

# The mpgraphics Package

<http://bitbucket.org/vafa/mpgraphics>

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Version 0.2      April 20, 2011

## Abstract

It is not possible to include MetaPost graphics directly into your  $\text{\LaTeX}$  documents; you have got to process your MetaPost code first with MetaPost and then include the images in your  $\text{\LaTeX}$  document. This is difficult and time consuming and the situation even becomes worsen when you have many MetaPost graphics.

The `mpgraphics` package allows you to have all your MetaPost codes directly into your  $\text{\LaTeX}$  document and if you run  $\text{\LaTeX}$ , or  $\text{\PDF\LaTeX}$ , or  $\text{\Xe\LaTeX}$  with the `-shell-escape` option only once, then you can see your MetaPost graphics in your  $\text{\LaTeX}$  output.

This package works with  $\text{\PDF\LaTeX}$  (both PDF and DVI modes) and  $\text{\Xe\LaTeX}$  formats.

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## 1 Dedication

We dedicate the `mpgraphics` package to the **Iranian mathematician, Jamshid Kashani**. Al-Kashi was one of the best mathematicians in the Islamic world. He was born in 1380,

in Kashan, in central Iran. This region was controlled by Tamurlane, better known as Timur, who was more interested in invading other areas than taking care of what he had. Due to this, al-Kashi lived in poverty during his childhood and the beginning years of his adulthood.

The situation changed for the better when Timur died in 1405, and his son, Shah Rokh, ascended into power. Shah Rokh and his wife, Goharshad, a Persian princess, were very interested in the sciences, and they encouraged their court to study the various fields in great depth. Their son, Ulugh Beg, was enthusiastic about science as well, and made some noted contributions in mathematics and astronomy himself. Consequently, the period of their power became one of many scholarly accomplishments. This was the perfect environment for al-Kashi to begin his career as one of the world's greatest mathematicians.



Figure 1: Ghyath al-Din Jamshid Kashani

Eight years after he came into power in 1409, Ulugh Beg founded an institute in Samarkand which soon became a prominent university. Students from all over the Middle East, and beyond, flocked to this academy in the capital city of Ulugh Beg's empire. Consequently, Ulugh Beg harvested many great mathematicians and scientists of the Muslim world. In 1414, al-Kashi took this opportunity to contribute vast amounts of knowledge to his people. His best work was done in the court of Ulugh Beg, and it is said that he was the king's favourite student.

Al-Kashi was still working on his book, called "Risala al-watar wa'l-jaib" meaning "The Treatise on the Chord and Sine", when he died in 1429. Some scholars believe that Ulugh Beg may have ordered his murder, while others say he died a natural death. The details are unclear.

## 2 Requirements

- ☞ A web2c  $\text{T}_\text{E}\text{X}$  implementation such as  $\text{T}_\text{E}\text{XLive}$  or  $\text{MiK}_\text{T}_\text{E}\text{X}$  is needed; the package does not work with commercial  $\text{T}_\text{E}\text{X}$  implementations such as  $\text{PCT}_\text{E}\text{X}$ .
- ☞  $\text{L}_\text{A}\text{T}_\text{E}\text{X}$ , or  $\text{PDFL}_\text{A}\text{T}_\text{E}\text{X}$ , or  $\text{X}_\text{L}_\text{A}\text{T}_\text{E}\text{X}$  (depending on which one you use) must be called with the `-shell-escape` option.

- ☞ A recent and working version of `epstopdf` program (available in  $\TeX$ Live and MiK $\TeX$ ) is needed.
- ☞ A recent version of `color`, `graphicx`, `ifpdf`, `ifplatform`, `iftex`, `moreverb`, and `xkeyval` packages are required.

### 3 Basic Usage

#### 3.1 Placing MetaPost graphics at the center

```
\begin{mpdisplay}
<MetaPost codes between beginfig(); and endfig;>
\end{mpdisplay}
```

- ☞ `mpdisplay` environment places MetaPost graphics in display mode (at the center).

