

Converting 24-bit Graphics for use on uEZ GUI units and other embedded products with 16-bit Displays



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1. Introduction

When working with 16-bit LCD displays, images created with 24-bit graphic tools will appear differently when rendered. For graphics with blend or gradient effects, banding can occur. Figure 1 shows an exaggerated example.

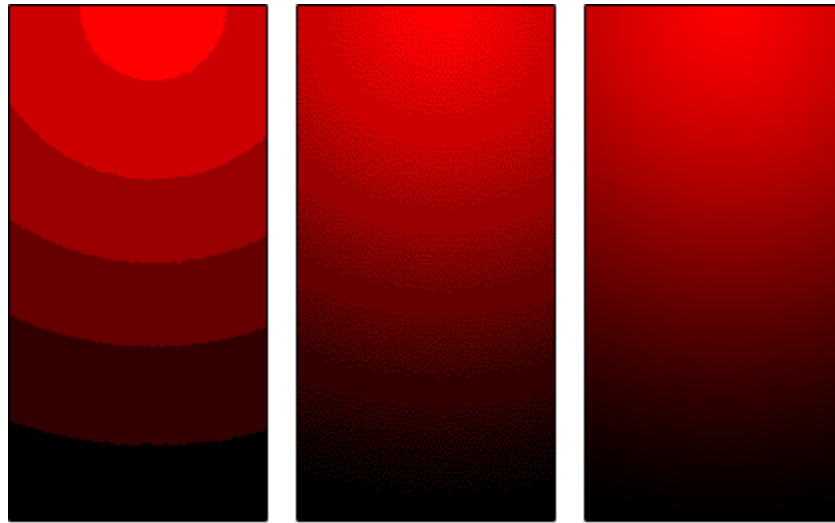


Figure 1: Banding (left), Dithering (center), 24-bit Source (right)

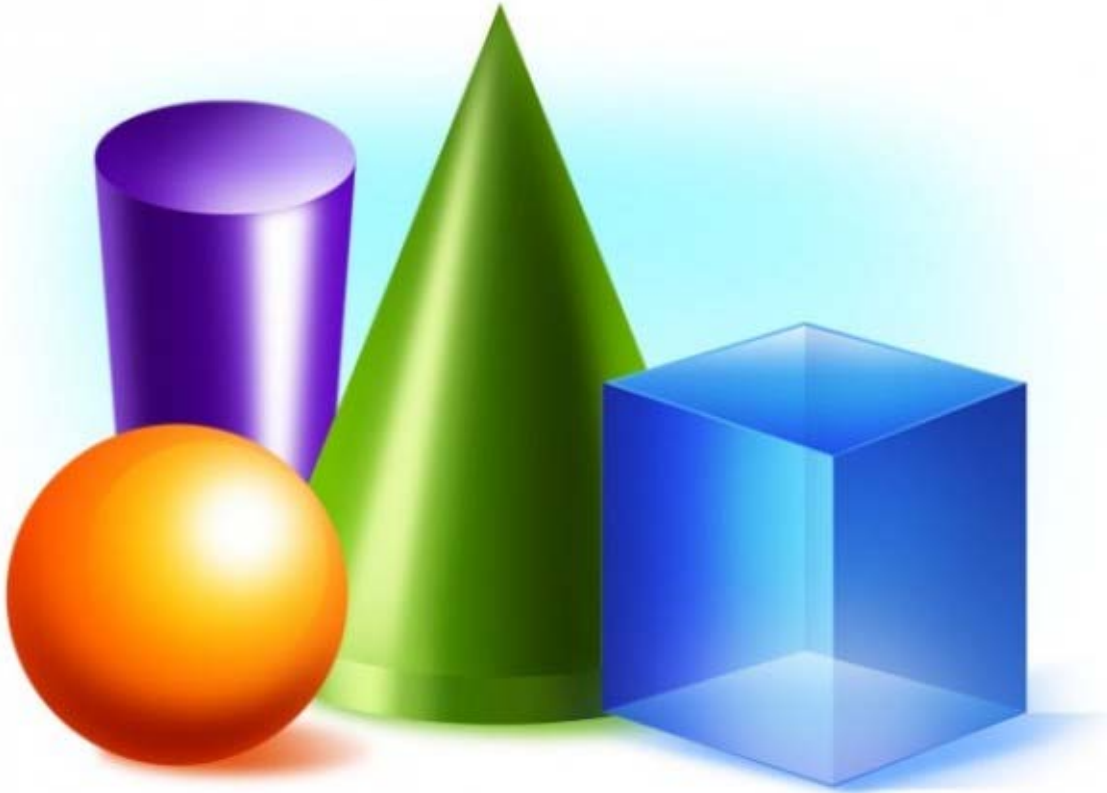
A 16-bit image is typically made up of 5 bits of red, 5 or 6 bits of green, and 5 bits of blue. A 24-bit image has 8-bits of each. Using 5-bits of red, only offers 32 shades of red, compared to the 256 shades provided by 8-bits of red with full 24-bit images. On a PC, the full 256 shades of red will be seen and the problem will not appear until moved to the 16-bit display, typical in embedded products.

