Getting good quality graphics inside a LaTeX document

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1 Introduction

For publications and scientific articles, reports and thesis the most important thing is to make well looking graphics. For that there are several guidelines, which help one to get his figures look professionally, but at the same time not to overdo things as there is a limit of how good the quality has to be.

1. Use vector graphics as much as possible. Especially where there is a lot of text in the figure. But remember, if you 'convert' a jpg to eps or svg or any other vector graphics format, you will **not** gain any quality. More on this, please use Google

2. If you have to use raster graphics, please select png format as a better alternative where possible

3. If you use raster graphics, do not exceed the final resolution of the picture to more than 600dpi as most of the printers are printing at 300dpi or 600dpi, so anything more than that might just be wasted time while waiting the figure to be rendered. Of course if you have a good reason why you need more than 600dpi, then go ahead.

4. Have a high quality copy of your figure somewhere in your computer. This is because while converting from one format to another one can **not** improve the quality.

If you feel that you have not found enough information on the graphics usage in LaTeX, please refer to these websites:

- Floats, Figures and Captions

- Importing Graphics

- Creating Graphics

2 Inserting a simple figure

Inserting a figure is a really easy task and it can be accomplished with the following code. Note, that there is an option to the \includegraphics command which scales the image, so that its width would not exceed the text width.

```
1  \begin{figure}[H]
2      \begin{center}
3          \includegraphics[width=.7\textwidth]{plot1.eps}
4      \end{center}
5      \caption{A properly aligned figure.}
6      \label{fig:plot1}
7  \end{figure}
```
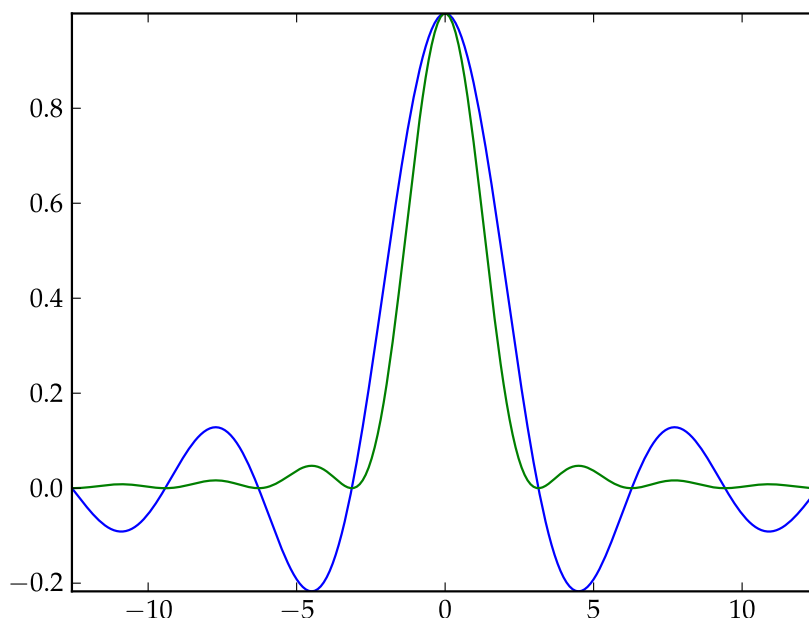
And our figure will look as follows:

Figure 1: A properly aligned figure.

3 Directory setting for graphics, their formats and LATEX compilers

The most convenient way nowadays to produce documents from LATEX source code is to use the pdftex or pdflatex compiler. It is because it produces a .pdf file directly and you do not need to convert the .ps file every time before viewing it with a viewer. Also with pdflatex you can use more graphics formats:

.pdf This is the native graphics vector format for this compiler

.eps This format also can be used with pdflatex, but you need to use the `epstopdf` package, which will convert them to `pdf` files on the fly. There are also options to make the conversion only when the `.eps` figures are changed, which speeds up everything substantially.

.png, .jpg At last you can use this format too if you need to import raster graphics into your document, which might ease a lot of things.