If your MetaPost code is something like this:

```
1 beginfig(1);
2 u=1cm;
3 draw (2u,2u)--(0,0)--(0,3u)--(3u,0)--(0,0);
4 pickup pencircle scaled 4pt;
5 for i=0 upto 2:
6 for j=0 upto 2: drawdot (i*u,j*u); endfor
7 endfor
8 endfig;
9 end;
```

Example 1: MetaPost code

Then the equivalent  $\LaTeX$  document should be like this:

```
1 \documentclass{article}
2 \usepackage{mpgraphics}
3 \begin{document}
4 \begin{mpdisplay}
5 u=1cm;
6 draw (2u,2u)--(0,0)--(0,3u)--(3u,0)--(0,0);
7 pickup pencircle scaled 4pt;
8 for i=0 upto 2:
9 for j=0 upto 2: drawdot (i*u,j*u); endfor
10 endfor
11 \end{mpdisplay}
12 \end{document}
```

### 3.2 Placing MetaPost graphics in inline mode

```
\begin{mpinline}  
<MetaPost codes between beginfig() and endfig;>  
\end{mpinline}
```

☞ `mpinline` environment places MetaPost graphics in inline mode (just like inline maths).

If your MetaPost code is something like this:

```
1 beginfig(2);  
2 draw (20,20)--(0,0)--(0,30)--(30,0)--(0,0);  
3 endfig;  
4 end;
```

Example 2: MetaPost code

Then the equivalent  $\text{\LaTeX}$  document should be like this:

```
1 \documentclass{article}  
2 \usepackage{mpgraphics}  
3 \begin{document}  
4 \begin{mpinline}  
5 draw (20,20)--(0,0)--(0,30)--(30,0)--(0,0)  
6 \end{mpinline}  
7 \end{document}
```

## 4 Your Global MetaPost definitions and inputs

```
\begin{mpdefs}  
<your global MetaPost definitions and inputs>  
\end{mpdefs}
```

☞ You can put your global MetaPost definitions and inputs inside `mpdefs` environment.

If your MetaPost code is something like this:

```
1 input metaobj  
2 defaultfont:="ptmr8r";  
3 warningcheck:=0;  
4 beginfig(1)  
5 newDEllipse.a(btex some text etex);  
6 scaleObj(a,1.7);  
7 rotateObj(a,45);  
8 a.c=origin;  
9 drawObj(a);
```

```
10 endfig;  
11 end;
```

Example 3: MetaPost code

Then the equivalent  $\text{\LaTeX}$  document should be like this:

```
1 \documentclass{article}  
2 \usepackage{mpgraphics}  
3 \begin{document}  
4 \begin{mpdefs}  
5 input metaobj  
6 defaultfont:="ptmr8r";  
7 warningcheck:=0;  
8 \end{mpdefs}  
9 \begin{mpdisplay}  
10 newDEllipse.a(btex some text etex);  
11 scaleObj(a,1.7);  
12 rotateObj(a,45);  
13 a.c=origin;  
14 drawObj(a);  
15 \end{mpdisplay}  
16 \end{document}
```

## 5 Your $\text{\LaTeX}$ packages and macros used within MetaPost graphics

```
\begin{ltxpreamble}  
<Your  $\text{\LaTeX}$  packages and macros used within MetaPost graphics>  
\end{ltxpreamble}
```

 You can put your  $\text{\LaTeX}$  packages and macros that needs to be used within MetaPost graphics, in `ltxpreamble` environment.

If you want to use the previous MetaPost code but you want that your labels to be typeset with fonts from `fourier` package, then your  $\text{\LaTeX}$  document should look like this:

```
1 \documentclass{article}  
2 \usepackage{mpgraphics}  
3 \begin{document}  
4 \begin{mpdefs}  
5 input metaobj  
6 defaultfont:="ptmr8r";  
7 warningcheck:=0;  
8 \end{mpdefs}  
9 \begin{ltxpreamble}  
10 \usepackage{fourier}  
11 \end{ltxpreamble}
```

```

12 \begin{mpdisplay}
13 newDEllipse.a(btex some text etex);
14 scaleObj(a,1.7);
15 rotateObj(a,45);
16 a.c=origin;
17 drawObj(a);
18 \end{mpdisplay}
19 \end{document}

```

## 6 Options of the package and few related commands

There are four options:

`epstopdf={options}` : Options can be appended to the `epstopdf` program if you wish<sup>1</sup>. For example, to run `epstopdf` auxiliary compilation with debugging information written to the console, use the following package option:

```
\usepackage [epstopdf={-debug}] {mpgraphics}
```

By default, no option is appended to the `epstopdf` program.

