not simply to mechanically put pieces of a film together, cut off film slates, or edit dialogue scenes. A film editor must creatively work with the layers of images, story, dialogue, music, pacing, as well as the actors' performances to effectively "re-imagine" and even rewrite the film to craft a cohesive whole. Editors usually play a dynamic role in the making of a film. Sometimes, auteurist film directors edit their own films, for example, Akira Kurosawa, Bahram Beyzai, and the Coen Brothers.

With the advent of digital editing, film editors and their assistants have become responsible for many areas of filmmaking that used to be the responsibility of others. For instance, in past years, picture editors dealt only with just that—picture. Sound, music, and (more recently) visual effects editors dealt with the practicalities of other aspects of the editing process, usually under the direction of the picture editor and director. However, digital systems have increasingly put these responsibilities on the picture editor. It is common, especially on lower budget films, for the editor to sometimes cut in makeshift music, mock up visual effects, and add temporary sound effects or other sound replacements. These temporary elements are usually replaced with more refined final elements produced by the sound, music, and visual effects teams hired to complete the picture.

Film editing technology

Before the widespread use of non-linear editing systems, the initial editing of all films was done with a positive copy of the film negative called a film workprint (cutting copy in UK) by physically cutting and pasting together pieces of film. Strips of footage would be hand cut and attached together with tape and then later in time, glue. Editors were very precise; if they made a wrong cut or needed a fresh positive print, it cost them money for the lab to reprint the footage and push the editing process back farther. With the invention of a splicer and threading machine with a viewer such as a Moviola, or "flatbed" machine such as a K.-E.-M. or Steenbeck, the editing process sped up a little bit and cut came out cleaner and more precise.

Today, most films are edited digitally (on systems such as **Avid, Final Cut Pro or Premiere Pro**) and bypass the film positive workprint altogether. In the past, the use of a film positive (not the original negative) allowed the editor to do as much experimenting as he or she wished, without the risk of damaging the original. With digital editing, editors can experiment just as much as before except with the footage completely transferred to a computer hard drive.

When the film workprint had been cut to a satisfactory state, it was then used to make an edit decision list (EDL). The negative cutter referred to this list while processing the negative, splitting the shots into rolls, which were then contact printed to produce the final film print or answer print. Today, production companies have the option of bypassing negative cutting altogether. With the advent of digital intermediate ("DI"), the physical negative does not necessarily need to be physically cut and hot spliced together; rather the negative is optically scanned into computer(s) and a cut list is conformed by a DI editor.

Post-production

Post-production editing may be summarized by three distinct phases commonly referred to as the editor's cut, the director's cut, and the final cut.

There are several editing stages and the editor's cut is the first. An editor's cut (sometimes referred to as the "Assembly edit" or "Rough cut") is normally the first pass of what the final film will be when it reaches picture lock. The film editor usually starts working while principal photography starts. Likely, prior to cutting, the editor and director will have seen and discussed "dailies" (raw footage shot each day) as shooting progresses. Screening dailies gives the editor a general idea of the director's intentions. Because it is the first pass, the editor's cut might be longer than the final film. The editor continues to refine the cut while shooting continues, and often the entire editing process goes on for many months and sometimes more than a year, depending on the film.

When shooting is finished, the director can then turn his or her full attention to collaborating with the editor and further refining the cut of the film. This is the time that is set aside where the film editor's first cut is molded to fit the director's vision. In the United States, under the rules of the Directors Guild of America, directors receive a minimum of ten weeks after completion of principal photography to prepare their first cut. While collaborating on what is referred to as the "director's cut", the director and the editor go over the entire movie in great detail; scenes and shots are re-ordered, removed, shortened and otherwise tweaked. Often it is discovered that there are plot holes, missing shots or even missing segments which might require that new scenes be filmed. Because of this time working closely and collaborating – a period that is normally far longer and more intricately detailed than the entire preceding film production – many directors and editors form a unique artistic bond.

Often after the director has had their chance to oversee a cut, the subsequent cuts are supervised by one or more producers, who represent the production company or movie studio. There have been several conflicts in the past between the director and the studio, sometimes leading to the use of the "Alan Smithee" credit signifying when a director no longer wants to be associated with the final release.

