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http://www.simfit.org.uk

There are essentially two extreme types of graphics files used to display or report scientific data: vector files and bit–map files but, because bit–map files are usually very large, several types of compression can be used. An explanation of which type of file to use follows, and this information is particularly valuable with SIMFIT *.eps files because they can be used retrospectively to generate any type of graphics file.

Standard graphics files

1. Vector files

   Vector files simply contain the instructions to draw lines and text in various sizes and colors and an interpreter is needed to visualize or print the file. The great advantage with such files is the compactness as only the information essential to interpret the data is included. As the size of plot being produced depends on the replay system, as does the application of anti-aliasing to smooth out curves and improve the readability of fonts, these files are essentially device-independent. Three of the standard formats are as follows.

   (a) Encapsulated PostScript (*.eps)

   This a special form of PostScript file consisting of exactly one page but with certain restrictions such as the necessity for a BoundingBox, which simply records the coordinates of the rectangle containing the plot. This feature allows computer programs to easily resize, re-scale, rotate, make collages, etc., and explains the wide use with advanced type-setting systems, such as LaTeX.

   (b) Scalable Vector Graphics (*.svg)

   This is a special form of XML containing only markup commands and is especially recommended by the W3C for the internet. Because of the increasing use of *.svg files there are now many editors to enhance the graphs, which is a strong recommendation.

   (c) Enhanced Metafiles (*.emf)

   This is a dedicated Windows format and so can be imported easily into documents prepared by most word processing programs. However, some versions allow users to scale unsymmetrically which will change the aspect ratio and can lead to ugly effects.

2. Bit–map files

   Typical bit–map files (*.bmp) contain the characteristic values for each pixel in a display. Because of this they tend to be very large and of fixed resolution, and so tend to be used to record photographs of tissue sections and similar, where fine variations in color and brightness are important. They are very convenient for inserting into documents and for photo-editing, but it is normal to store in a compressed form especially when there is much redundant information. For instance, the background of a scientific graph consisting of lines, symbols, and text, accounts for a large portion of the bit–map information, but actually it can be represented entirely by the value of one pixel.

Compressed bit–maps

Compression always leads to loss of information and there are many compression algorithms. The most used format is the joint photographic group one (*.jpg), but for the web the portable network graphic format (*.png) is recommended because it is rather more lossless and better captures the lines and curves found in scientific graphs. As compression cannot be reversed and the resolution cannot be improved, it is advantageous to create *.jpg and *.png files from *.eps files because they can then be of much higher resolution than those saved as screen dumps.

Document files

Two standard document files that can also be used as graphics files are the portable document format (*.pdf) and the Microsoft Windows *.xps format.

The *.pdf format developed from PostScript but with the additional advantage that font information could be embedded. This means that *.pdf files created from SIMFIT *.eps files retain some of the the virtues of being compact and to a degree device independent. For instance, the SIMFIT reference manual (`w_manual.pdf`) has some 500 pages packed with hundreds of mathematical formulas, tables, and graphs but is only about 5MB: a very small fraction of what such a manual would be when produced by a typical document preparation program.

