Attention Live Picture Users

Solution to an Important but Little Known Color Management Problem

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An important potential bottleneck in color managed workflows exists, which will often affect the quality of results obtainable with Live Picture. For example, if you are starting with a scan of a chrome or a digital camera capture (or more than one of either), the gamut of the source will be substantially larger than the gamut of your monitor. The gamut of the output system will vary tremendously with the system: a film recorder gamut when going to chrome material will be large; newsprint offset will be very small; the Fujix Pictrography gamut is quite large; inkjet gamuts vary from quite large (with brilliant inksets on glossy paper) to quite small (with less brilliant inksets on rag paper). SWOP offset on coated stock is bigger than the monitor in the yellow region, but far smaller in the blue.

If you have a profile for your capture device (you should use one, but it must be a good one), then you can use this profile as the "Reference" (i.e. source) profile in Live Picture, together with your monitor profile, or with both your monitor profile and a printer profile, to obtain simulations of either the original (the chrome or the subject of a digital capture by choosing Display Matching) or the final output (by choosing Soft Proof).

ColorSync does not automatically take all the colors of the source gamut and map them into all the colors of the destination gamut, even if you use the perceptual rendering intent. If the source gamut is small, then a large destination gamut will almost always not be fully utilized. If the source gamut is large, then a small destination gamut may be fully utilized, and lots of out-of-gamut colors will be “scrunched” inward to bring them into the gamut of the output device. Further, two gamuts may be of about the same size, but one may be larger at a high lightness level (such as a monitor), and the other may be larger at a low lightness level (such as a printer).

If you take your original file and use ColorSync to process the image and bring it from a source gamut into your monitor gamut, the colors that were originally assigned to a part of L*a*b* space outside the gamut of your monitor will be mapped to the part of L*a*b* space which is inside the gamut of the monitor. Then if you print to a large gamut device (or a device with any part of its gamut outside that of the monitor) you won’t be able to get the colors in the output device gamut that are beyond the monitor’s gamut. Using an ordinary monitor profile as a “vessel” for “storing” scans creates a bottleneck that will make more or less difference to the final print, depending on how much the gamut of the destination device exceeds the gamut of the monitor and whether the image happens to contain any of those colors.

Often you will not know what you are missing, when an output device’s entire gamut is not being utilized (rather just some subset of it). You will have to study the numbers in certain particular ways to determine which colors are not reachable.

When a composite of multiple images (two or more) is made in Live Picture, the ColorSync services that provide either of the two simulations (soft proofing, meaning output simulation, or display matching, meaning source simulation) cannot provide you with a different simulation for each image in the composite. If the images don’t have the same source profile, you will have to do a ColorSync transformation on each file (e.g. from scanner A to your monitor and from scanner B to your monitor), separately, and then work from there, using your monitor as the source from then on.

Alternatively you may just forget the scanner profile, and edit the images until they look right on the monitor and use your monitor profile as the source, but this will still mean that you have a monitor-sized gamut from then on, and it will probably result in somewhat inferior color quality and much more time editing the image to get it to look right, compared with using a good scanner profile.

You may also compromise and use one scanner profile for all of the images, even though it won't handle the colors very well for parts of the composite.

A better solution to the problem of needing a common “storage” profile for captures is to use a high-quality “Big RGB” profile. You can use the Apple ColorSync plug-ins,* for example, (not Live Picture, since it doesn’t support source to monitor transformations) to send your files from your scanner profiles to the Big RGB profile. Then when you open them to do compositing work in Live Picture, use the Big RGB profile as the source for all of them, and you will have the best of everything—the colors from any kind of film scan and at least the overwhelming majority of the colors from a direct digital capture (and usually all of them) will remain exactly as they were (each RGB number affiliated by the source profile with the correct color in L*a*b* space) so that when you print to output devices with a large gamut, you will retain the full gamut of the source.

> *Version 2.1 of the Apple plug-in set is far superior to version 2.0. The earlier version of the Export plug-in has a terrible bug that randomly substitutes the wrong profile in the transformation some of the time, as well as failing to make any transformation at all sometimes!

On a related note, if you are scanning with LinoColor/VisuaLab software, you will be asked to choose an RGB destination profile to save your scan after editing in LCH (a variant of L*a*b* which makes color moves easier). Choosing any ordinary monitor profile will greatly reduce the gamut of your files when, for example, coming from a scan of a transparency. Choosing a printer profile will lock you into a device-specific gamut and may not work at all, and choosing a scanner profile is impossible. If you choose a L*a*b* color space profile, you will be unable to work in Live Picture until you convert from there into RGB, using ColorSync.

Don't be fooled by what you can't see on the monitor! To see this loss of gamut numerically, take a scan of an Ektachrome IT8 target and first process it from the scanner profile to the Lab Color Space Profile supplied by Apple (losing no gamut). Then use ColorSync to process the file from there to your monitor profile and back again. Open the latest file and again measure the L*a*b* values. The most saturated colors will mostly have been reduced in chroma (the a* and b* values will have moved toward zero), some a great deal, while most of the colors in the target will not have moved more than a point or two. In my tests a Fujichrome yellow b* value of 105 and an Ektachrome yellow b* value of 90 were each reduced to only about 73. Cyans were similarly injured. Most of the primaries were less affected, though often still significantly.

The appearance on the monitor of the last three processed files will be essentially identical, since the differences are occurring beyond the bounds of the monitor's gamut. If your output system's gamut is smaller in every part than that of the monitor, this problem is of little consequence, but few gamuts are, and you may also want to output your work to several systems! This is what Linotype was alluding to in their ads with all the crayons (lots of crayons for L*a*b* and few for RGB). The ad touched on an important point: an RGB workflow is likely to lose color gamut, but with the right profiles it doesn’t have to!

