# The **asymptote** package

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**Abstract**

This package provides integration of inline and external Asymptote graphics within a LaTeX document.

# Contents

# 1  Introduction

This is the documentation for the LaTeX package `asymptote` which accompanies the Asymptote drawing package. For further details on Asymptote, please see its documentation in `asymptote.pdf`.

# 2  User syntax

## 2.1  Package loading and options

The package may take two options at load time: `inline` or `attach`. These options can also be set at any time with the `\asysetup{⟨options⟩}` command, or specified individually in the optional argument to each `asy` environment or `asyinclude` command.

The `inline` option uses Asymptote's 'inline' mode whereby included graphics have their labels typeset in the environment of the document they are contained within. Otherwise the Asymptote graphics are self-contained and their formatting is independent of the document.

The `attach` option allows generated graphics to be embedded within the PDF using the `attachfile2` package; please load that package separately if you wish to use it. The `attach` option takes precedence over the `inline` option.

This package produces quite a number of output files, which by default are created in the same directory as the LaTeX document that is being compiled. To keep things more tidy, you can specify an output directory for these files by defining the `\asydir` command. For example, if you wish to store the figure files in the subdirectory `asytmp/`, the you would write `\renewcommand\asydir{asytmp}`.

Alternatively (and tentatively), you may write `dir=asytmp` in either the `asy` environment options or the options to `\asysetup`.

## 2.2 Commands for inserting Asymptote graphics

The main environment defined by the package is the `asy` environment, in which verbatim Asymptote code is placed that will be compiled for generating a graphic in the document. For example,

```
\begin{figure}
\begin{asy}[ <options> ]
<ASYMPTOTE CODE>
\end{asy}
\caption{...}\label{...}
```

If you have Asymptote code in a separate file, you can include it with the `\asyinclude[`⟨*options*⟩`]{`⟨*filename*⟩`}` command.

For Asymptote code that should be included in *every* graphic, define it using the `asydef` environment.

## 2.3 Graphics options

Both the `asy` environment and the `\asyinclude` command take optional parameters for controlling aspects of the graphics creation. In addition to locally setting `inline` and `attach`, the following options may also be used:

**width** Width of the figure

**height** Height of the figure

**keepAspect** Maintain aspect ratio [default true]

**viewportwidth** Viewport width for 3D figures

**viewportheight** Viewport height for 3D figures

These may also be set globally using the `\asysetup` command.

# 3 Processing the document

After running LaTeX on the document, it is necessary to process the Asymptote graphics so they can be included in the next compilation. The simplest procedure is a recipe such as

```
pdflatex mydoc
asy mydoc-*.asy
pdflatex mydoc
```

This technique will recompile each graphic every time, however. To only recompile graphics that have changed, use the `latexmk` tool. Asymptote is distributed with a `latexmkrc` configuration file; place this file in a place where `latexmk` will find it and your document may be compiled, including the `asy` compilations, with `latexmk mydoc` or `latexmk --pdf mydoc`.

# 4 Implementation

```
1 \def\Asymptote{{\tt Asymptote}}
```

```
2 \InputIfFileExists{\jobname.pre}{}{}
```

## 4.1 Allocations

### Allocations

```
3 \newbox\ASYbox
4 \newcounter{asy}
```

```
5 \newwrite\AsyStream
6 \newwrite\AsyPreStream
```

```
7 \newif\ifASYinline
8 \newif\ifASYattach
9 \newif\ifASYkeepAspect
10 \ASYkeepAspecttrue
```

## 4.2 Packages

```
11 \RequirePackage{keyval}
12 \RequirePackage{ifthen}
13 \RequirePackage{color,graphicx}
```

**Emulating packages**   We cannot assume that Asymptote users have recent TEX distributions. (E.g., Fedora until recently still shipped teTeX.) So load ifpdf and ifxetex if they exist; otherwise, emulate them.

In due course, delete this code and just load the packages.

```
14 \IfFileExists{ifpdf.sty}{
15   \RequirePackage{ifpdf}
16 }{
17   \expandafter\newif\csname ifpdf\endcsname
18   \ifx\pdfoutput\@undefined\else
19     \ifcase\pdfoutput\else
20       \pdftrue
21     \fi
22   \fi
23 }
```

```
24 \IfFileExists{ifxetex.sty}{
25   \RequirePackage{ifxetex}
26 }{
27   \expandafter\newif\csname ifxetex\endcsname
28   \ifx\XeTeXversion\@undefined\else
29     \xetextrue
30   \fi
31 }
```

`\CatchFileDef`   Used for `\asyinclude`. Note that the fallback definition is not as robust as the one provided by catchfile.

```
32 \IfFileExists{catchfile.sty}{
33   \RequirePackage{catchfile}
34 }{
35   \newcommand\CatchFileDef[3]{%
36     \begingroup
37     \everyeof{%
38       \ENDCATCHFILEMARKER
39       \noexpand
40     }%
41     \long\def\@tempa####1\ENDCATCHFILEMARKER{%
42       \endgroup
43       \def##1{####1}%
44     }%
45     ##3%
46     \expandafter\@tempa\@@input ##2\relax
47   }
48 }
```