`compilation=(on/off)` : After your MetaPost figures have been generated and you no longer wish to re-generate your MetaPost figures, the package can be given the `compilation=off` option to save compilation time:

```
\usepackage [compilation=off] {mpgraphics}
```

By default, `compilation=on` . Also the following two commands are provided:

```
\mpgOff   \mpgOn
```

☞ `\mpgOff` turns off compilation.

☞ `\mpgOn` turn on compilation.

A command `\NoProcess` is also available to facilitate suppressing of pdf/eps generation of those figures whose pdf/eps's are already available. This might prove helpful when you have more figures to process and many of them are perfected and don't need recompilation and translation everytime you run  $\LaTeX$ . The usage is:

---

<sup>1</sup>See options of `epstopdf` program.

```
\NoProcess [comma separated and/or hyphen separated ranges]
```

For example, If you have ten figures and if you want to suppress the processing of the figure numbers 1, 2, 4 to 8 you can issue the command at the top of the document as:

```
\NoProcess [1,2,4-8]
```

**metapost={*options*}** : The MetaPost auxiliary compilation has some hard-coded options (`-tex=latex`, `-jobname="\mpgfigname"`, and `-interaction=batchmode`), and further options can be appended if you wish<sup>2</sup>. For example, to run MetaPost auxiliary compilation with more information written to the console, use the following package option:

```
\usepackage [metapost={-interaction=nonstopmode}] {mpgraphics}
```

**runs={*positive integer*}** : Sometimes with some MetaPost macros such as `makecirc`, you find that you need to run MetaPost more than once. The exact number will vary by exact application, and must be set explicitly. For example if you want to run MetaPost twice, then You can have:

```
\usepackage [runs=2] {mpgraphics}
```

By default MetaPost runs only once so we have **runs=1** by default.

## 7 Controlling different aspects of MetaPost graphics

There are few hooks to control different aspects of MetaPost graphics:

```
\configure [mpggraphic] [width=2in]
\configure [mpggraphic] [height=3in]
\configure [mpggraphic] [width=2in,height=3in]
\configure [mpggraphic] [scale=.5]
\configure [mpggraphic] [linecolor=red]
\configure [mpggraphic] [linewidth=1pt]
\configure [mpggraphic] [background=green]
\configure [mpggraphic] [rulesep=6pt]
```

The functionality is same as the `width`, `height` and `scale` options as in the `\includegraphics` command. But the graphic will be restricted to aspect ratio. `linecolor`, `linewidth`, `rulesep` and `background` corresponds to the box surrounding the graphic. The default values are `white`, `Opt`, `Opt` and `white` respectively.

<sup>2</sup>See page 89 of MetaPost manual.

## 8 Acknowledgements

Many thanks to the authors of `pdftricks` (Radhakrishnan CV, Rajagopal CV, and Antoine Chambert-Loir) and `auto-pst-pdf` (Will Robertson and Johannes Große) packages. This package could not exist without their combined efforts over many years as `mpgraphics` package borrows some ideas from `pdftricks` and `auto-pst-pdf` packages.

Thanks to Enrico Gregorio for suggesting `epstopdf` program.

Finally, I wish to thank John D. Hobby, Taco Hoekwater, and other MetaPost developers for developing MetaPost.