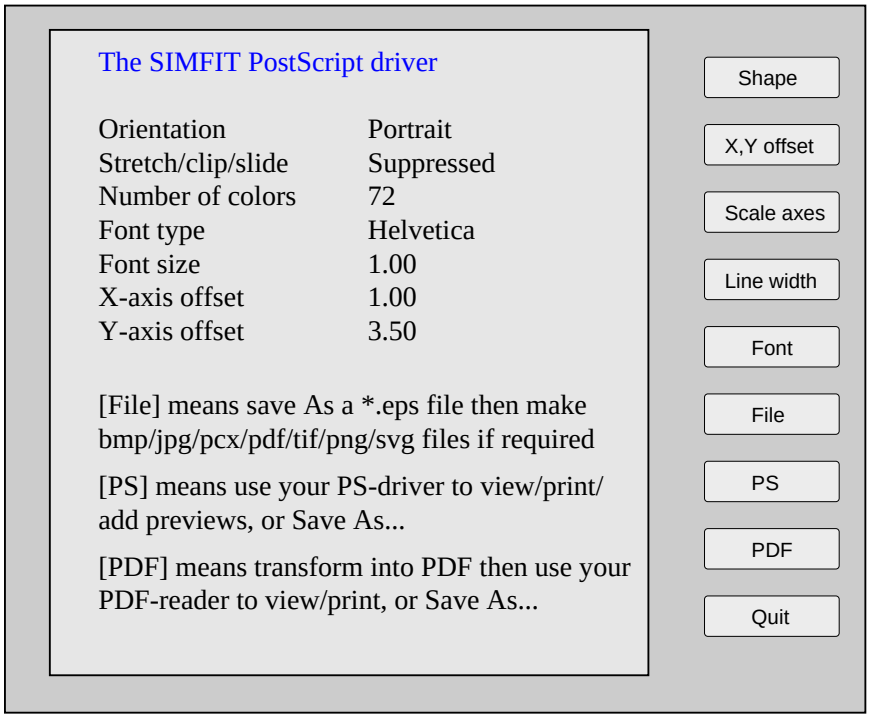
The *.xps format is a specialized ZIP archive file containing XML and was created to compete with the *.pdf format. It is only of value to users of Microsoft Office, but nevertheless such files can be created from SIMFIT *.eps files.

Warning

SIMFIT users should note that *.svg files created directly using the [Win] option or *.eps files using the [PS] option are true vector files. That is, they only consist of instructions that can be used to create hardcopy of any size and resolution for viewing or printing, and they contain no embedded bit–maps. Unfortunately, all the vector files in existence have the facility to embed bit–maps for pre-viewing, and this has been exploited by many computer programs, to the extent that *.eps files can be output as screen dumps from bit–map displays so as to constitute the total file without including vector–type information, so completely vitiating the whole purpose of vector graphic files format.

Using GhostScript to create graphics files form *.eps files

The recommended way to save graphics files from SIMFIT is to use the [PS] option first to open the PostScript interface, shown next.



From the [File] option it is possible to save a *.eps file which can then create transformed files immediately. Otherwise, use the main SIMFIT [Plot] control or else program **editps** retrospectively, to transform *.eps files into one of the following file types.

1. **PDF**

   This will create a high quality file preserving many of the *.eps vector file features.

2. **PNG**

   This is highly recommended as long as the effect of the dots per inch (DPI) setting is understood.

   If a low value for DPI is chosen, say 72 dpi, the resulting file will be satisfactory for a website thumbnail but not suitable for a document or visual display. Choosing a larger value, say 300 dpi, will be fine for documents but the resulting file size will be greater, while choosing, say > 600 dpi, will result in much bigger files with little further improvement in resolution. Anti-aliasing can be used to make curves smoother and fonts more readable.

   One great advantage of *.png files created this way instead of directly from the [Win] hardcopy control is that files saved from the [Win] control have a fixed maximum resolution limited by the display size, but files created using *.eps with GhostScript can have much higher resolution.

3. **JPG**

   Comments about DPI as for PNG files, but subsequent editing may be easier.

4. **XPS**

   Comments about DPI as for PNG files, but only useful for Word processors that can import *.xps files.

5. **PCX**

   Now an obsolete format.

6. **BMP**

   Comments about DPI as for PNG files, but can lead to massive files.

7. **TIFF**

   Now an obsolete format

8. **SVG**

   The quality available from GhostScript has been very poor so, unless this changes, it is preferable to use **Gsview**. In any case, SVG files saved directly from the [Win] option are true vector files. Note that, program **GSview** version 6.0 on uses MuPdf technology to generate high quality *.svg files from SIMFIT *.eps files.

Retrospective editing of graphics files

Very often it is wished to make changes to scientific graphs such as altering line thickness, color, dashed type into dotted, etc., or maybe replacing circles by triangles for clarity before incorporating into documents. It is very easy to make such changes to SIMFIT *.eps files using any text editor as the format was designed with this in mind, and the way to do this is described in the reference manual and tutorials.

Now there are many programs for editing graphics files such as *.jpgf or *.svg but it is obvious that such possibilities are not available in hardcopy files created from *.eps. Even editing SIMFIT *.eps in dedicated PostScript editors such as Adobe Illustrator destroys the ability to edit SIMFIT *.eps files retrospectively in a text editor.