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VIDEO TYPOGRAPHY ON THE MAC

BY CHRIS ALLAIN

Titling for video production is in a phase of radical change.

Until recently, a video producer could only create high-quality screen text with a high-end dedicated character generator (CG). Today that function can also be created with a high-end personal computer-based graphics system. Macintosh-based titling and graphics systems, once the domain of a handful of patient zealots, are now common components in most major production facilities. The Mac expanded design capabilities for desktop publishers, and it is now doing the same for video producers.

Early users have had to wait for availability of the features and functions required to create production graphics. Relative to the mass markets pursued by major software developers, the video industry is small and its technology is complex.

Today a well-equipped Mac can provide most of the basic capabilities required of a CG. But basic capabilities are not where the Mac excels in video titling. It excels in versatility, image quality, and ease of use. Although features such as rolling text are barely on a par with the lowest cost CG, other features—such as the quality and quantity of type styles—rival the most expensive CGs available.

The creative freedom allowed by the Mac and the right software, combined with a skilled artist, can turn pages of text into more than character generation. Why offer character generation to your clients, when you could offer them “video typography?”

Hardware For Video Typography

Dispel the notion that frame buffers available for the Mac are inherently inferior to those of dedicated systems. Both the NuVista, from Truevision, and the Video Explorer, from Intelligent Resources can display video at CCIR 601 (D-1) specifications. Additionally, Intelligent Resources has paid particular attention to the quality of D to A and A to D converters on the Explorer board.

Both boards are capable of providing very good quality RGB video. Users often evaluate systems, however, with low-cost encoders and decoders such as those provided onboard with the NuVista+. The NuVista's encoding and decoding are not bad. Actually they are great, considering that they are practically free. Bear in mind that a quality encoder or decoder alone can cost more than twice as much as a NuVista. Mac graphics look great with quality encoding.

A producer integrates a graphic into a video production by recording the graphic full-screen directly to tape or by mixing or keying the graphic in with other material. For some time now, Macintosh solutions have allowed users to do a good job of laying graphics directly to tape. These users have been challenged, however, when trying to create good alpha channels for linear keying. At last, applications are available that can create good quality linear key channels quickly. (See sidebar: “The Interplay of Linear Keys, antiAliasing, and Resolution.”)

Software for Video Typography

The software used to create video typography falls into two groups: packages designed for creating video title graphics; programs designed for print graphics, image processing, and animation. Your application determines which group will be more valuable.

Software vendors have created a handful of packages expressly for video titling. This article deals with only two of them, Flamingo Graphics' Bola32, now available from Avid Technology, and Comet, from AT&T Graphics Software Labs. The other applications are inappropriate for most professional application, with the exception of Video Quill, from Data Translation (Marlboro MA). Flamingo Graphics wrote Video Quill as well, and although it is a useful product, it is largely the same program as Bola32. Data Translation has removed Video Quill from the market, but Avid offers an upgrade to Bola32.

Several programs fall into the second

group. The creators of these programs did not design them for producing video titles but, when used with other tools, they can do exactly that.

FontStudio, from Letraset, allows the user to create and edit Postscript type and outline graphics. In addition to text, FontStudio saves characters such as symbols and logos as part of a font and associates them with keystrokes. You might associate the Apple logo, for instance, with the letter A on the keyboard. Font characters or objects can be scaled, rotated, and manipulated just as easily as text. Any program that supports antialiased Postscript type such as Letraset's ColorStudio and Adobe Photoshop can render these objects as antialiased bitmaps.

LetraStudio, also from Letraset, allows the user to manipulate Postscript type and objects stored as font characters. LetraStudio can twist and distort text, flow text along a path, or wrap text around a circle. These features give a designer a great opportunity to be creative. On certain projects, which require these effects, a program such as LetraStudio is the only way to quickly produce the work.

MacroMedia (formerly MacroMind•Paracomp) publishes Director, a high quality general purpose 2-D animation program. The company considers itself a supplier of “multimedia” solutions and does not directly address the professional production market, but Director is still a valuable tool for titling and other animation. It sequences and transitions between various graphics or pages of graphics and will maintain and display an alpha-channel. In Director, a user can not edit an alpha channel and the program's paint capabilities don't stand up very well to ColorStudio or Photoshop. Still, Director is very solid program that belongs in every Mac producer's tool box.

