EMP:
Encapsulated METAPOST for \LaTeX* \\

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Abstract

The EMP package allows to encapsulate METAPOST files in \LaTeX sources. This is very useful for keeping illustrations in sync with the text. It also frees the user from inventing descriptive names for PostScript files that fit into the confines of file system conventions.

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1 Introduction

When adding illustrations to documents, one faces two bookkeeping problems:

1. How to encourage oneself to keep the illustrations in sync with the text, when the document is updated?
2. How to make sure that the illustrations appear on the right spot?

For both problems, the best solution is to encapsulate the figures in the \LaTeX source:

1. It is much easier to remember to update an illustration if one doesn’t have to switch files in the editor.
2. One does not have to invent illustrative file names, if the computer keeps track of them.

Therefore EMP was written to allow to encapsulate METAPOST [1, 2] into \LaTeX [2, 3, 4].

These macros have some overlap with feynMF [2, 5], axodraw [6] and mfpic [2, 7]. In fact, most of the functionality of EMP is available from feynMF. Longer pieces of METAPOST code are however not very conveniently typed in feynMF, because there is no facility for multi line input (using \texttt{\textbackslash fmfrom} with long arguments can overflow METAPOST’s input buffers because of the missing line breaks). Since feynMF provides much syntax that is superfluous for EMP’s purpose (the EMP package exports only five new environments and five commands), it is more appropriate to create a separate small package than to add this functionality to feynMF. Similar comments apply to mfpic.

2 Usage

2.1 Commands and Environments

\begin{empfile}
All descriptions that should go into one METAPOST file are placed inside a \texttt{empfile} environment which takes the name of the METAPOST file as an optional argument:

\begin{verbatim}
\begin{empfile}[/\texttt{METAPOST-file}] \\
\end{empfile}
\end{verbatim}

The default METAPOST-filename is \texttt{\jobname.mp}.

\begin{emp}
The \texttt{emp} environment contains the description of a single figure that will be placed at the location of the environment. Required arguments are the width and the height of the figure, in units of \texttt{\textbackslash unitlength}. They will be available as the METAPOST variables \texttt{w} and \texttt{h}. The optional argument assigns a name to be used with \texttt{\textbackslash emp}use\texttt{(name)}.

\begin{verbatim}
\begin{emp}[/\texttt{name}]\{(\texttt{width},\texttt{height})} \\
\texttt{METAPOST-commands} \\
\end{emp}
\end{verbatim}

\end{emp}

\end{empfile}
Note that this environment uses the \texttt{verbatim} package to process the input lines and can therefore \textit{not} be used as an argument to another macros. To work around this problem, you can first use the \texttt{empdef} environment and \texttt{\empdef} it later.

\begin{verbatim}
\begin{empdef}[(name)]{(width),(height)}
  \{METAPOST\-commands\}
\end{empdef}
\end{verbatim}

\begin{verbatim}
\begin{empcmds}
  \{METAPOST\-commands\}
\end{empcmds}
\end{verbatim}

\begin{verbatim}
\begin{empgraph}[(name)]{(width),(height)}
  \{METAPOST\-commands\}
\end{empgraph}
\end{verbatim}

\texttt{\empTeX} Define a \LaTeX\ prelude to be written to the top of every \METAPOST\ file. The default is \texttt{\documentclass[\pitsize]{article}}. If the prelude is not empty, \texttt{\begin{document}} will be added. Note that you have to run \METAPOST\ as \TeX=latex mpost \texttt{filename} if the prelude calls \LaTeX.\texttt{\empdtdetex} Add to the \LaTeX\ prelude. E.g., \texttt{\empdtdetex{usepackage\{euler\}}} makes sure that \METAPOST\ will use the Euler fonts for the labels.\texttt{\empprelude} Define and add to a \METAPOST\ prelude to the top of every \METAPOST\ file. The default is empty.

\subsection{Examples}

For a simple example, let's draw a smiling and a frowning face. Since they are identical except for the mouth, we prepare a macro for the common parts:

\begin{verbatim}
1 \begin{empcmds}
 2  vardef draw\_face =
 3      pair lefteye, righteye, nose[];
 4      lefteye = c + (-0.25w,0.15h);  righteye = c + (0.25w,0.15h);
 5      nose1 = c - (0,0.08h);  nose2 = c + (0,0.15h);
 6      pickup pencircle scaled 1;
 7      draw fullcircle xscaled w yscaled h shifted c;
 8      draw fullcircle scaled 2 shifted lefteye;
\end{empcmds}
\end{verbatim}
Figure 1: graph example.

\begin{empcmds}
\begin{verbatim}
draw fullcircle scaled 2 shifted righteye;
draw nose1--nose2; draw mouth1..mouth2..mouth3;
setbounds currentpicture to unit square xscaled wyscaled .5h;
enddef;
\end{verbatim}
\end{empcmds}