## 9 mpgraphics implementation

```
1 \NeedsTeXFormat{LaTeX2e}
2 \newcommand{\mpgraphics@date}{2011/07/25}
3 \newcommand{\mpgraphics@version}{v0.2}
4 \newcommand{\mpgraphics@commit}{commit 7}
5 \ProvidesPackage{mpgraphics}[\mpgraphics@date\space \mpgraphics@version\space <\mpgraphics@commi
6 inline and display metapost figures in LaTeX}
7 \newcommand{\mpg@graphicsextension}{\ifPDFTeX\ifpdf pdf\else eps\fi\else\ifXeTeX pdf\fi\fi}
8 \newcommand{\mpg@graphicsformatname}{\ifPDFTeX\ifpdf PDF\else EPS\fi\else\ifXeTeX PDF\fi\fi}
9 \newcommand{\mpg@formatname}{\ifPDFTeX\ifpdf pdflatex\else latex\fi\else\ifXeTeX xelatex\fi\fi}
10 \RequirePackage{graphicx,color,moreverb,xkeyval,ifplatform,iftex,ifpdf}
11 \@ifundefined{verbatim@out}{\newwrite\verbatim@out}{}%
12 \newif\if@mpg@debug\@mpg@debugfalse
13 \expandafter\newif\csname if@mpg@no@mpg@graphicsextension\endcsname
14 \newif\if@mpg@noprocess \@mpg@noprocessfalse
15 \newif\if@mpg@On
16 \DeclareOptionX{metapost}{%
17   \def\mpg@metapost@opts{%
18     -tex=latex
19     -jobname="\mpgfigname"
20     -interaction=batchmode
21     #1}}
22 \DeclareOptionX{epstopdf}{\def\mpg@epstopdf@opts{#1}}
23 \define@choicekey{mpgraphics.sty}{compilation}[\@tempa\@tempb]{on,off}{%
24   \ifcase\@tempb\relax
25     \@mpg@Ontrue
26   \or
27     \@mpg@Onfalse
28   \fi}
29 \define@choicekey{mpgraphics.sty}{debug}[\@tempa\@tempb]{on,off}{%
30   \ifcase\@tempb\relax
31     \@mpg@debugtrue
32   \or
33     \@mpg@debugfalse
34   \fi}
35 \newcounter{mpg@runs}
36 \DeclareOptionX{runs}{%
```

```

37 \setcounter{mpg@runs}{#1}% support calc
38 \ifnum\c@mpg@runs > \z@
39 \else
40   \mpg@PackageWarning{The number of runs must be at least one.}%
41   \c@mpg@runs\@ne
42 \fi}
43 \newcommand{\mpgOff}{\@mpg@Onfalse}
44 \newcommand{\mpgOn}{\@mpg@Ontrue}
45 \ExecuteOptionsX{%
46   metapost={},%
47   epstopdf={},%
48   compilation=on,%
49   debug=off,%
50   runs=1%
51 }
52 \ProcessOptionsX
53 \def\mpg@exe{\immediate\write18}
54 \def\OnlyIfFileExists#1#2{\IfFileExists{#1}{#2}{}}
55 \def\NotIfFileExists#1#2{\IfFileExists{#1}{}{#2}}
56 \def\mpg@convert#1#2#3{%
57   \OnlyIfFileExists{#2}{%
58     \mpg@exe{\csname mpg@cmd@#1\endcsname{#2}{#3}}%
59     \NotIfFileExists{#3}{\mpg@Warning{Creation of #3 failed.}}}
60 \def\mpg@cmd@metapost#1#2{mpost \mpg@metapost@opts\space
61   "\unexpanded{\input} #1"}
62 \def\mpg@cmd@extrametapost#1#2{mpost \mpg@metapost@opts\space
63   "\unexpanded{\input} #1"}
64 \def\mpg@cmd@epstopdf#1#2{epstopdf \mpg@epstopdf@opts\space -o "#2" "#1"}
65 \def\mpg@nl{^^J\space\space\space\space}
66 \newcommand\mpg@PackageError[2]{%
67   \PackageError{mpgraphics}{\mpg@nl #1^^J}{#2}}
68 \newcommand\mpg@Warning[2]{\if@mpg@debug\PackageWarning{#1}{#2}\fi}
69 \newcommand\mpg@PackageWarning[1]{%
70   \PackageWarning{mpgraphics}{\mpg@nl #1^^JThis warning occurred}}
71 \newcommand\mpg@WarningNoLine[2]{\if@mpg@debug\PackageWarningNoLine{#1}{#2}\fi}
72 \ifshellescape
73   \PackageWarningNoLine{mpgraphics}
74   {*****\MessageBreak
75     Using \csname write\endcsname18 capability \MessageBreak
76     for producing \mpg@graphicsformatname-figures. \MessageBreak
77     *****}
78 \else
79   \mpg@PackageError{%
80     "shell escape" (or "write18") is not enabled;\mpg@nl
81     mpgraphics will not work!}
82   {You need to run "\mpg@formatname\space -shell-escape"\mpg@nl
83     on your LaTeX document Or turn compilation off}
84 \fi
85 \newenvironment{mpdefs}{\MPDEFsverbatimwrite{mpdefs.mp}}
86   {\endMPDEFsverbatimwrite}