Footage

In filmmaking and video production, footage is the raw, unedited material as it had been originally filmed by movie camera or recorded by a video camera which usually must be edited to create a motion picture, video clip, television show or similar completed work. More loosely, footage can also refer to all sequences used in film and video editing, such as special effects and archive material (for special cases of this, see stock footage and B roll). Since the term originates in film, footage is only used for recorded images, such as film stock, videotapes or digitized clips – on live television, the signals from video cameras are called sources instead.

The origin of the term "footage" is that early 35 mm silent film has traditionally been measured in feet and frames; the fact that film was measured by length in cutting rooms, and that there are 16 frames (4-perf film format) in a foot of 35 mm film which roughly represented 1 second of silent film, made footage a natural unit of measure for film. The term then became used figuratively to describe moving image material of any kind. Television footage, especially news footage, is often traded between television networks, but good footage usually commands a high price. The actual sum depends on duration, age, size of intended audience, duration of licensing and other factors. Amateur film footage of current events can also often fetch a high price on the market – scenes shot inside the World Trade Center during the September 11, 2001 attacks were reportedly sold for US$45,000. Sometimes film projects will also sell or trade footage, usually second unit material not used in the final cut. For example, the end of the non-director's cut version of Blade Runner used landscape views that were originally shot for The Shining before the script was modified after shooting had finished. A footage broker is an agent who deals in footage by promoting it to footage purchasers or producers, while taking a profit in the sales transaction.

Shot (filmmaking)

In filmmaking and video production, a shot is a series of frames, that runs for an uninterrupted period of time. Film shots are an essential aspect of a movie where angles, transitions and cuts are used to further express emotion, ideas and movement. The term "shot" can refer to two different parts of the filmmaking process:

In production, a shot is the moment that the camera starts rolling until the moment it stops.
In film editing, a shot is the continuous footage or sequence between two edits or cuts.

Final Cut Pro

Final Cut Pro is a series of non-linear video editing software programs first developed by Macromedia Inc. and later Apple Inc. The most recent version, Final Cut Pro X 10.3, runs on Intel-based Mac computers powered by OS X El Capitan or later. The software allows users to log and transfer video onto a hard drive (internal or external), where it can be edited, processed, and output to a wide variety of formats. The fully rewritten Final Cut Pro X was introduced by Apple in 2011, with the last version of the legacy Final Cut Pro being version 7.0.3.

Since the early 2000s, Final Cut Pro has developed a large and expanding user base, mainly video hobbyists and independent filmmakers. It had also made inroads with film and television editors who have traditionally used Avid Technology's Media Composer. According to a 2007 SCRI study, Final Cut Pro made up 49% of the United States professional editing market, with Avid at 22%.[1] A published survey in 2008 by the American Cinema Editors Guild placed their users at 21% Final Cut Pro (and growing from previous surveys of this group), while all others were still on an Avid system of some kind.

Features

Final Cut Pro provides non-linear, non-destructive editing of any QuickTime-compatible video format including DV, HDV, P2 MXF (DVCProHD), XDCAM (via plug-in), 2K, 4K and 5K film formats.[3] It supports a number of simultaneously composited video tracks (limited mainly by video form capability); unlimited audio tracks; multi-camera editing for combining video from multiple camera sources; as well as standard ripple, roll, slip, slide, scrub, razor blade and time remapping edit functions. It comes with a range of video transitions and a range of video and audio filters such as keying tools, mattes and vocal de-poppers and de-essers. It also has a manual 3-way color correction filter, videoscopes and a selection of generators, such as slugs, test cards and noise.

Interface

This section is written like a manual or guidebook. Please help rewrite this section from a descriptive, neutral point of view, and remove advice or instruction. (January 2010) (Learn how and when to remove this template message)
The legacy (v. 7.0.3 and earlier) Final Cut (Pro and Express) interface was designed around non-computerized editing work-flows, with four main windows that replicate tried-and-trusted methods of organising, viewing and editing physical tape or film media. The browser, where source media files (or clips) are listed, replicates the editor's traditional film "bins" or stacks of videotapes. The Viewer, where individual media files can be previewed and trimmed, replicates the source monitor of older tape-based systems. The Canvas replicates the "program" monitor in such systems, where the edited material is viewed. The Timeline, where media are assembled into a sequence, replicates the physically edited film or master tape of earlier systems. There is also a small Toolbox window and two audio-level indicators for the left and right audio channels.