A number of other programs might be used depending on the effect the artist is trying to create, including Adobe Illustrator, Aldus Freehand, Electric Image Animation System, and others.

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All of these programs are being used here to create 32-bit full-color graphics and usually include an 8-bit alpha channel.

Most pros choose ColorStudio or Photoshop for creating paint-style graphics. ColorStudio offers better control over text because of the shapes module, but either of these programs can produce great text graphics. These are not the tools to use, however, to create several pages of character generation. A dedicated program provides much greater productivity for this application.

Bola and Comet Compared

The dedicated titling programs, Bola and Comet, are important to those who create video titles daily. These programs can be a bit faster at creating a page of title graphics than combinations of the programs mentioned above, and offer features specifically suited to video production. Sequencing, transitions, antialiasing, NTSC palettes, drop shadows, and other features are essential for professional production graphics.

Bola32 and Comet are similar applications with different strengths and weaknesses. A beta or pre-release copy of Bola32, version 2.0b6, was evaluated for this article. Version 2.0, which should be shipping by the time you read this, places it on a par with Comet from the standpoint of features. With 2.0, Bola32 will no longer require a NuVista board to run. Features in the current shipping version of Bola would not be a match for Comet's features but the beta version is very stable so a quick release seems likely. What follows in this article describes some of the features that are similar in the two programs.

Both Comet and Bola32 support Adobe Postscript and TrueType fonts. The Adobe type library includes more than 1,300 type faces and is without question the most broadly supported digital type library. Bola32 adds to this a set of proprietary fonts including over 50 type faces from 28 families. Bola includes 12 type faces and the remainder are available in an extended package that adds \$200 to the cost. The Bola fonts are clean and the basic set includes a useful symbols font called glyphs. AT&T GSL does not include fonts with Comet, but, of course, a huge selection of Postscript fonts is available and many users will already own them. Note that this beta version of Bola has

a bug in doing large Postscript fonts, which Flamingo says it will fix by the time 2.0 ships. Titles created with Bola fonts, however, work fine.

Both programs offer flexible scaling and sizing of text. Bola can size text in one-point increments from 5 to 2,000 points. AT&T GSL provides no range in its manual for point sizes, but in tests Comet allowed the use of 5 and 2,000 point sizes. Text in 5-point size would

probably be too small to be read. At 2,000 points, a portion of a character fills the screen. Both have practically unlimited sizing.

The scaling feature of both programs allows scaling of the X or Y axis separately in one percent increments. Bola has a bit broader range, from five percent to 1,000 percent. Comet's numeric dialogue box works with fractional numbers but is equivalent

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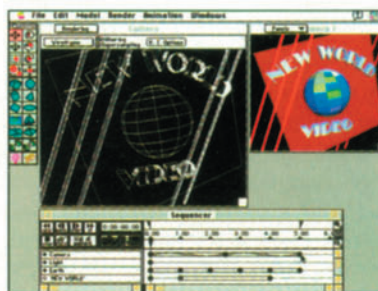
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to a ten percent to 300 percent range. Bola's percentage control approach seems slightly more intuitive.

Drop shadows are implemented in slightly different ways in the two programs and one could argue in favor of either. Both offer a standard drop shadow and a depth or extruded drop shadow. The standard shadow is essentially a copy of the character that has been offset a specified number of pixels. The depth or extruded shadow uses multiple copies of the character in a quantity equal to the number of pixels that it is offset. Both allow transparency to be set for the shadow in one percent increments and for the color to be set separately from that of the primary character.

Both programs offer text transparency variable in one percent increments.

For various reasons, good scrolling is a difficult thing for the Mac to do. No Mac application has offered a decent implementation of scrolling before now. Both of these programs do scroll smoothly using the NuVista board. The board's graphics co-processor supports a limited selection of smooth scroll speeds. Bola offers only two speeds while Comet offers three dedicated speeds that are smooth and a speed setting variable by frames. Comet's variable speed scrolls are more flexible though all but the dedicated speeds seemed too jumpy for professional applications.

