ATFX and graphics Zofia Walczak

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When TEX was written, PostScript/eps, jpeg, gif, and other graphic formats did not exist. As a result, Knuths dvi format does not have direct support for imported graphics. However, TEX allows dvi files to contain \special commands which pass commands to programs which use dvi files. This allowed T_EX and LATEX to import any graphic format which was supported by the dvi program being used. Inserting eps graphics in LATEX originally required the low-level \special command. To make graphic-insertion easier and more portable, two higher-level packages epsf and psfig were written for LATEX2.09. With the release of LATEX2e in 1994, the LATEX3 team addressed the general problem of inserting graphics in LATEX. Their efforts produced the "LATEX graphics bundle" which contains totally re-written commands that are more efficient, more robust, and more portable than other graphics-insertion commands.

The picture environment is used to draw pictures composed of text, straight lines, arrows and circles. The objects in the picture are positioning by specifying their coordinates.

The basic syntax for the environment is:

\begin{picture}(width,height)(x-offset,y-offset) picture commands

\end{picture}

Everything that appears in a picture is drawn by the \put command.

The graphics bundle contains the "standard" graphics package and the "extended". Just as the latex command uses TEX to process LATEX documents into dvi files, the command pdflatex uses pdftex to process LATEX documents directly into pdf files.

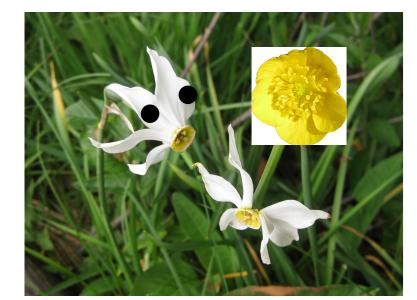
An important aspect of pdfT_EX is its native inclusion of a variety of graphics formats: JPEG, PNG, PDF, METAPOST. Although older versions of pdftex supported native inclusion of tiff files, the current version of pdftex does not support tiff. Note that pdftex can not directly import eps files, which requires users with eps files to use a program like epstopdf which converts eps files to pdf format, although this prevents the direct use of psfrag. Some current TEX implementations (like T_EXLive 2012/2013) support conversion *eps-to-pdf* "on a fly".

PSfrag package

The psfrag package allows LATEX users to replace text strings in eps files with LATEX text or equations. To use psfrag, create an eps file and then perform the following steps

- Include \usepackage{psfrag} in the preamble of the LATEX document.
- ▶ In the document, use the \psfrag command to specify the eps text to replace and the LATEX string to replace it. This makes the specified substitution occur in any subsequent \includegraphics command issued in the same environment.
- ► Use the \includegraphics command as usual.

The LATEX \psfrag command has the following syntax \psfrag{PStext} [posn] [PSposn] [scale] [rot] {text} Pictures are taken from [8].



\begin{picture}(10,8) \includegraphics{1.jpg} $\left(-4,4\right)$ {\includegraphics{2.jpg}} \put(-6,5){\Large \$\bullet\$} \end{picture}

The \put(1,2) {obj} command puts the object specified by obj in the picture, with the reference point at coordinates (1,2). **Remark:** The *tex* file can be compiled with latex and pdflatex.

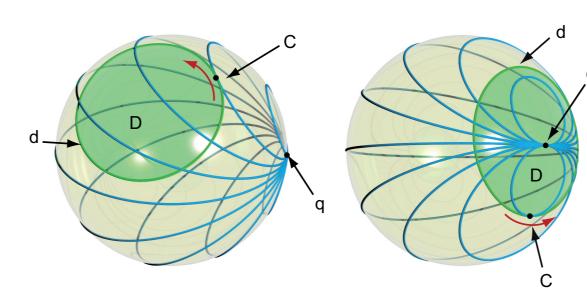


Figure : Contact of Δ with a projection of a Hopf torus of \mathcal{F}_0 .