Both the Viewer and Canvas have a shuttle interface (for variable-speed scanning, forwards or backwards through a clip) and a jogging interface for frame-by-frame advancing.

Browser

As in most digital non-linear editing applications, the Browser is not an interface to the computer's file-system. It is an entirely virtual space in which references to clips (aliases)

are placed for easy access, and arranged in folders called 'bins'. Since they are only references to clips that are on the media drive of the computer, moving or deleting a source file on the media hard drive destroys the link between the entry in the Browser and the actual media. This results in a 'media offline' situation, and the media must be 'reconnected'. Final Cut Pro can search for the media itself, or the user can do this manually. If multiple clips are offline at the same time, Final Cut can reconnect all the offline media clips that are in the relative directory path as the first offline media clips that is reconnected.

The browser has an 'effects' tab in which video transitions and filters can be browsed and dragged onto or between clips.

Canvas

The canvas outputs the contents of the Timeline. To add clips to the Timeline, besides dragging them there, it is possible to drag clips from the Browser or Viewer onto the Canvas, whereupon the so-called 'edit overlay' appears. The edit overlay has seven drop zones, into which clips can be dragged in order to perform different edits. The default is the 'overwrite' edit, which overwrites at an in point or the space occupied after the playhead with the incoming clip. The 'insert' edit slots a clip into the sequence at the in point or playhead's position, keeping the rest of the video intact, but moving it all aside so that the new clip fits. There are also drop zones to have the application automatically insert transitions. The 'replace' edit replaces a clip in the Timeline with an incoming clip, and the 'fit to fill' edit does the same thing, but at the same time, it adjusts the playback speed of the incoming clip so that all of it will fit into the required space [in the Timeline]. Finally there is the 'superimpose' edit, which automatically places the dropped clip on the track above the clip in the Timeline, with a duration equal to the clip below it. Unless an in or out point are set, all edits occur from the position of the playhead in the Timeline.

Using the wireframe view on the canvas, the clip can be manipulated directly - dragging it around in the canvas to change its position, for example, or resizing it. Precise adjustment controls for these things are in the viewer.

Viewer

The viewer has tabs for each channel of the selected clip's audio, in which the waveform for the audio can be viewed and scrubbed, and where its volume can be keyframed. The filters tab is where effects for the clip appear and where their parameters can be adjusted and keyframed. If the clip selected is a generator (such as an oval shape), a control tab appears for changing its geometrical properties. Finally, the viewer's motion tab contains tools to adjust the scale, opacity, cropping, rotation, distortion, drop shadow, motion blur and time remapping properties of a clip. Mini-timelines to the right of each parameter allow the property to be keyframed. The Viewer is not present in Final Cut Pro X.

Timeline

Clips can be edited together in timelines called sequences. Sequences can be nested inside other sequences, so that a filter or transition can be applied to the grouped clips.

The Timeline in Final Cut Pro allows 99 video tracks to be layered on top of each other. If a clip is higher [in the timeline] than another, then it obscures whatever is below it. The size of a video clip can be altered, and the clips can be cropped, among many other settings that can be changed. Opacity levels can also be altered, as well as animated over the course of the clip using keyframes, defined either on a graphical overlay, or in the Viewer's 'motion' tab, where precise percentage opacity values can be entered. Final Cut also has more than a dozen common compositing modes that can be applied to clips, such as Add, Subtract, Difference, Screen, Multiply, Overlay, and Travel Matte Luma/Alpha.

The compositing mode for a clip is changed by control-clicking or right-clicking on the clip and selecting it from the cascading contextual menu, or by selecting the mode from the application's 'modify' menu. For either matte modes, the clip that will perform the key is placed overneath the fill clip on the Timeline.

For more advanced compositing Final Cut Pro is compatible with Apple's Shake (discontinued) and Apple Motion software.

Keyboard shortcuts

Final Cut Pro uses a set of hot-keys to select the tools. There are almost 400 keyboard commands that allow the user to increase the speed of edits.[4] This combined with the nonlinear approach that digital editing, provides Final Cut Pro users with several editing options.