```

```

87 \newenvironment{ltxpreamble}{\verbatimwrite{ltxpreamble.ltx}}
88   {\endverbatimwrite}
89 \newcommand{\mpgfigname}{\jobname-fig\thempgfig}
90 \def\MPGverbatimwrite#1{%
91   \@bsphack
92   \immediate\openout \verbatim@out #1
93   \BeforeMPGStream%
94   \let\do\@makeother\dospecials
95   \catcode\^^M\active \catcode\^^I=12
96   \def\verbatim@processline{%
97     \immediate\write\verbatim@out
98       {\the\verbatim@line}}%
99   \verbatim@start}
100 \def\endMPGverbatimwrite{%
101   \immediate\write\verbatim@out{endfig;}
102   \immediate\write\verbatim@out{end;}
103   \immediate\closeout\verbatim@out
104   \@esphack}
105 \def\MPDEFSverbatimwrite#1{%
106   \@bsphack
107   \immediate\openout \verbatim@out #1
108   \BeforeMPDEFSStream%
109   \let\do\@makeother\dospecials
110   \catcode\^^M\active \catcode\^^I=12
111   \def\verbatim@processline{%
112     \immediate\write\verbatim@out
113       {\the\verbatim@line}}%
114   \verbatim@start}
115 \def\endMPDEFSverbatimwrite{%
116   \immediate\closeout\verbatim@out
117   \@esphack}
118 \def\BeforeMPGStream
119   {\message{Opening MPGStream=\mpgfigname.mp}%
120   \ifPDFTeX\ifpdf%
121     \immediate\write\verbatim@out{prologues:=3;} \else
122     \immediate\write\verbatim@out{prologues:=2;} \fi \else \ifXeTeX
123     \immediate\write\verbatim@out{prologues:=3;} \fi \fi
124     \immediate\write\verbatim@out{outputtemplate:= "\@percentchar j.eps";}
125     \immediate\write\verbatim@out{verbatimtex}
126     \immediate\write\verbatim@out{\string\documentclass{article}}
127     \IfFileExists{ltxpreamble.ltx}{\immediate\write\verbatim@out{\string\input{ltxpreamble.ltx}}.
128     \immediate\write\verbatim@out{\string\begin{document}}
129     \immediate\write\verbatim@out{etex;}
130     \IfFileExists{mpdefs.mp}{\immediate\write\verbatim@out{input mpdefs;}}{}
131     \immediate\write\verbatim@out{beginfig(\thempgfig);}
132   }
133 \def\BeforeMPDEFSStream
134   {\message{Opening MPGStream=mpdefs.mp}%
135   \immediate\write\verbatim@out{verbatimtex}
136   \immediate\write\verbatim@out{\string\documentclass{article}}

```

```

137 \IfFileExists{ltxpreamble.ltx}{\immediate\write\verbatim@out{\string\input{ltxpreamble.ltx}};
138 \immediate\write\verbatim@out{\string\begin{document}}
139 \immediate\write\verbatim@out{etex;}
140 }
141 \newenvironment{mpdisplay}{\stepcounter{mpgfig}%
142 \xdef\MPGCutFile{\mpgfigname.mp}
143 \MPGverbatimwrite{\MPGCutFile}}
144 {\endMPGverbatimwrite%
145 \MPGgraphicsinclude%
146 \global\@mpg@noprocessfalse\noindent}
147 \newenvironment{mpinline}{\stepcounter{mpgfig}%
148 \xdef\MPGCutFile{\mpgfigname.mp}
149 \MPGverbatimwrite{\MPGCutFile}}
150 {\endMPGverbatimwrite%
151 \MPGinlinegraphicsinclude%
152 \global\@mpg@noprocessfalse\noindent}
153 \AtEndDocument{\endMPGhook%
154 \csname if@mpg@no@\mpg@graphicsextension\endcsname
155 \PackageWarningNoLine{mpgraphics}
156 {*****\MessageBreak
157 Some \mpg@graphicsformatname\space files of images were not found.\MessageBreak
158 *****}
159 \fi
160 }
161 \gdef\endMPGhook{}
162 \newcommand{\mpgnoprocess}{\global\@mpg@noprocesstrue
163 \PackageWarning{mpgraphics}
164 {*****\MessageBreak
165 Figure Number: \mpgfigname\space is not processed \MessageBreak
166 *****\MessageBreak}
167 }
168 \newcounter{mpgfig}
169 \newif\if@mpgGINwidth
170 \newif\if@mpgGINheight
171 \newif\if@mpgGINscale
172 \long\gdef\MPGgraphicsProcess{%
173 \@ifundefined{Fig\thempgfig}
174 {\mpg@WarningNoLine{mpgraphics}
175 {*****\MessageBreak
176 ***** Processing Fig: \thempgfig\space*****\MessageBreak
177 *****}
178 }
179 {\mpgnoprocess}
180 \ifshellescape\if@mpg@noprocess\relax\else\if@mpg@On
181 \IfFileExists{\mpgfigname.mp}{%
182 \loop\ifnum\c@mpg@runs > \@ne
183 \mpg@convert{extrametapost}{\mpgfigname.mp}{\mpgfigname.eps}%
184 \advance\c@mpg@runs\m@ne
185 \repeat
186 \mpg@convert{metapost}{\mpgfigname.mp}{\mpgfigname.eps}%