\begin{figure} \psfrag{d}{\$\delta\$} \psfrag{D}{\$\Delta\$} $psfrag{q}{$q_0$}$ \psfrag{C}{Contact} \includegraphics{AA.eps} \end{figure}

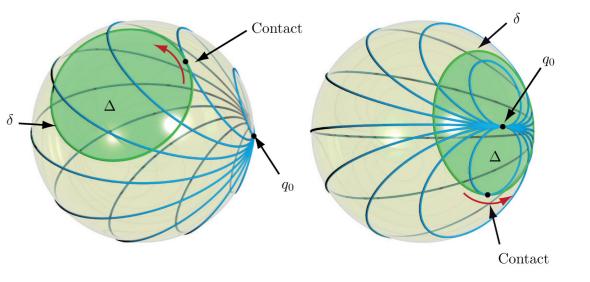


Figure : Contact of Δ with a projection of a Hopf torus of \mathcal{F}_0 .

Remark: PSfrag cannot be used with pdfT_EX. If psfrag substitution is needed, one option is to use the LAT_EX-to-dvi-to-PostScript-to-pdf route that was used before pdfT_EX. PSfrag doesn't work with beamer. When preparing presentation with beamer one can use TikZ package instead (*eps* figure should be converted to *pdf* format).

MusiXT_FX

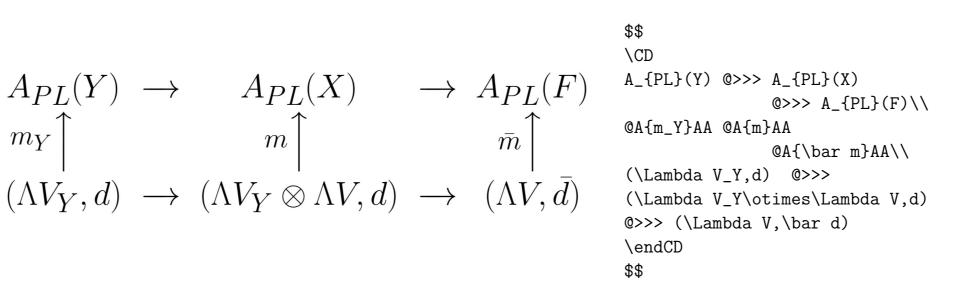
MusiXT_EX is a set of macros and fonts which enables music typesetting within the TEX system. MusiXTEX might be regarded as the digital equivalent of a box of type. It contains symbols for staves, notes, chords, beams, slurs and ornaments, ready to be arranged to form a sheet of music. But it must be told how to position those symbols on the page. This could be done by the typesetter himself, if he elects to proceed by entering MusiXT_EX commands manually into an input file. However most users will find it far less taxing to let such decisions be made largely by the preprocessor PMX, which in addition uses a much simpler input language than MusiXTFX.

Riff in C

W. A. Mozart (1756–1791)

amscd package

The amscd package provides a CD environment that emulates the commutative diagram capabilities of $\mathcal{A}_{\mathcal{M}}\mathcal{S}\mathsf{T}_{\mathsf{E}}\mathsf{X}$ version 2.x. This means that only simple rectangular diagrams are supported, with no diagonal arrows or more exotic features. Diagram is taken from [4].



