

Converting Microscopy Images Into Other Formats

Jessica Bailey, Handmade Software, Inc.

In recent years, microscopy systems have become more capable of capturing, transferring, and manipulating electronic images. In the last issue of this publication, there was a summary of different image format types and their flexibility for use with microscopy. This article will briefly discuss converting images among different formats, which often becomes necessary when transferring images from one software application to another or creating hardcopy of the image. In order to transfer the image, either the original software has to save the image to a format which the new software or output device can read, or that new software or device has to read a format which is native to the image generating software.

Sometimes (happy days), this all works out straightforwardly. Other times, transferring an image is impossible. The user then has the choice of writing his own conversion software, finding freeware, or purchasing a commercial conversion utility.

In the simplest case, for microscopists who use only one microscope, always import an image into one particular image analysis application and don't anticipate any other need for the image (or the analysis software adequately converts the images once it can read them), then the implementation of format conversion really involves only one specific conversion. Assuming the conversion isn't already supported by the analysis software, the microscopist can likely write the conversion code or find freeware that works in that specific instance, and consider the problem solved.

In the cases where either it is known that there are many sources of input images, or many uses of images (e.g. making slides, publishing documents, giving presentations, or modeming images), the format conversion solution will have to be more robust. Unless you truly can anticipate your image conversion requirements beforehand and address them individually - let's assume you have the time to do this - you may run into a variation of a format for which you have not added support.

Even if you can anticipate your image conversion requirements, you may still run into a variation of a format for which you have not added support, particularly with TIFF. Even if a software application supports TIFF, it might not be able to read the particular variation which you need. The is particularly a problem across areas of specialization.

Why do you keep running into format variations you can't read?

Format variations abound for two main reasons: First, application developers and hardware manufacturers strive to be on the cutting edge of their own fields, and while image conversion is a useful feature, it is simply one of many features which the vendor is undoubtedly trying to add. Second, supporting image formats requires heavy technical-support (which means that it's expensive), because standards change, sometimes an application adds incorrect support for a standard, and some standards are able to be tailored to include vendor-specific features (e.g. compression).

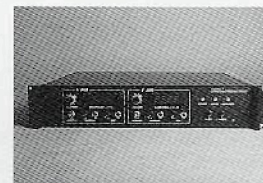
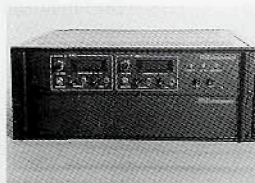
For example, TIFF specifications are notoriously open-ended. Not only do they support a variety of colorspaces (such as RGB--which the monitor uses, or CMYK--used when generating professional black & white, grayscale or color output), but they also support a wide variety of compression types, including those which are vendor-specific. It is often the compression types which are the most difficult to implement. Also, the standards evolve over time, so if you've got everything covered today, but TIFF 7.0 arrives, you may find that more code is needed. The number of TIFF permutations is truly astounding: Image Alchemy, by Handmade Software, currently reads 157 variations of TIFF alone.

Besides TIFF to TIFF conversions, you may want to convert images to other formats for various uses. If you are in a corporate setting and need to pass your image around, TIFF to Adobe Acrobat's PDF may be useful, or TIFF to Mac PICT, Sun Raster or PCX might be necessary if your images need to be put into newsletters or financial reports. Image compression is

also becoming a necessary function of image storage, since as resolution goes up, so does the image size. Commercial image conversion utilities often support a variety of compression schemes, since they are considered a variation of the image format. While TIFF support generally (de)compresses CCITT Group 3 and Group 4, LZW, and RLE, if you need more compression and lossy compression is adequate (e.g. "Here is an example of radiation damage..."), JPEG compression compresses images down to the 20:1 - 50:1 range.

So if you have a well-defined instance of format conversion for which you can write your own software or easily find freeware, it may be worth your time to write the conversion code yourself. If you anticipate a variety of image inputs and/or a variety of image outputs, then you should consider a commercially available image conversion software utility. ■

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