By using a technique called “dithering”, dot patterns can be used to simulate the full range of colors (shown above in center) and closely matching the original 24-bit source (right). This document outlines the procedure using the converter tool ImageMagick to generate the dithered version image and thus produce the best looking final output image on a typical 16-bit embedded display.

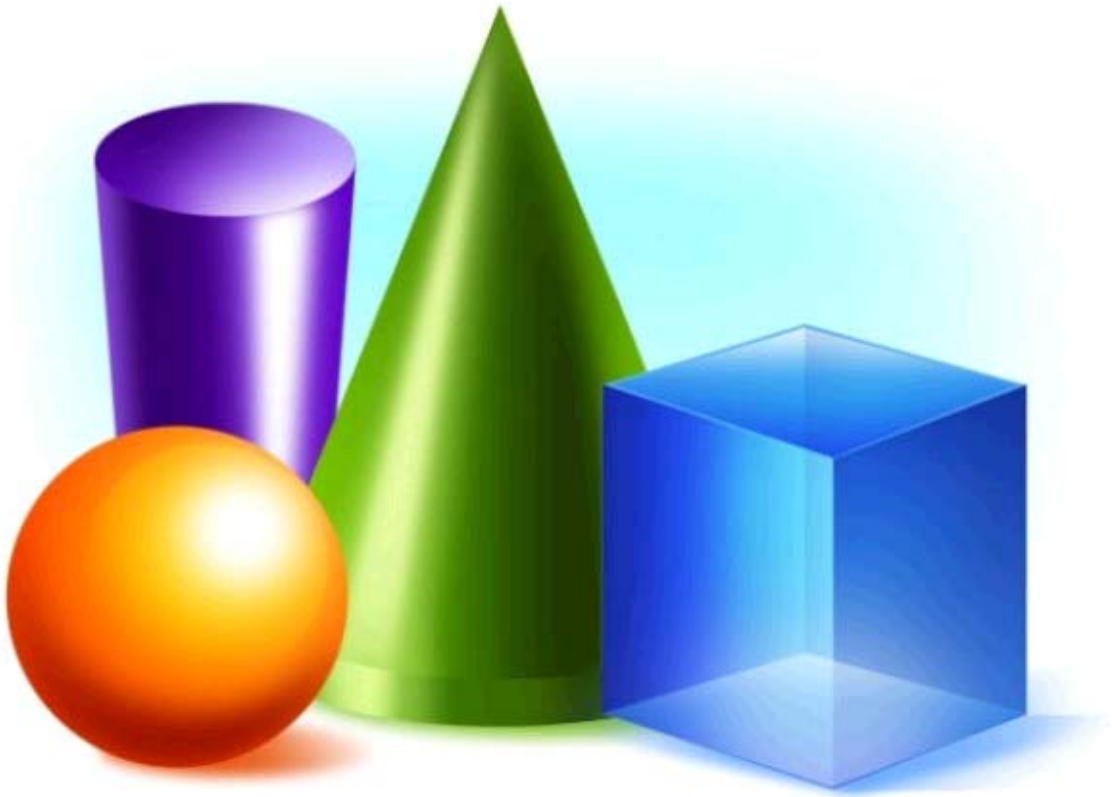
2. Steps to Convert

The following is a step by step example of how to do the conversion. In this example, Adobe Photoshop Elements 8.0 was used (but the steps can be done with most all Adobe Photoshop versions).