Users can also set their own customisable keyboard preferences.

File format

A Final Cut Pro Project technically consists of separate files:

- Project File
- Media Source Files
- Render Files, Cache Files

The location of the Media and the Render/Cache Files is not standardised. Final Cut Pro can be configured where to store them. Some users have a central directory where they store all their Source/Render/Cache files, some set those file paths to their specific project directory, so that they have all project files at one place.

After having finished a project, one can erase everything but the project file, to save disk space, and at a later time Final Cut Pro can re-capture/re-link all source data and recalculate all render and cache data, provided it can access all linked sources.

Project file

The first versions of Final Cut Pro and Final Cut Express used a binary file which contained all montage information such as timecode information, clip's in/out-points, size/crop/position, composition nesting, filter settings, automation data, etc.

More recent editions of Final Cut Pro and Final Cut Express, before Final Cut Pro X, used the file extension .fcp.

The latest version of Final Cut Pro, Final Cut Pro X, uses a new file extension; .fcpx. Apple has come under some criticism for not supporting the older .fcp project files, when it does support importing iMovie projects (.imovieproj files). This concern has been addressed through the use of third party software, allowing for the migration of legacy FCP file formats into working FCPX libraries and projects. The software is called 7toX[14] and was developed by Philip Hodgetts.

Media source files

Either captured from tape or loaded/imported from the file system.

Render Files, cache files, etc

Files which are generated by Final Cut Pro, i.e. audio waveform display, filter effects, etc.

Mixing console

An audio engineer adjusts a mixer while doing live sound for a band.
In audio, a mixing console is an electronic device for combining (also called "mixing"), routing, and changing the volume level, timbre (tone color) and/or dynamics of many different audio signals, such as microphones being used by singers, mics picking up acoustic instruments such as drums or saxophones, signals from electric or electronic instruments such as the electric bass or synthesizer, or recorded music playing on a CD player. In the 2010s, a mixer is able to control analog or digital signals, depending on the type of mixer. The modified signals (voltages or digital samples) are summed to produce the combined output signals, which can then be broadcast, amplified through a sound reinforcement system or recorded (or some combination of these applications).

Mixing consoles are used in many applications, including recording studios, public address systems, sound reinforcement systems, nightclubs, dance clubs, broadcasting, television, and film post-production. A typical, simple application combines signals from two microphones (each used by vocalists singing a duet, perhaps) into an amplifier that drives one set of speakers simultaneously. In live performances, the signal from the mixer usually goes directly to an amplifier which is plugged into speaker cabinets, unless the mixer has a built-in power amplifier or is connected to powered speakers. A DJ mixer

may have only two channels, for mixing two record players. A coffeehouse's tiny stage might only have a six channel mixer, enough for two singer-guitarists and a percussionist. A nightclub stage's mixer for rock music shows may have 24 channels for mixing the signals from a rhythm section, lead guitar and several vocalists. A mixing console for a large concert may have 48 channels. A mixing console in a professional recording studio may have as many as 96 channels.

In practice, mixers do more than simply mix signals. They can provide phantom power for capacitor microphones; pan control (which changes a sound's apparent position in the stereo soundfield); filtering and equalization, which enables sound engineers to boost or cut selected frequencies to improve the sound; routing facilities (to send the signal from the mixer to another device, such as a sound recording system or a control room; and monitoring facilities, whereby one of a number of sources can be routed to loudspeakers or headphones for listening, often without affecting the mixer's main output. Some mixers have onboard electronic effects, such as reverb. Some mixers intended for small venue live performance applications may include an integrated power amplifier.

Terminology
A mixing console is also known as an audio mixer, audio console, mixing desk, sound mixer, sound board, or simply as board or mixer.

Structure

A typical analog mixing board has three sections:

Channel inputs
Master controls
Audio level metering

The channel input strips are usually a bank of identical monaural or stereo input channels. Each channel has rotary knobs, buttons and/or faders for controlling the gain and equalization (e.g., bass and treble) of the signal on each channel. Depending on the mixer, a channel may have buttons which enable the audio engineer to reroute the signal to a different output for monitoring purposes, turn on an attenuator "pad", or activate other features.