This can now be used for the frowning \textbullet
\begin{empcmds}
\begin{verbatim}
\begin{emp}[5,5]
pair mouth[], c; c = (0.5w,0);
mouth1 = c + (-0.2w,-0.25h);
mouth2 = c + (0,-0.2h);
mouth3 = c + (0.2w,-0.25h);
draw_face;
\end{emp}
\end{verbatim}
\end{empcmds}

and the smiling \textbullet face
\begin{empcmds}
\begin{verbatim}
\begin{emp}[smile][5,5]
pair mouth[], c; c = (0.5w,0);
mouth1 = c + (-0.2w,-0.2h);
mouth2 = c + (0,-0.25h);
mouth3 = c + (0.2w,-0.25h);
draw_face;
\end{emp}
\end{verbatim}
\end{empcmds}

Since we have given a name to \textbullet face, we can now use it with \textbullet face:\textbullet
\begin{verbatim}
Note that the reference point has been set up such that it works best as replacement for \textbullet bullet in itemize environments.
\end{verbatim}
\textbullet Note that the reference point has been set up such that it works best as replacement for \textbullet bullet in itemize environments.

\textbullet This is very useful for slides.

As a second example, the simple plot of
\begin{equation}
\tilde{j}_0 = \frac{\sin(x)}{x}
\end{equation}

is shown in figure 1:
\begin{empgraph}[60,40]
pickup pencircle scaled 1pt;
path p;
for x = -20 step 0.2 until -0.2:
\end{empgraph}
Figure 2: Another graph example.

\begin{empgraph}
\begin{tikzpicture}
\begin{axis}[
    xlabel={$Q^2$/GeV},
    ylabel={$\alpha_s(Q^2)$},
    xmin=0.5, xmax=10,
    ymin=0.2, ymax=1,
    xtick={0.5,1,2,5,10},
    ytick={0.2,0.4,0.6,0.8,1},
    width=\textwidth,
    height=\textwidth
]
\addplot[domain=0.5:10]{1/(ln(x/(4*pi*beta0*beta0)))};
\end{axis}
\end{tikzpicture}
\end{empgraph}

\begin{equation}
\alpha_s(Q^2) = \frac{4\pi}{\beta_0 \ln(Q^2/\Lambda_{QCD}^2)}
\end{equation}

with $\Lambda_{QCD} \in [0.15 \text{ GeV}, 0.25 \text{ GeV}]$ and $\beta_0 = 11 - 2N_f/3$ is shown in figure 2.

\begin{verbatim}
33 augment.p (x, sind(x*180/3.14159)/x);
34 endfor
35 augment.p (0, 1);
36 for x = 0.2 step 0.2 until 20:
37 augment.p (x, sind(x*180/3.14159)/x);
38 endfor
39 \label{lrt} (\texttt{\textbackslash displaystyle} \texttt{\textbackslash frac} \{\texttt{\textbackslash sin}(x)\} x \texttt{\textbackslash etex}, (\texttt{-20,1}));
40 gdraw p;
41 \end{empgraph}
\end{verbatim}

The command \texttt{\textbackslash emp\textbackslash prelude\{input\ graph\}} must have been put in the preamble to make the \texttt{graph} package available.

Finally, another application of the \texttt{graph} package:

\begin{equation}
\alpha_s(Q^2) = \frac{4\pi}{\beta_0 \ln(Q^2/\Lambda_{QCD}^2)}
\end{equation}

Note that the \texttt{\textbackslash text} macro of AMS-\texttt{\LaTeX} has been used, therefore, the command \texttt{\emp\texttt{\textbackslash addto\{\textbackslash \textbackslash usepackage\{amsmath\}\}}} must have been put in the preamble for this example to work.

5
References


Distribution

\texttt{EMP} is available by anonymous internet \texttt{ftp} from any of the Comprehensive \LaTeX{} Archive Network (CTAN) hosts

\texttt{ftp.tex.ac.uk,ftp.dante.de}

in the directory

\texttt{macros/latex/contrib/supported/emp}

It is also available from the host

\texttt{crunch.ikp.physik.tu-darmstadt.de}

in the directory

\texttt{pub/ohl/emp}

Unsupported snapshots of work in progress are provided as

\texttt{pub/ohl/emp.versions/emp-current.tar.gz}

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Numbers written in italic refer to the page where the corresponding entry is described, the ones underlined to the code line of the definition, the rest to the code lines where the entry is used.

\begin{verbatim}
E \empaddtoprelude . . 3
emp (environment) . . 2
\end{verbatim}
\texttt{\emph{empprelude}} \ldots \ 3 \quad \texttt{\emph{empfile}} \ldots \ 2
\texttt{\emph{empcmds}} \quad \texttt{(environment)} \quad \texttt{\emph{empfile}} \quad \texttt{(environment)} \quad \texttt{\emph{empdef}} \quad \texttt{(environment)} \quad \texttt{\emph{empprelude}} \quad \texttt{\emph{empfile}} \quad \texttt{\emph{empdef}} \quad \texttt{\emph{\textbackslash text}} \ldots \ldots \ldots \ 56
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