Using color management in Photoshop still doesn't work very well, because Adobe still (in version 4) doesn’t support ColorSync source or output simulations. You have to use one of the Apple plug-ins to make a new version of the file (using the right procedure!) and then open it. There are new applications that purport to enable soft proofing inside of Photoshop using the plug-in architecture, including Kodak’s new ColorFlow software and MonacoCOLOR from Monaco Systems, but I am unfamiliar with both and can’t say whether they are user-friendly, as for example by not forcing you to process the entire file to see a simulation and by letting you work in the simulation. There is also a new, useful and very inexpensive app from Color Solutions: ColorBlind ICC Viewer, that enables soft proofing and all other kinds of simulations with TIFF files, as well as performing all types of color matching transformations, but only outside of Photoshop. Large files can be opened pretty quickly too. Also, Color Savvy's printer profiling applications, SMPKit and RTKit have the ability to create Photoshop Separation Tables for color matching to CMYK devices, and then these tables can be used for soft proofing CMYK just by using the CMYK preview in Photoshop. It may even be possible to specify a source device other than the monitor, I’m not sure.

I spent a great deal of time recently, creating what I think are a superb pair of profiles to solve the above problem. One of them is, strictly speaking, a Big RGB profile, which has a gamut larger than all RGB systems that I have seen gamuts for, including Ektachrome and Fujichrome. The Fujichrome gamut is a bit larger than the Ektachrome gamut, especially in the cyan and yellow regions, and so I made a special profile just for Ektachrome that has a gamut smaller than Big RGB but still far bigger than any monitor, and which beautifully fits the actual

Ektachrome gamut, resulting in both no loss of gamut and the best image quality that I could manage.

At the suggestion of Live Picture, Inc., I am offering both of these profiles to any end user interested in them for $50. Send me an e-mail, I will give you an address to mail a check, and when I receive it, I will e-mail you the profiles, completing thereby what I hope will have proven to be a significantly illuminating lesson in one of the subtleties of color management.

Whenever I make scans with LinoColor, I will be using one of these two new profiles as the destination for saving the scans, and then I will use them as the source with my archived files. I have constructed them so that they impart the least possible harm to the histogram. Any file that has been sent to these profiles from a scanner profile will look somewhat flat when opened in RGB without using source simulation, but not as flat as a raw RGB scan would look. That is simply because the RGB numbers in the image file are affiliated by the profile with a larger region of L*a*b* space than the gamut of the monitor, so displaying these numbers on the monitor without using a source simulation “assigns” these numbers incorrectly to the weaker colors of your monitor. Understand? It's confusing, but it’s true!

Best regards,

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PS: I am discovering that these profiles can be used with some success as generic scanner profiles when no scanner profile exists. I am also working on creating two special profiles expressly for that purpose which I will include, in addition to the above two profiles. A generic scanner profile can't undo gray balance or tone scale errors imparted by a flawed scan, nor can it map hues with greatest accuracy, but it can be very helpful in bringing up the chroma or saturation of scans in a way that can't be duplicated with the color correction tools in either Live Picture 2.6 or Photoshop 4. The scanner profiles that I will make will facilitate choosing between a range of chroma options (more or less saturation in the result) and are intended to be used with scans of transparencies.

When selecting a source profile in Live Picture, using the Display Matching option under the View Menu and the ColorSync Preferences dialog, it is a relatively simple matter to switch between several different potential source profiles, and to see which gives the most pleasing color in the source simulation on the monitor. It is not necessary to always use the profile that was made for the scanner/film combination, when the scanner had a certain group of settings (tone curve, white and black point, etc.) that were used for the actual scan. It often works beautifully to use a scanner profile that was made of the scanner in a moderately different condition (i.e. tone curve settings) to get the profile to provide some desirable tonal adjustment. Similarly, it can also be useful when no profile was provided with a scan, to use a profile that provides at least some of the color correction that a good scanner profile is supposed to provide.

With ColorSync 2.5 we will be able to store folders of profiles within the ColorSync Profiles folder, and even to use aliases of profiles or folders stored elsewhere. You might then want to keep your various scanner profiles all in one folder to easily switch between them.

One sample workflow for compositing work might be as follows:

Say you start with two or more images that you want to composite, but you don't have source profiles for all of them, or if you do, they are not all the same.

For any images that have no source profile, choose whichever one of my four profiles gives the most pleasing color when used with your monitor profile in the Display Matching simulation (source simulation) in Live Picture or in ColorBlind ICC Viewer. Of course, you will need to open a FITS file and create the IVUE image layer to view the simulation, or you can open a TIFF directly and view simulations with ICC Viewer.

Then apply a transformation, bringing each image from its chosen source profile to either the Big RGB color space profile or the Ektachrome Space profile. If one or more scans is of a Fujichrome and contains relatively highly saturated subject colors, choose the Big RGB profile, otherwise choose the Ektachrome Space profile. You cannot use Live Picture to perform a transformation from a source profile to a monitor profile, and my special profiles are all monitor profiles at heart, so use the Apple ColorSync 2.1 or later plug-ins in Photoshop instead, or another application such as ICC Viewer to perform each transformation.

Now choose the Big RGB or Ektachrome Space profile (selected above) as the source for your composite in Live Picture, along with your favorite monitor profile and the destination profile of choice, and you're set! Just make sure your destination profile is a good one, that your monitor matches the calibration state described in its profile (most are gamma 1.80 and D50), ambient lighting around the monitor matches the color of the monitor, and the output device is also in calibration. Lots of things can go wrong with color management, but the results can be stunning and are remarkably simple when the right parts are in place!