For this example, we'll use the the following image "Shapes.png":



Normally this image looks great on a PC, but when displayed on a 16-bit display, it looks like the following:



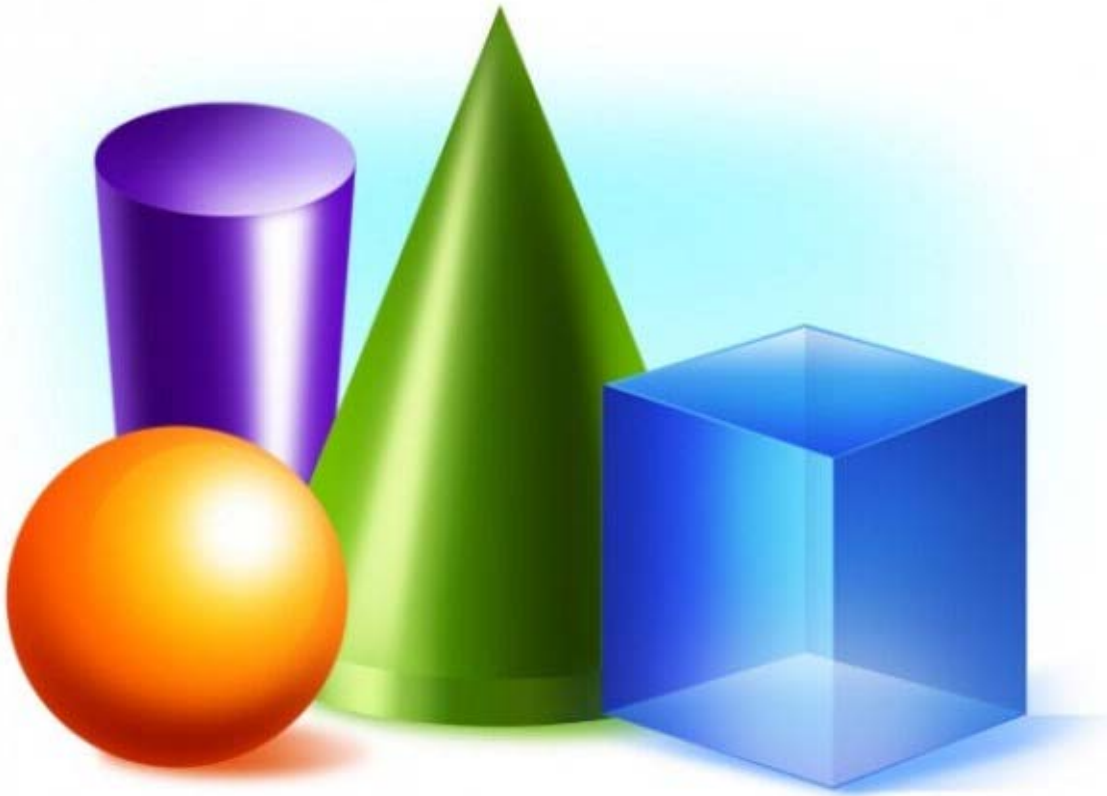
Banding is occurring in the middle of the green shape and through out the blue shape. Close inspection of the light cyan background is also showing banding. These problems can be fixed by using the ImageMagick utility to dither the image and save to a 16-bit image.

- 1) Download ImageMagick from it's website <http://www.imagemagick.org/script/binary-releases.php#windows> using this link: <http://www.imagemagick.org/download/binaries/ImageMagick-6.8.5-10-Q16-x86-windows.zip>. Just unzip. Also install the Windows [Visual C++ Redistributable Package \(x86\)](#) to ensure you have other libraries needed by the tool.
- 2) From where you unzipped the ImageMagick folder, copy the file "bin\convert.exe" into your working directory.
- 3) Because the ImageMagick is a command line tool, a DOS batch file must be written to use it. To do so, open Notepad (or any other text editor) and create the following one-line document.

```
convert "shapes.png" -ordered-dither o8x8,32,64,32 Shapes_565d.png
```

- 4) Save this to the file "shapes565.bat"

- 5) Now double click on the shapes565.bat file to run the batch file. This will generate a new file called shapes565d.png in the working directory. It should look like the following:



- 6) The new shapes565d.png can now be used on a 16-bit display without banding problems.

If more graphics need to be converted, create more batch files of the following format (or put the commands together into one batch file):

```
convert <24BitFile> -ordered-dither o8x8,32,64,32 <16BitFile>
```

NOTE: ImageMagick works with BMP, GIF, JPG, and PNG files as well as many other less common formats.