The master control section is used to adjust the levels of the overall output of the mixer. The master control section has sub-group faders, master faders, master auxiliary mixing bus level controls and auxiliary return level controls. In addition it may have solo monitoring controls, a stage "talk-back" microphone control (so the sound engineer can talk to the band, who may be some distance away at a live show or who might be separated in an isolation booth in the recording studio), muting controls and an output matrix mixer. On smaller mixers the inputs are on the left of the mixing board and the master controls are on the right. In larger mixers, the master controls are in the center with input faders and channel strips on both sides.

The audio level meters (which may be meters with needles or LEDs) may be above the input and master sections or they may be integrated into the input and master sections themselves. The audio level meters indicate when the signals are clipping.

Channel input strip

The input strip is usually separated into these sections:

Input jacks
Microphone preamplifiers
equalization
Dynamics processing (e.g. dynamic range compression, gating)
Routing including direct outs, aux-sends, panning control and subgroup assignments
Input faders (on some smaller mixers, these may be rotary knobs, to save space)

On many consoles, these sections are color-coded for quick identification by the operator. Each signal (e.g., a singer's vocal mic, the signal from an electric bass amp's DI box, etc.) that is plugged into the mixer has its own channel. Depending on the specific mixer, each channel is stereo or monaural. On most mixers, each channel has an XLR input, and many have RCA or quarter-inch TRS phone connector line inputs. The smallest, least expensive mixers may only have one XLR input with the other inputs being line inputs. These can be used by a singer-guitarist or other small acts.

Basic input controls

Below each input, there are usually several rotary controls (knobs or "pots"). The first knob is typically a trim or gain control. The inputs buffer the signal from the external device and this controls the amount of amplification (boosting) or attenuation (turning down of gain) needed to bring the signal to a nominal level for processing. This stage is where most noise of interference is picked up, due to the high gains involved (around +50 dB, for a microphone). Balanced inputs and connectors, such as XLR or phone connectors, reduce interference problems.

A mixing console may provide insert points after the buffer/gain stage. These provide a send and return connection for external processors that only affect an individual channel's signal. Effects that operate on multiple channels connect to auxiliary sends (below).

Auxiliary send routing

The auxiliary send routes a split of the incoming signal to an auxiliary bus, which can then be routed to external devices. Auxiliary sends can either be pre-fader or post-fader, in that the level of a pre-fade send is set by the auxiliary send control, whereas post-fade sends depend on the position of the channel fader as well. Auxiliary sends can send the signal to an external processor such as a reverb, with the return signal routed through another channel or designated auxiliary return. These are normally post-fader. Pre-fade auxiliary sends can provide a monitor mix to musicians onstage (which they hear through

monitor speakers pointing at the performers or in-ear monitors); this mix is thus independent of the main mix.

Most live radio broadcasting sound boards send audio through "program" channels. (See image to the lower left) When a given channel button is selected, the audio will be sent to that device or transmitter. Program 1 is typically the on-air live feed, or what those listening to the broadcast will hear. Most boards have 3-4 programming channels, though some have more options. Often, one of the programming channels will feed one or more computers used for editing or sound playback. Another channel may be used to send audio to the talents' headset if they are broadcasting from a remote area.

Channel equalization

Further channel controls affect the equalization of the signal by separately attenuating or boosting a range of frequencies. The smallest, least expensive mixers may only have bass and treble controls. Most mid-range and higher-priced mixers have bass, midrange, and treble, or even additional mid-range controls (e.g., low-mid and high-mid). Many high-end mixing consoles have a parametric equalizer on each channel. Some mixers have a general equalization control (either graphic or parametric) at the output, for controlling the tone of the overall mix.

Cue system

The cue system allows the operator to listen to one or more selected signals without affecting the console's audio outputs. A sound engineer can use the "cue" feature to get a sound recording she wishes to play soon cued up to the start point of a song, without the listeners hearing these actions. The signal from the cue system is fed to the console's headphone amp and may also be available as a line-level output that is intended to drive a monitor speaker system. The terms PFL (Pre Fade Listen) and AFL (After Fade Listen) are used to characterize the point in the signal flow from which the cue signal is derived. Input channels are usually configured as PFL so the operator can audition the channel without sending it to any mix. Consoles with a cue feature have a dedicated button on each channel, typically labeled Cue (or AFL, PFL, Solo, or Listen).