Comet integrates its scrolling feature into the main application and Bola provides a separate application. Although Comet's integration has merit, Bola Scroll is easier to use and allows quick sequencing of PICT screens. PICT is the most common picture file format in the Macintosh environment. Bola Scroll also seems to scroll more reliably with 32-bit picture files. Comet's scrolling will sometimes pause repeatedly in the middle of a scroll of pictures. Both programs scroll PICT's with the alpha channel. This is a nice feature, allowing good clean keyed picture elements to scroll in front of a video background.

Comet integrates sequencing into the application but Bola uses yet another application, Bola View. Director is much more flexible than Bola View, and is usually a better way to sequence. Comet offers a useful transition feature between sequenced screens, true fades in and out. Comet, again using the Nu-

Vista, fades the key fill and the key cut in and out. This has the effect of dissolving the key in or out without using a transition from the keyer or a switcher. Comet cannot, however, perform a true dissolve between two screens. It can perform title fades at virtually any speed, and is set in frame increments.

Where Comet Has the Edge

Features in which Comet seems to have an advantage include grouping of text blocks. This allows them to be moved or formatted together. Bola does not allow grouping.

Comet also has the edge in image quality and NTSC color filtering. Comet can lock the operator out of using NTSC illegal colors, and filter pictures created elsewhere to use legal colors. Bola does provide an NTSC palette but does not provide an option to block illegal colors or filter picture files.

Comet allows image quality to be varied from two to nine times oversampling, while Bola's is fixed at four times oversampling. From a practical standpoint most users will stay between three and five times oversampling. The higher quality levels in Comet can take much more memory and time to render and the difference is barely perceptible. When text is created against a background, instead of keyed, the image quality of the two programs is very close. Overall, however, Comet has slightly better image quality than Bola, especially when keying. Comet does a better job with the alpha channel and so its keying looks better. Bola has a serious bug in the creation of alpha channels when a drop shadow is used. Until it is fixed, this bug makes Bola unsuited for keying with drop shadows. Flamingo claims that it will be fixed in the version 2.0 release.

Comet demonstrates innovation with this next group of features that are not available in Bola.

The most significant of these is Publish & Subscribe, a System 7.0 feature that allows the sharing of data between application in a highly integrated way. With this feature a database can keep track of election results or baseball statistics and Comet will automatically update the screen. A user on another computer can be updating that database. When asked, Comet will display the page with the updated information. This feature is impressive, but the jury's still out on its performance, until more applications take advantage of Publish & Subscribe.

Comet is innovative in other features as well. It can take standard object files created by drawing applications and render them antialiased. A user can very easily create certain types of object artwork with Canvas and MacDraw.

Comet can automatically correct the aspect ratio for objects and text when using a video board driven at an alternate resolution. The most common resolution for Mac application is 640 by 480, but for better quality many users would prefer to configure their NuVista for the 720 by 486 resolution. This changes the aspect ratio and size at which other images are displayed. Although it does not automatically scale bit-mapped picture files, this feature represents a thoughtful addressing of a persistent problem.

Comet will offer another advantage soon when support is complete for the Video Explorer board. This board should allow a much richer special effect feature set than is currently possible with the NuVista including a greater variety of scroll speeds. Flamingo could rewrite Bola to support the Explorer but that project is not currently underway.

Where Bola32 has the Edge

Bola's greatest advantage is in its overall ease of use. It seems easier and faster. The interface to many functions is more straightforward; for instance, Bola allows the positioning of a graphic numerically in pixels from the upper left corner of the screen. This facilitates the alignment of graphics within a screen or between separate screens. Comet does not allow numeric positioning or a nudge function that moves the object one pixel in any direction. Bola does this easily, with the arrow keys. An operator has a much harder time positioning objects in Comet.

The positioning issue also affects the use of PICT or picture backgrounds. Bola automatically positions a PICT opened as a background. The operator can also open the PICT into a picture box, where it can be sized and positioned numerically. Comet uses the picture box scenario, but it is a challenge to size and position it without numerics.