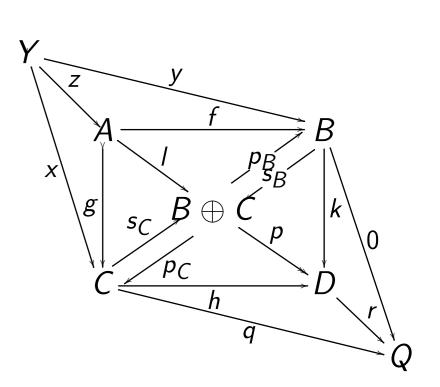
Xy-pic package

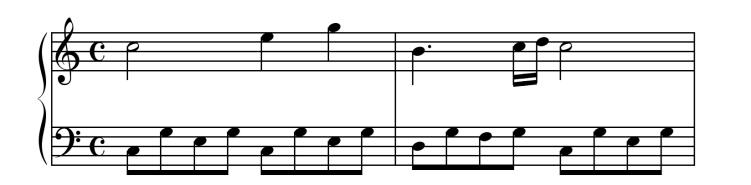
 $X_{\rm P}$ pic is a general-purpose drawing package based on T_EX. It works smoothly with most formats, including $\square T_EX$, $\mathcal{A_MS}$ - $\square T_EX$, $\mathcal{A_MS}$ - T_EX , and plain TFX. It has been used to typeset complicated diagrams from numerous application areas, including category theory, automata, algebra, geometry, neural networks, and knot theory.

Xy-diagram from [2].

 $K/H \longrightarrow K/H \longrightarrow K/H$ $\Gamma \setminus \overset{\mathsf{r}}{\mathsf{G}}/H \longrightarrow M \overset{\mathsf{r}}{/}H \longrightarrow B \overset{\mathsf{r}}{H}$ $B^{\dagger}\Gamma \xrightarrow{b} M^{\prime}/K \xrightarrow{f} B^{\prime}K$

More sophisticated Xy-diagram from [1].





Small fragment of code:

{\mtxTitle}{2.0}{\mtxPoetComposer}{2.0}\en% % Bar count 1 \pnotes{2.00}\ibl1{'E}0\qb1C\qb1G\qb1E\tbl1\qb1G\ibl1E0\qb1C\qb1G\qb1E\ \tbl1\qb1G|\hl{'c}\sk\sk\ql e\sk\ql g\en% % Bar count 2 \xbar $\mbox{1.41}\tbl1\qb1{'G}|\ibbl2{'c}\qb2c\tbl2\qb2d\en%$ $\t tbl1{'E}0\dt C\dt tbl1\dt tbl1\dt$

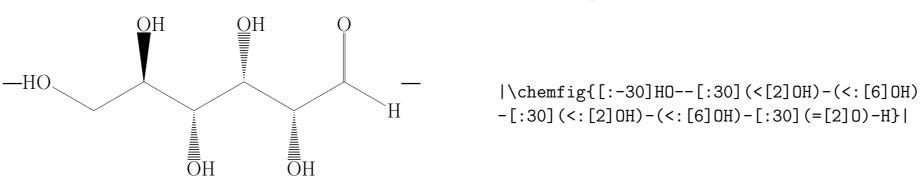
Remark: MusiXT_EX needs elAT_EX which is automatically invoke when is needed but in general IATEX and MusiXTEX does not collaborate. For typesetting a large musical score is better to use TFX.

Remark: The amscd package does not collaborate with BEAMER class.

chemfig package

This is the T_EX package for drawing molecules. The most important command for drawing molecules is \chemfig{<code>}. The argument code is a set of characters describing the structure of the molecule according to the rules which are described in this manual. The command \chemfig draws a molecule using the commands provided by the TikZ package, placed inside a tikzpicture environment.

Glucose, skeleton diagram



Remark: The current maintainer of this package is Christian Tellechea. The package can be used with latex and pdflatex, there are some problems with compilation in BEAMER class.

\xymatrix{ $K/H \ar[r] \ar[d]\&$ $K/H \ar[r] \ar[d]\&$ $K/H \ar[d] \$ \varGamma\setminus G/H ar[r] ar[d] & M/H ar[r] $ar[d]\&BH ar[d] \$ B\varGamma \ar[r]^b& $M/K \ [r]^f \& BK$

TikZ – a frontend of pgf package

A frontend is a set of commands or a special syntax that makes using the basic layer easier. The TikZ frontend is the "natural" frontend for PGF. It gives you access to all features of PGF, but it is intended to be easy to use. The syntax is a mixture of METAFONT and pstricks and some ideas of the author.