Solo In Place (SIP) is a related feature on advanced consoles. It typically is controlled by the Cue button, but unlike Cue, SIP is "destructive" (that is, has a major impact on) of the output mix. It mutes everything except channels being soloed. SIP is useful for setup and trouble-shooting, in that it allows the operator to quickly mute everything but the signal being worked on. SIP is potentially disastrous if engaged during performance, as it will mute all the channels except one, so most consoles require the operator to take very deliberate actions to engage SIP mode.

Subgroup and mix routing

Each channel on a mixer has a sliding volume control (fader) that allows adjustment of the level of that channel. Some smaller mixers may use a rotary control instead of a fader

to save space. The signals are summed to create the main mix, or combined on a bus as a submix, a group of channels that are then added to get the final mix (for instance, many drum mics could be grouped into a bus, and then the proportion of drums in the final mix can be controlled with one bus fader). There may also be insert points for a certain bus, or even the entire mix.

VCA groups

Some higher-end consoles use voltage-controlled amplifier (VCA) groups VCAs and DCAs function somewhat like subgroups but let the operator control the level of multiple input channels with a single fader. Unlike subgroups, no sub-mix is created. The audio signals from the assigned channels remain routed independently of VCA assignments. Since no sub-mix is created, it is not possible to insert processing such as compressors into a VCA/DCA group. In addition, on most VCA/DCA-equipped consoles, post-fader auxiliary send levels are affected by the VCA master. This is usually desirable, as post-fader auxiliary sends are commonly used for effects such as reverb, and sends to these effects should track changes in the channel signal level.

Master output controls

Subgroup and main output fader controls are often found together on the right hand side of the mixer or, on larger consoles, in a center section flanked by banks of input channels. Matrix routing is often contained in this master section, as are headphone and local loudspeaker monitoring controls. Talkback controls allow conversation with the artist through their monitors, headphones or in-ear monitor. A test tone generator might be located in the master output section. Aux returns such as those signals returning from external processors are often in the master section.

Metering

Finally, there are usually one or more VU or peak meters (peak meters often use LEDs) to indicate the levels for each channel, for the master outputs and to indicate whether the console levels are clipping the signal. The sound engineer typically adjusts the gain of the input signals to get the strongest signal that can be obtained without causing "clipping" (unwanted distortion) or causing audio feedback "howls". Having the gain set as high as possible improves the signal to noise ratio. Most mixers have at least one additional output, besides the main mix. These are either individual bus outputs, or auxiliary outputs, used, for instance, to output a different mix to onstage monitors.

As the human ear experiences audio level in a logarithmic fashion (both amplitude and frequency), mixing console controls and displays are almost always in decibels, a logarithmic measurement system. Since it is a relative measurement, and not a unit itself, the meters must be referenced to a nominal level. The "professional" nominal level used on professional mixers is considered +4 dBu. The "consumer grade" level is −10 dBV.

Hardware routing and patching

For convenience, some mixing consoles include inserts or a patch bay or patch panel. Patch bays are mainly used for recording mixers. However, live sound mixers may also include patch bays. In live sound, the cables from the onstage microphones and instrument outputs are not typically plugged directly into the mixer, because this would require a large number of cables to go from the stage the mixer. Instead, the onstage mic and instrument cables are typically plugged into the patch bay of a thick snake cable, which runs from the stage to the mixer. The outputs from the snake's second patch bay (near the mixer) are then plugged into the mixer.