Another pair of features is absent from Comet's tool chest, the ability to create objects, other than text, internally and to fill objects, text or the background with gradients. Bola's

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simple rectangle tool frequently proves convenient for creating lines and boxes highlighting a text block. It is a useful general purpose design tool. The glyphs font creates other objects easily that are used in a similarly way. Comet does allow the creation of an outline around a text block, and one could create any object elsewhere and easily imported. This is not a bad solution since the same end can be achieved in combination with other programs, but it would be easier in Bola.

Bola easily creates color gradients for background and character fills. It's a feature that is used frequently. Comet can fill characters with a picture but it is more of an effort than with Bola. The Comet operator would have to create a gradient elsewhere to use as a picture. Again, this is not a bad solution, but more trouble than with Bola. For gradient backgrounds, the Comet user would have to go the same route, external creation.

Bola rotates text easily in one degree increments or using a free rotate tool. Comet can import an object rotated with Canvas or MacDraw and render it easily, something that Bola could not do. If simple rotated text were desired, however, again Bola would be faster.

Bola allows kerning of characters at set levels such as loose medium & tight. It allows the inter-character and inter-word space to be varied in one pixel increments in either a negative or positive direction. Comet uses Postscript font kerning information, if present; but it lacks this important feature.

Bola allows text and graphic objects to be flipped horizontally & vertically. This is not a feature used every day, but it would have to be done externally in Comet.

One fairly large oversight by AT&T GSL in the design of Comet 1.0 was the omission of commands to change the video board on which the output is displayed. When a workstation is equipped with multiple boards, this can cause major grief. A beta version received just before this writing did address this problem. If your setup uses multiple boards be sure that the version you get will allow you to switch between boards. Avid Technology, makers of nonlinear editing systems, has just purchased the marketing rights and source code for Bola32, and intends to continue to refine it. Avid's resources should prove valuable to Bola's development. AT&T GSL is also committed to Comet. Both of these companies are interested in, and

responsive to the user's needs.

Bola32 and Comet are valuable tools for video production titling. During the research and writing of this article, each program seemed to have the edge at one point or another. Before testing, Comet's innovative features sounded so strong that it would have totally outclassed Bola32, but this is not the case. Bola is friendlier and easier to use. Two good packages now compete for the Macintosh video titling market and regardless of who places first in this round, it is clear that the user will be the winner. □

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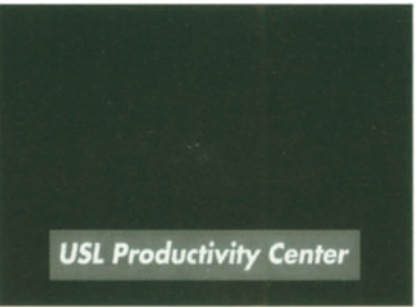
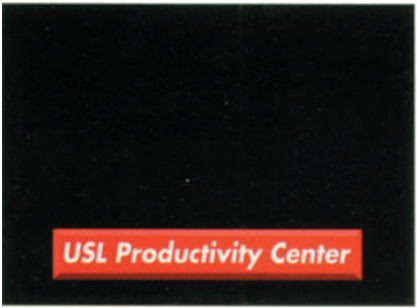
THE INTERPLAY OF LINEAR KEYS, RESOLUTION, AND ANTIALIASING

There are two ways in which any computer graphic can be integrated into a video production. The first is simply to record full-screens directly to tape,

and the second is to mix or key graphics in with other material.

Linear keying is a method of overlaying video sources with variable levels of

transparency using a keyer. A simple keyer would have three inputs, a key cut input, a key fill input, and a background input. A nonlinear keyer might have the



Left: Key fill -- 24 bit. Graphic to be keyed over video.
Center: Alpha Channel-- 8 bit greyscale key cut signal. the value of the key signal tells the linear keyer how much of the fill signal to mix with live video. Where the key signal is 50 percent white, the keyer will mix the fill signal with 50 percent live video. where the key signal is 100 percent white, the keyer will fully replace the live video.
Right: Key over live video. Note that the box is partially transparent and the text is opaque.