```

```

187 \mpg@WarningNoLine{mpgraphics}
188   {*****\MessageBreak
189   \mpgfigname.mp converted to \mpgfigname.eps\MessageBreak
190   *****}
191   }{}
192   \IfFileExists{\mpgfigname.eps}{%
193   \ifPDFTeX\ifpdf%
194   \mpg@convert{epstopdf}{\mpgfigname.eps}{\mpgfigname.pdf}%
195   \mpg@WarningNoLine{mpgraphics}
196   {*****\MessageBreak
197   \mpgfigname.eps converted to \mpgfigname.pdf\MessageBreak
198   *****}\else\fi\else\ifXeTeX%
199   \mpg@convert{epstopdf}{\mpgfigname.eps}{\mpgfigname.pdf}%
200   \mpg@WarningNoLine{mpgraphics}
201   {*****\MessageBreak
202   \mpgfigname.eps converted to \mpgfigname.pdf\MessageBreak
203   *****}\fi\fi
204 }{%
205   \mpg@PackageError{%
206     metapost encountered error(s) while compiling your\mpg@nl
207     metapost code and so it did not produce the figure!}
208     {Fix your metapost code, delete all metapost and\mpg@nl
209     LaTeX auxillary files and then run "\mpg@formatname\space -shell-escape"\mpg@nl
210     on your document again}
211 } \else\fi
212   \ifwindows%
213   \IfFileExists{\mpgfigname.log}{\immediate\write18{del \mpgfigname.log}}{}%
214   \IfFileExists{\mpgfigname.mp}{\immediate\write18{del \mpgfigname.mp}}{}%
215   \ifPDFTeX\ifpdf%
216   \IfFileExists{\mpgfigname.eps}{\immediate\write18{del \mpgfigname.eps}}{\else\fi\else\ifXeTeX%
217   \IfFileExists{\mpgfigname.eps}{\immediate\write18{del \mpgfigname.eps}}{\fi\fi%
218   \IfFileExists{\mpgfigname.mpx}{\immediate\write18{del \mpgfigname.mpx}}{}%
219   \IfFileExists{texnum.mpx}{\immediate\write18{del texnum.mpx}}{}%
220   \IfFileExists{makempx.log}{\immediate\write18{del makempx.log}}{}%
221   \IfFileExists{mpxerr.log}{\immediate\write18{del mpxerr.log}}{}%
222   \IfFileExists{mpxerr.tex}{\immediate\write18{del mpxerr.tex}}{}%
223   \else
224   \IfFileExists{\mpgfigname.log}{\immediate\write18{rm \mpgfigname.log}}{}%
225   \IfFileExists{\mpgfigname.mp}{\immediate\write18{rm \mpgfigname.mp}}{}%
226   \ifPDFTeX\ifpdf%
227   \IfFileExists{\mpgfigname.eps}{\immediate\write18{rm \mpgfigname.eps}}{\else\fi\else\ifXeTeX%
228   \IfFileExists{\mpgfigname.eps}{\immediate\write18{rm \mpgfigname.eps}}{\fi\fi%
229   \IfFileExists{\mpgfigname.mpx}{\immediate\write18{rm \mpgfigname.mpx}}{}%
230   \IfFileExists{texnum.mpx}{\immediate\write18{rm texnum.mpx}}{}%
231   \IfFileExists{makempx.log}{\immediate\write18{rm makempx.log}}{}%
232   \IfFileExists{mpxerr.log}{\immediate\write18{rm mpxerr.log}}{}%
233   \IfFileExists{mpxerr.tex}{\immediate\write18{rm mpxerr.tex}}{}%
234   \fi\fi
235   \fi
236 }