For all these features, one should use the `graphicx` package as this is the recommended way to do it. What is more, this packages provides some other useful commands. You can tell it where to search for figures by issuing the \graphicspath{{./path/to/your/directory}} command. What is more, you can specify several directories in the following way \graphicspath {{./dir1}{./dir2}}. The symbols ./ mean, that the top directory is where the `.tex` file is located. So if you have the following directory structure:

```
1  some  document
2      |−figures
3      |−mytexfile.tex
```

you will need to issue \graphicspath{{./figures}. The preamble of this file contains the following lines:

```
1  \usepackage[pdftex]{graphicx}
2  \graphicspath{{./figs/}}
3  \usepackage[update,verbose=false]{epstopdf}
```

The options for the `epstopdf` package mean, that it will convert the `.eps` graphics only when they are updated and it will not output any errors.

4 Overlaying a figure with LaTeX code

Although there are different ways of how to overlay text onto graphics, I will examine only one of them - the `TikZ` package, which seems to be much easier to use and more powerful than the native LaTeX `picture` environment.
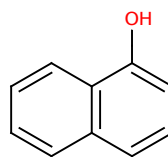
4.1 TikZ package

Let's look at the example bellow, which has to do more with chemistry than the figure 1. The thing, which we want to do is to put 4 structures and then label them. The final image is shown in the figure 2, where the work-flow is explained in the figure 3 on page 6.

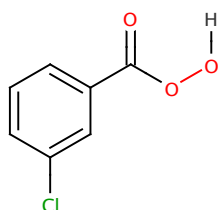You can check out the code listing for creating the figure 3 bellow:
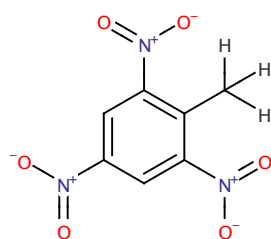
```
1  \begin{figure}[h]
2      \centering
```
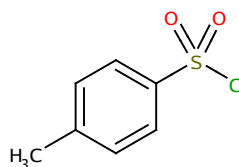
TNT

Naphtol

1

2

Figure 2: Overlaying LaTeX commands to get some nice things.

```latex
3        \setlength{\tikzunit}{.085\textwidth}
4        \begin{tikzpicture}[scale=1.0,x=\tikzunit,y=\tikzunit]
5 % —— Draw a grid which should help to position things ————
6 %          \draw[step=.5,color=gray,thin,dashed] (−4,−4) grid (4,4);
7 %          \draw[step=1.0,color=gray]             (−4,−4) grid (4,4);
8 %          \draw[step=4.0,color=black]            (−4,−4) grid (4,4);
9 %   Notes:
10 %       just uncomment the lines with draw commands and the grid
11 %       will appear. The commands, I believe are self explanatory
12 %       and it can be drawn as big as you want. The two coordinates
13 %       denote lower left and upper right corners of the grid.
14 % ————————————————————————————————————————
15        \node(0,0){\includegraphics[width=7\tikzunit]{4struct.eps}};
16        \draw (−2.1, 0.5) node{TNT};
17        \draw ( 2.1, 0.5) node{Naphtol};
18        \draw (−2.1,−3.5) node{\compx{1}};
19        \draw ( 2.1,−3.5) node{\compx{2}};
20     \end{tikzpicture}
21     \caption{Overlaying \LaTeX\ commands to get some nice things.}
22     \label{fig:struct1−2}
23 \end{figure}
```

4

This way one can create good figures very easily. What is more, if you have just simple structure images you do not have to worry about placing them correctly using your mouse or making sure that the font will be the same as in all the other text if you overlay everything using this LaTeX package.