Other features

Most, but not all, audio mixers can

add external effects.
use monaural signals to produce stereo sound through pan and balance controls.
provide phantom power required by some microphones.
Some mixers can

create an audible "test tone" via an oscillator. The test tone can be used to troubleshoot issues before the band arrives and determine if channels are functioning properly.
add effects internally.
read and write console automation.
be interfaced with computers or other recording equipment (to control the mixer with computer presets, for instance).
control or be controlled by a digital audio workstation via MIDI or proprietary commands.
be powered by batteries (this is only for the smallest mixers, such as four to six channel mixers that might be used on location outdoors).
provide amplifier power for external speaker cabinets (these are called "powered mixers")

Mirroring

Some mixing consoles, particularly those designed for broadcast and live sound, include facilities for "mirroring" two consoles, making both consoles exact copies of each other with the same inputs and outputs, the same settings, and the same mix. There are two primary reasons for doing this; one, in the event of a hardware failure, a second redundant console is already in place and can be switched to (an important feature for live broadcasts); second, it allows the operators to set up two identical mix positions, one at front of house — where the audio will be mixed during a performance — and the other at some other location within the theater; this way, if the acoustics at front of house are unfavorable, a mix can be programmed at an acoustically better position in the room, and the presets can be accessed from the front of house console during the performance.

Digital versus analog

Digital mixing console sales have increased dramatically since their introduction in the 1990s. Yamaha sold more than 1000 PM5D mixers by July, 2005, and other manufacturers are seeing increasing sales of their digital products. Digital mixers are more versatile than analog ones and offer many new features, such as reconfigure signal routing at the touch of a button. In addition, digital consoles often include processing capabilities such as compression, gating, reverb, automatic feedback suppression and delay. Some products are expandable via third-party software features (called plugins) that add further reverb, compression, delay and tone-shaping tools. Several digital mixers include spectrograph and real time analyzer functions. A few incorporate loudspeaker management tools such as crossover filtering and limiting. Digital signal processing can perform automatic mixing for some simple applications, such as courtrooms, conferences and panel discussions. Consoles with motorized faders can read and write console automation.

Propagation delay

Digital mixers have an unavoidable amount of latency or propagation delay, ranging from less than 1 ms to as much as 10 ms, depending on the model of digital mixer and what functions are engaged. This small amount of delay is not a problem for loudspeakers aimed at the audience or even monitor wedges aimed at the artist, but can be disorienting and unpleasant for IEMs (In-ear monitors) where the artist hears their voice acoustically in their head and electronically amplified in their ears but delayed by a couple of milliseconds.

Every analog to digital conversion and digital to analog conversion within a digital mixer entails propagation delay. Audio inserts to favorite external analog processors make for almost double the usual delay. Further delay can be traced to format conversions such as from ADAT to AES3 and from normal digital signal processing steps.

Within a digital mixer there can be differing amounts of latency, depending on the routing and on how much DSP is in use. Assigning a signal to two parallel paths with significantly different processing on each path can result in extreme comb filtering when recombined. Some digital mixers incorporate internal methods of latency correction so that such problems are avoided.

Ease of use

In the 2010s, analog consoles remain popular, as they have a column of dedicated, physical knobs, buttons, and faders for each channel, which is logical and familiar to many users. This takes more physical space, but can accommodate rapid responses to changing performance conditions.

Most digital mixers use technology to reduce physical space requirements, entailing compromises in user interface such as a single shared channel adjustment area that is selectable for only one channel at a time. Additionally, most digital mixers have virtual pages or layers that change fader banks into separate controls for additional inputs or for

adjusting equalization or aux send levels. This layering can be confusing for some operators. Analog consoles make for simpler understanding of hardware routing. Many digital mixers allow internal reassignment of inputs so that convenient groupings of inputs appear near each other at the fader bank, a feature that can be disorienting for persons having to make a hardware patch change.

On the other hand, many digital mixers allow for extremely easy building of a mix from saved data. USB flash drives and other storage methods are employed to bring past performance data to a new venue in highly portable manner. At the new venue, the traveling mix engineer simply plugs the collected data into the venue's digital mixer and quickly makes small adjustments to the local input and output patch layout, allowing for full show readiness in very short order. Some digital mixers allow offline editing of the mix, a feature that lets the traveling technician use a laptop to make anticipated changes to the show while en route, shortening the time it takes to prepare the sound system for the artist.

Sound quality

Both digital and analog mixers rely on analog microphone preamplifiers, a high-gain circuit that increases the low signal level from a microphone to a level that is better matched to the console's internal operating level. In this respect, both formats are on par with each other. In a digital mixer, the microphone preamplifier is followed by an analog-to-digital converter. Ideally, this process is carefully engineered to deal gracefully with overloading and clipping while delivering an accurate digital stream. Further processing and mixing of digital streams within a mixer need to avoid saturation if maximum audio quality is desired.