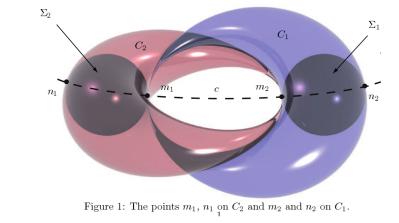
The PGF package, where "pgf" is supposed to mean "portable graphics" format" is a package for creating graphics in an "inline" manner.

Comparison with other graphics packages.

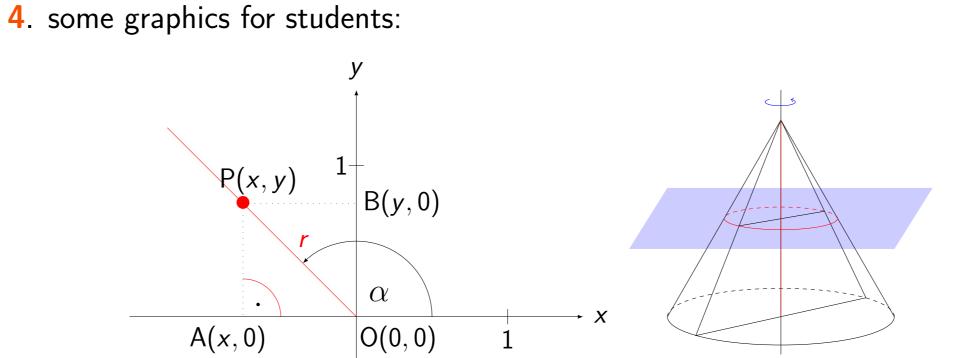
- ▶ The TikZ syntax is more consistent than the pstricks syntax.
- ► The X₄-pic package is an older package for creating graphics.
- ▶ The xfig program is an important alternative to TikZ for users who do not wish
- to "program" their graphics as is necessary with TikZ and X/-pic.

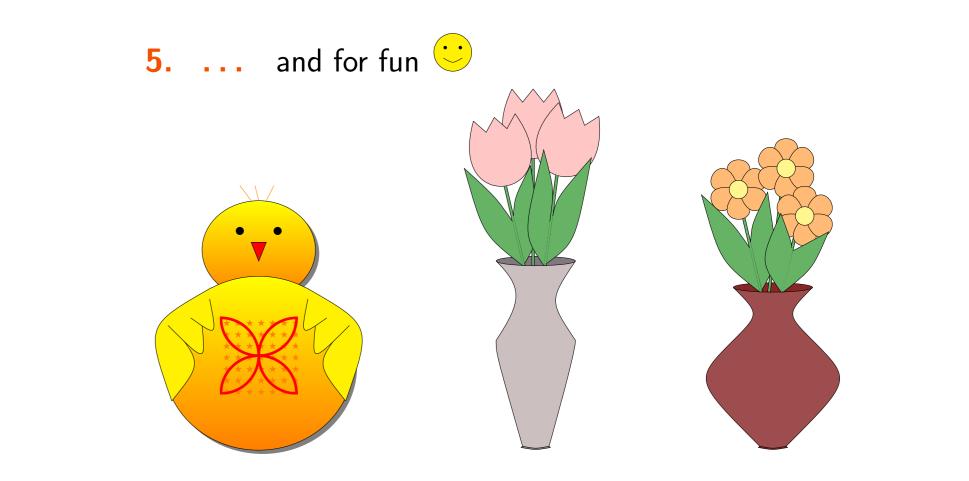
Examples

One can use TikZ for: **1.** adding mathematical symbols to the picture prepared by external program (picture from [8])

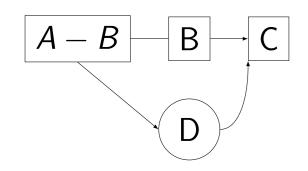


\begin{tikzpicture} \node [anchor=south west] at (0,0) { \includegraphics{XY.jpg}; \node at (4.6,3.5) {\$c\$}; \node at (9,5.3) {\$\Sigma_1\$}; \node at (-0.05,5.5) {\$\Sigma_2\$}; \node at (6.5,5) {\$C_1\$};