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same inputs, but the key cut would only allow the foreground pixel to be turned on or off. The linear keyer allows each pixel of foreground to be variably mixed with the background.

The best linear key signals provide 256 levels of transparency (8 bits) for each pixel in the graphic. The key channel, sometimes called an alpha channel, can be viewed as a gray scale image accompanying a graphic in perfect registration. An example of the use of a linear key is a semi-transparent beveled edge rectangle with text in the center of it keyed over a building. The foreground graphic would include a non-transparent beveled box with text over it. The key channel would contain a 50 percent gray box in registration with the beveled box in the foreground graphic. The linear keyer could then overlay the beveled rectangle semitransparently over the background building.

Transparent keys might be of limited usefulness to some, but linear keyers also allow text to be keyed over a background using antialiasing. Antialiasing, as most videographers know, is a feature of graphics systems that allows the simulation of higher resolutions. It does this by creating subtle ramps between adjacent contrasting pixels. These in-between pixels reduce the jaggy edges



Antialiased character with close-up of serif. Note that the edges of the character blend from white to black.

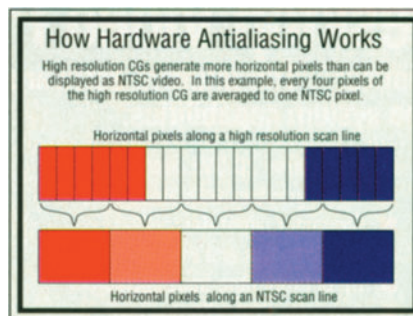
of square pixels and allow smoother curves and diagonal lines.

A user would deal with antialiasing differently depending on how a graphic is used. For instance, if the graphic is to be laid to tape directly, the software would antialias entirely within the graphic. Linear keying is unnecessary since the graphic will not be mixed with a background. Obviously, the graphic requires no key channel, either. But if the graphic is mixed with a background, a key signal must cut a hole.



Key fill and key cut signals for the letter I, with and extruded drop-shadow. The edges of the key fill signal are jaggy, and the edges of the key cut signal are antialiased. Note that software antialiasing occurs within the key fill (where the edge of the letter meets its drop-shadow). Using the antialiased key cut signal, a linear keyer will blend the edges of the key fill with background video (enlarged 10 times normal size).

An 8-bit key signal or alpha channel increases the complexity of creating the image by an order of magnitude. A graphic designed for keying is created the same way except where the image is adjacent to background material at the edge of the key. Along the key edge, the foreground and the background must be blended using the alpha channel and a linear keyer. Here, the edges of the key fill should not be antialiased within the graphic layer. Instead, the full pixel should extend to the key's edge. In this way, the alpha channel will mix a full-color pixel with the video background and not a pixel that is already blended



Hardware antialiasing with a high-resolution character generator.

or antialiased with other colors. If, for instance, white text were antialiased to a black screen in the foreground graphic it would have a dark outline at the key's edges when keyed.

Hardware antialiasing through increased horizontal resolution is another aspect of antialiasing. Generally, NTSC

video is able to reproduce about 440 lines across the horizontal axis. High-resolution systems, however, can generate a much greater pixel count. A 35 nanosecond CG, for instance, generates horizontal resolution in the 1,500 pixel range. These pixels are effectively hardware antialiased when the greater number of horizontal pixels is averaged or filtered down to 440 lines. The effect of this is very similar to software antialiasing. A high horizontal pixel count is what makes some non-antialiased CGs look as good as they do. A problem with this approach is that it does nothing for vertical resolution which is fixed at approximately 484 lines and cannot be varied for higher vertical resolution.