There is another example shown in the figure 4. This is a true scientific quality figure and with overlaying text on top you ensure, that it will be readable in your document.
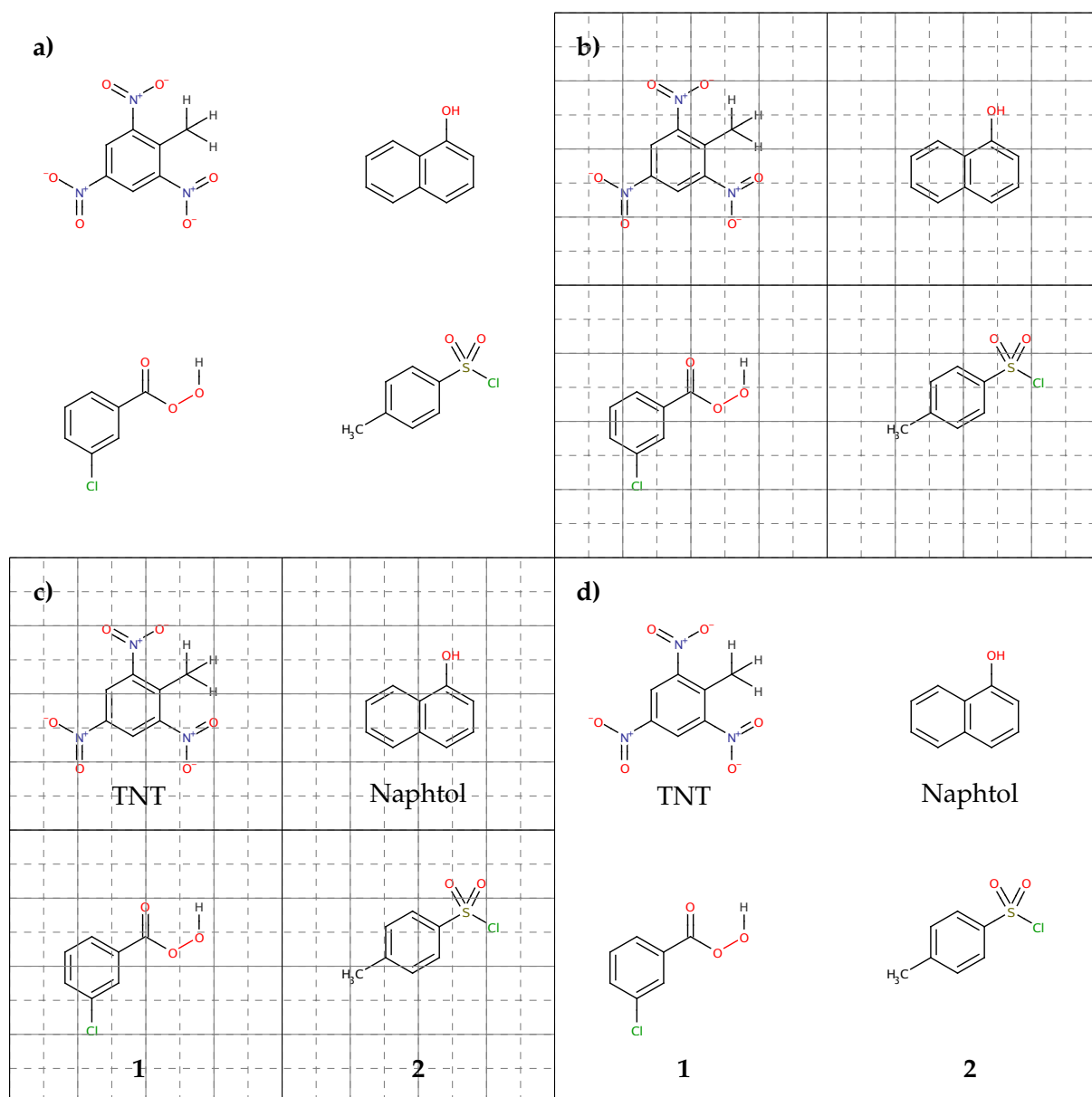
Figure 3: The workflow of placing the text on top of the figure. The 4 steps of producing good graphics are shown from the top left corner. The initial figure **a)** did not contain names and the grid was added at **b)** to help determine the position of the labels, which where placed at **c)** and then the grid was removed at **d)**. NB this ilustration was done also using the very same TikZ package.
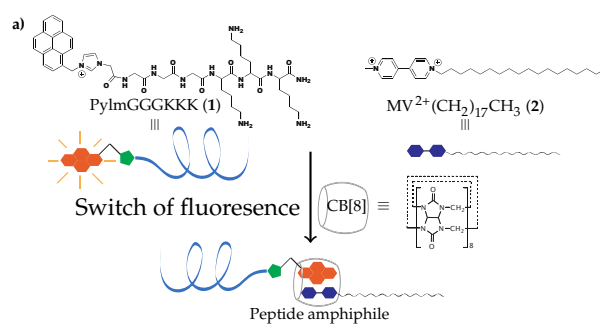
Figure 4: scientific illustration