```

```

237 \long\gdef\MPGgraphicsinclude{\MPGgraphicsProcess%
238 \IfFileExists{\mpgfigname.\mpg@graphicsextension}%
239   {\begin{center}
240     \bgroup\fbboxsep\@MPGboxsep\fbboxrule\@MPGboxrule%
241     \color{\@MPGgraphiccolor}%
242     \fcolorbox{\@MPGgraphiclinecolor}{\@MPGgraphicbackground}%
243     {\if@mpgGINwidth%
244     \includegraphics[width=\@MPGgraphicwidth]{\mpgfigname.\mpg@graphicsextension}\else%
245     \if@mpgGINheight%
246     \includegraphics[height=\@MPGgraphicheight]{\mpgfigname.\mpg@graphicsextension}\else%
247     \if@mpgGINscale%
248     \includegraphics[scale=\@MPGgraphicscale]{\mpgfigname.\mpg@graphicsextension}\else%
249     \includegraphics{\mpgfigname.\mpg@graphicsextension}\fi\fi\fi%
250   }\egroup\end{center}%
251   \global\@mpgGINwidthfalse\let\@MPGgraphicwidth\relax
252   \global\@mpgGINheightfalse\let\@MPGgraphicheight\relax
253   \global\@mpgGINscalefalse\let\@MPGgraphicscale\relax
254   }\csname @mpg@no@\mpg@graphicsextension true\endcsname}
255 \gdef\@MPGgraphiclinecolor{white}
256 \gdef\@MPGgraphicbackground{white}
257 \gdef\@MPGboxsep{0pt}
258 \gdef\@MPGboxrule{0pt}
259 }
260 \long\gdef\MPGinlinegraphicsinclude{%
261 \MPGgraphicsProcess%
262 \IfFileExists{\mpgfigname.\mpg@graphicsextension}%
263   {\bgroup\fbboxruleOpt%
264   \normalcolor\fbbox{\includegraphics{\mpgfigname.\mpg@graphicsextension}}%
265   \egroup}%
266   {\csname @mpg@no@\mpg@graphicsextension true\endcsname}%
267 }
268 \def\configure[#1][#2]{\setkeys{#1}{#2}
269 \mpg@Warning{mpgraphics}{Reconfigured #1 parameter(s)\MessageBreak
270 #2\MessageBreak}}
271 \define@key{mpggraphic}{width} {\gdef\@MPGgraphicwidth{#1}%
272 \global\@mpgGINwidthtrue}
273 \define@key{mpggraphic}{height} {\gdef\@MPGgraphicheight{#1}%
274 \global\@mpgGINheighttrue}
275 \define@key{mpggraphic}{scale} {\gdef\@MPGgraphicscale{#1}%
276 \global\@mpgGINscaletrue}
277 \define@key{mpggraphic}{color} {\gdef\@MPGgraphiccolor{#1}}
278 \define@key{mpggraphic}{linecolor} {\gdef\@MPGgraphiclinecolor{#1}}
279 \define@key{mpggraphic}{background} {\gdef\@MPGgraphicbackground{#1}}
280 \define@key{mpggraphic}{linewidth} {\gdef\@MPGboxrule{#1}}
281 \define@key{mpggraphic}{rulesep} {\gdef\@MPGboxsep{#1}}
282 \gdef\@MPGgraphiccolor{black}
283 \gdef\@MPGgraphiclinecolor{white}
284 \gdef\@MPGgraphicbackground{white}
285 \gdef\@MPGboxrule{0pt}
286 \gdef\@MPGboxsep{0pt}