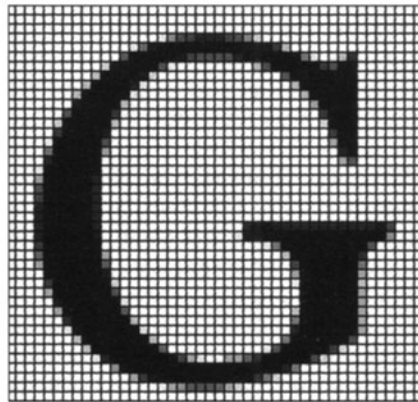
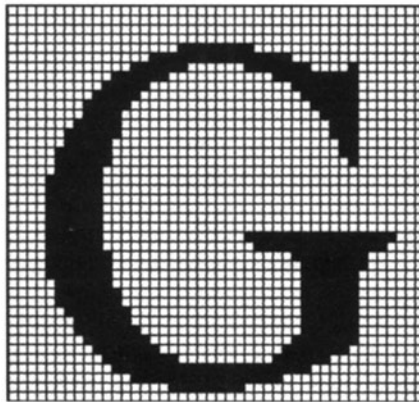
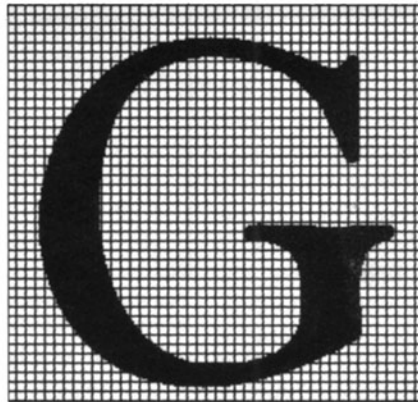
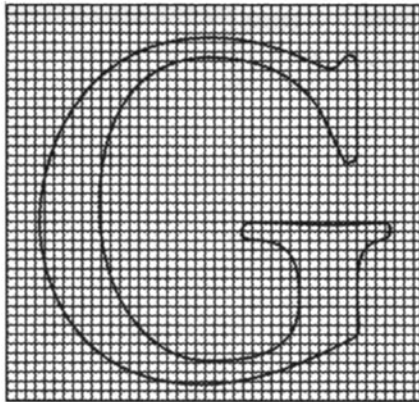
Antialiasing is similar to the process that takes place when a lens focuses light on to a discrete picture element of a CCD. The resolving power of a lens is greater than that of the CCD's pixel. A pixel can only have one color value, so details that strike the pixel elements are averaged. For instance, if an individual pixel is receiving half black and half light blue information the pixel will perceive it as a dark blue. This has a similar effect to having more resolution.

Software antialiasing works with a high resolution version of the object in memory. The program creates a very high resolution image in which objects are defined and then uses algorithms to scale the image to video resolution. This process is sometimes called oversampling. A four-times oversample uses a four by four pixel grid. Oversampling can effectively create the appearance of a much higher pixel count.

A non-antialiased screen with a horizontal pixel count of 640 pixels is similar to an 80 nanosecond resolution CG. When that screen is antialiased using 4 X over-sampling it is loosely equivalent to the output of a non-antialiased CG with 20 nanosecond resolution. "Active" versus "effective" resolution is a sticky area and other factors come into play, but generally, a well antialiased 640 by 480 Mac screen looks much better than a 35 nanosecond non-antialiased CG.

The best systems employ both high horizontal pixel counts and software antialiasing. Macintosh computers are capable of driving a higher pixel count display, but most systems are optimized for the standard 640 horizontal pixels. The major video boards are also capable of higher resolution. A user can configure the NuVista board, for instance, to

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display 1,536 pixels horizontally.

When a system must antialias a keyed foreground against background video, the software uses the same over-sampling technique to create the alpha channel. The alpha channel contains a softening ramp at the edges of the key. A linear keyer uses the softened edges in the alpha channel to overlay a foreground image over video. The blending of pixels from the foreground and background at the edges of the key makes those edges appear smooth and sharp.

—Chris Allain

(Illustrations by Scott Rachal)

Upper left: Outline of a Postscript character superimposed over a NTSC grid (enlarged 10 times normal size). Upper right: Oversample bitmap of character over NTSC grid. Note that the super sampled pixels are much smaller than NTSC pixels. Lower left: Non-antialiased character at NTSC resolution. Lower right: Antialiased NTSC bitmap built from over-sampled bitmap.

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