Analog mixers, too, must deal gracefully with overloading and clipping at the microphone preamplifier and as well as avoiding overloading of mix buses. Very high frequency background hiss in an analog mixer is always present, though good gain stage management and turning unused channels down to zero minimizes its audibility. Idle subgroups left "up" in a mix add background hiss to the main outputs. Many digital mixers avoid this problem by low-level gating. Digital circuitry is more resistant to outside interference from radio transmitters such as walkie-talkies and cell phones. Hiss can be reduced with electronic noise reduction devices or with an equalizer.

Many electronic design elements combine to affect perceived sound quality, making the global "analog mixer vs. digital mixer" question difficult to answer. Experienced live sound professionals agree that the selection and quality of the microphones and loudspeakers (with their innate higher potential for creating distortion) are a much greater source of coloration of sound than the choice of mixer. The mixing style and experience of the person mixing may be more important than the make and model of audio console. Analog and digital mixers both have been associated with high-quality concert performances and studio recordings.

Remote control

Analog mixing in live sound has had the option since the 1990s of using wired remote controls for certain digital processes such as monitor wedge equalization and parameter changes in outboard reverb devices. That concept has expanded until wired and wireless remote controls are being seen in relation to entire digital mixing platforms. It is possible to set up a sound system and mix via laptop, touchscreen or tablet. Computer networks can connect digital system elements for expanded monitoring and control, allowing the system technician to make adjustments to distant devices during the performance. The use of remote control technology can be utilized to reduce "seat-kills", allowing more paying customers into the performance space.

Software mixers

For recorded sound, the mixing process can be performed on screen, using computer software and associated input, output and recording hardware. The traditional large control surface of the mixing console is not utilized, saving space at the engineer's mix position. In a software studio, there is either no physical mixer fader bank at all or there is a compact group of motorized faders designed to fit into a small space and connected to the computer. Many project studios use such a space-efficient solution, as the mixing room at other times can serve as business office, media archival, etc. Software mixing is heavily integrated as part of a digital audio workstation.

Applications

Public address systems in schools, hospitals and other institutions use a mixing console to set microphones to an appropriate level and can add in recorded sounds such as music into the mix. PA mixers usually have controls that help to minimise audio feedback.

Most rock and pop bands use a mixing console to combine musical instruments and vocals so that the mix can be amplified through a nightclub's PA system. Among the highest quality bootleg recordings of live performances are so-called soundboard recordings sourced directly from the mixing console.

Radio broadcasts use a mixing desk to select audio from different sources, such as CD players, telephones, remote feeds, prerecorded advertisements, and in-studio live bands. These consoles, often referred to as "air-boards" are apt to have many fewer controls than mixers designed for live or studio production mixing, dropping pan/balance, EQ, and multi-bus monitoring/aux feed knobs in favor of cue and output bus selectors, since, in a radio studio, nearly all sources are either prerecorded or preadjusted.

DJs playing music for dancers at a dance club use a small DJ mixer to make smooth transitions between different songs which are played on sound sources that are plugged into the mixer. Compared with other mixers that are used in sound recording and live sound, DJ mixers have far fewer inputs. The most basic DJ mixers have only two inputs. Some DJ mixers have four or more inputs. These sound sources could be turntables, CD

players, or iPods. The DJ mixer also allows the DJ to use headphones to cue the next song to the desired starting point before playing it.

Hip hop music DJs and Dub producers and engineers were early users of the mixing board as a musical instrument.

Noise music musicians may create feedback loops within mixers, creating an instrument known as a no-input mixer. The tones generated from a no-input mixer are created by connecting an output of the mixer into an input channel and manipulating the pitch with the mixer's dials.

FC7

The FC7 is a heavy-duty foot controller used for changing volume, expression and other assignable parameters. With its "fortissimo function", you can accent certain parts of a performance. Adjustable pedal angle, spring point adjustment and a metal connection plate for multiple pedal "ganging," add a unique touch to this versatile controller tailoring the pedal to various playing styles.. The FC7 can also be utilized with the DG Series amplifiers.