```

```

287 \@ifundefined{c@arraylength}{\newcounter{arraylength}}{}%
288 \@ifundefined{c@ArrayIndex}{\newcounter{ArrayIndex}}{}%
289 \@ifundefined{c@zeroCtr}{\newcounter{zeroCtr}}{}%
290 \@ifundefined{c@recordCtr}{\newcounter{recordCtr}}{}
291 \setcounter{recordCtr}{1}
292 \@ifundefined{c@Ctr}{\newcounter{Ctr}}{}
293 \def\DeclareArray#1{\Array{#1}[0]}%
294 \def\Array#1[#2]#3{%
295     \expandafter\gdef\csname #1#2\endcsname{#3}%
296     \expandafter\gdef\csname #1\endcsname[##1]{\csname #1##1\endcsname}}%
297 \def\getArraylength#1{\setcounter{arraylength}{0}%
298     \loop\expandafter\ifx\csname #1\thearraylength\endcsname\relax%
299     \else\stepcounter{arraylength}\repeat}%
300 \def\addToArray#1#2{\setcounter{arraylength}{0}%
301     \loop\expandafter\ifx\csname #1\thearraylength\endcsname\relax%
302     \else\stepcounter{arraylength}\repeat%
303     \Array{#1}[\thearraylength]{#2}}%
304 \def\clearArray#1{\getArraylength{#1}%
305     \loop\ifnum\c@arraylength >0%
306     \global\expandafter\let\csname #1\thearraylength\endcsname\relax%
307     \addtocounter{arraylength}{-1}\repeat}%
308 \long\def\ArrayIterator#1#2{%
309     \setcounter{ArrayIndex}{1}\getArraylength{#1}%
310     \setcounter{zeroCtr}{\c@arraylength}%
311     \loop\ifnum\c@ArrayIndex<\c@zeroCtr{#2}%
312     \stepcounter{ArrayIndex}\repeat%
313 }%
314 \def\@nnil{\@nil}
315 \def\@empty{}
316 \def\@cvrstop#1\@#2{}
317 \long\def\cvr@delimfor#1#2#3{\DeclareArray{#1}\clearArray{#1}%
318     \long\def\@icvrloop##1#2##2\@##3{\def##3{##1}\ifx ##3\@nnil%
319     \expandafter\@cvrstop \else\addToArray{#1}{##1}%
320     \relax\expandafter\@icvrloop\fi##2\@##3}%
321     \long\def\@cvrloop##1#2##2#3\@##4{\addToArray{#1}{##1}%
322     \def##4{##1}\ifx ##4\@nnil \else%
323     \def##4{##2}\def\y@y{##2}\ifx\y@y\@nnil\else%
324     \addToArray{#1}{##2}\fi\ifx ##4\@nnil \else%
325     \@icvrloop ##3\@##4\fi\fi}%
326     \expandafter\def\expandafter\@fortmp\expandafter{#3}%
327     \ifx\@fortmp\@empty \else%
328     \expandafter\@cvrloop#3#2\@nil#2\@nil\@##4\fi}%
329 \@ifundefined{c@f@irstCtr}{\newcounter{f@irstCtr}}{}%
330 \@ifundefined{c@s@econdCtr}{\newcounter{s@econdCtr}}{}%
331 \long\gdef\NoProcess[#1]{%
332     \long\def\@i@noprocess##1,##2\@##3{\def##3{##1}\ifx ##3\@nnil%
333     \expandafter\@cvrstop \else
334     \expandafter\hyphencheck##1-@-*[*]
335     \relax\expandafter\@i@noprocess\fi##2\@##3}%
336     \long\def\@##1,##2,##3\@##4{

```

```

337 \expandafter\hyphencheck##1-@-*[*]
338 \def##4{##1}\ifx ##4\@nnil \else%
339 \def##4{##2}\def\y@y{##2}\ifx\y@y\@nnil\else%
340 \expandafter\hyphencheck##2-@-*[*]
341 \fi\ifx ##4\@nnil \else%
342 \i@noproces ##3\@##4\fi\fi}%
343 \expandafter\def\expandafter\@fortmp\expandafter{#1}%
344 \ifx\@fortmp\@empty \else%
345 \expandafter\@noproces##1,\@nil,\@nil\@e@fi}%
346 \def\d@d#1[*]{%
347 \def\hyphencheck#1-#2-#3{\def\r@r{@}\def\s@s{*}\edef\c@c{#3}
348 \ifx\c@c\r@r
349 \setcounter{f@firstCtr}{#1}
350 \setcounter{s@econdCtr}{#2}
351 \stepcounter{s@econdCtr}
352 \loop\ifnum\thes@econdCtr > \thef@firstCtr%
353 \expandafter\edef\csname Fig\thef@firstCtr\endcsname{TRUE}
354 \stepcounter{f@firstCtr}
355 \repeat%
356 \else\ifx\c@c\s@s%
357 \expandafter\edef\csname Fig#1\endcsname{TRUE}
358 \fi\fi\d@d}

```

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