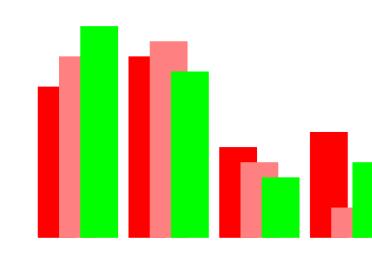




2. drawing diagrams



3. drawing bar diagrams



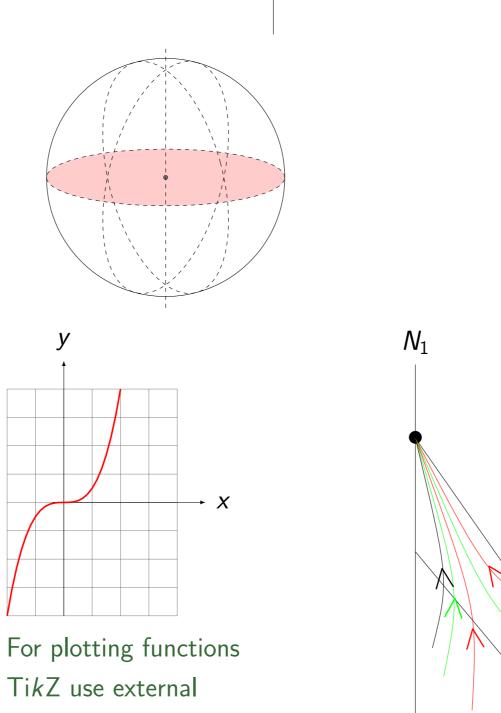
\end{tikzpicture}

. . .

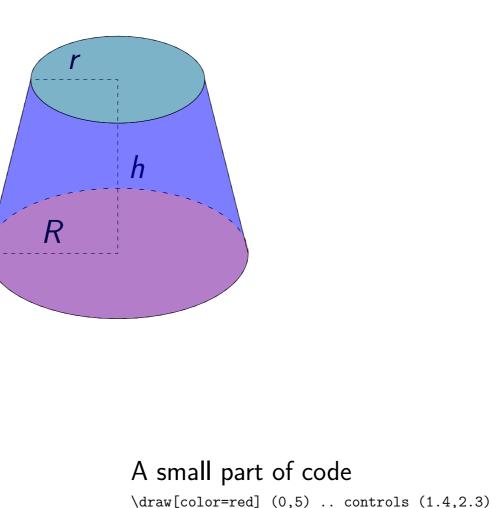
\begin{tikzpicture}

\node[rectangle,draw] (b1) at (5,0){\$A-B\$}; \node[rectangle,draw] (b2) [right=of b1] {B}; \node[rectangle,draw] (b3) [right=of b2] {C}; draw[->](b1.east)--(b2.west)(b2.east)--(b3.west);\node[circle,draw] (b4) [below=of b2] {D}; \draw[>=latex,->] (b1.south)--(b4.west); \draw[->] (b4.east) .. controls +(right:5mm) and +(down:10mm) .. (b3.south west); \end{tikzpicture}

\begin{tikzpicture}[ycomb,scale=4] \draw[color=red,line width=1cm] plot coordinates{(0,1) (.6,1.2) (1.2,.6) (1.8,.7) (2.4,.9); \draw[color=red!50,line width=1cm, xshift=4pt] plot coordinates{(0,1.2) (.6,1.3) (1.2,.5) (1.8,.2) (2.4,.5); \draw[color=blue,line width=1cm, xshift=8pt] plot coordinates{(0,1.4) (.6,1.1) (1.2,.4) (1.8,.5) (2.4,1); \end{tikzpicture}



program GNUPLOT



.. (2.8,2)

(3.5,1)

 N_2

node[pos=.50]{\rotatebox{35}{\$\wedge\$}};

node[pos=.55]{\rotatebox{35}{\$\wedge\$}};

\draw[color=green] (0,5) .. controls (1.5,1.5)

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