## Ensuring attachfile2 is loaded if [attach] is requested

```
49 \newif\if@asy@attachfile@loaded
```

```
50 \AtBeginDocument{%
51   \@ifpackageloaded{attachfile2}{\@asy@attachfile@loadedtrue}{}%
52   \let\asy@check@attachfile\asy@check@attachfile@loaded
53 }
```

```
54 \newcommand\asy@check@attachfile@loaded{%
55   \if@asy@attachfile@loaded\else
56     \PackageError{asymptote}{You must load the attachfile2 package}{^^J%
57       You have requested the [attach] option for some or all of your^^J%
58       Asymptote graphics, which requires the attachfile2 package.^^J%
59       Please load it in the document preamble.^^J%
60     }%
61   \fi
62 }
```

```
63 \newcommand\asy@check@attachfile{%
64   \AtBeginDocument{\asy@check@attachfile@loaded}%
65   \let\asy@check@attachfile\@empty
66 }
```

## Macros

```
67 \def\csarg#1#2{\expandafter#1\csname#2\endcsname}
```

## 4.3   Package options

```
68 \DeclareOption{inline}{%
69   \ASYinlinetrue
70 }
71 \DeclareOption{attach}{%
```

```
72    \asy@check@attachfile
73    \ASYattachtrue
74 }
75 \ProcessOptions*

76 \def\asylatexdir{}
77 \def\asydir{}
78 \def\ASYasydir{}
79 \def\ASYprefix{}
```

## 4.4  Testing for PDF output

Note this is not quite the same as `\ifpdf`, since we still want PDF output when using XeTeX.

```
80 \newif\ifASYPDF
81 \ifxetex
82   \ASYPDFtrue
83   \usepackage{everypage}
84 \else
85   \ifpdf
86     \ASYPDFtrue
87   \fi
88 \fi
89 \ifASYPDF
90   \def\AsyExtension{pdf}
91 \else
92   \def\AsyExtension{eps}
93 \fi
```

## 4.5  Bug squashing

```
94 \def\unquoteJobname#1"#2"#3\relax{%
95   \def\rawJobname{#1}%
96   \ifx\rawJobname\empty
97     \def\rawJobname{#2}%
98   \fi
99 }
100 \expandafter\unquoteJobname\jobname""\relax
```

Work around jobname bug in MiKTeX 2.5 and 2.6: Turn stars in file names (resulting from spaces, etc.) into minus signs

```
101 \def\fixstar#1*#2\relax{%
102   \def\argtwo{#2}%
103   \ifx\argtwo\empty
104     \gdef\Jobname{#1}%
105   \else
106     \fixstar#1-#2\relax
107   \fi
108 }
109 \expandafter\fixstar\rawJobname*\relax
```

Work around bug in dvips.def: allow spaces in file names.

```
110 \def\Ginclude@eps#1{%
111   \message{<#1>}%
112   \bgroup
113   \def\@tempa{!}%
114   \dimen@\Gin@req@width
115   \dimen@ii.1bp\relax
116   \divide\dimen@\dimen@ii
117   \@tempdima\Gin@req@height
118   \divide\@tempdima\dimen@ii
119     \special{PSfile=#1\space
120       llx=\Gin@llx\space
121       lly=\Gin@lly\space
122       urx=\Gin@urx\space
123       ury=\Gin@ury\space
124       \ifx\Gin@scalex\@tempa\else rwi=\number\dimen@\space\fi
125       \ifx\Gin@scaley\@tempa\else rhi=\number\@tempdima\space\fi
126       \ifGin@clip clip\fi}%
127   \egroup
128 }
```

## 4.6   Input/Output

```
129 \immediate\openout\AsyPreStream=\jobname.pre\relax
130 \AtEndDocument{\immediate\closeout\AsyPreStream}

131 \def\WriteAsyLine#1{%
132   \immediate\write\AsyStream{\detokenize{#1}}%
133 }

134 \def\globalASYdefs{}
135 \def\WriteGlobalAsyLine#1{%
136   \expandafter\g@addto@macro
137   \expandafter\globalASYdefs
138   \expandafter{\detokenize{#1^^J}}%
139 }
```

## 4.7   Commands for verbatim processing environments

```
140 \def\ProcessAsymptote#1{%
141   \begingroup
142   \def\CurrentAsymptote{#1}%
143   \let\do\@makeother \dospecials
144   \@makeother\^^L% and whatever other special cases
145   \catcode`\ =10
146   \endlinechar`\^^M \catcode`\^^M=12 \xAsymptote
147 }
```

Need lots of comment chars here because ⟨*line end*⟩ is no longer a space character.

```
148 \begingroup
149   \catcode`\^^M=12 \endlinechar=-1\relax%
150   \gdef\xAsymptote{%
151     \expandafter\ProcessAsymptoteLine%
152   }
```

```
153  \gdef\ProcessAsymptoteLine#1^^M{%
154    \def\@tempa{#1}%
155    {%
156      \escapechar=-1\relax%
157      \xdef\@tempb{\string\\end\string\{\CurrentAsymptote\string\}}%
158    }%
159    \ifx\@tempa\@tempb%
160      \edef\next{\endgroup\noexpand\end{\CurrentAsymptote}}%
161    \else%
162      \ThisAsymptote{#1}%
163      \let\next\ProcessAsymptoteLine%
164    \fi%
165    \next%
166  }
167 \endgroup
168 \def\asy@init{
169   \def\ASYlatexdir{}
170   \ifx\asylatexdir\empty\else
171     \def\ASYlatexdir{\asylatexdir/}%
172   \fi
173   \ifx\asydir\empty\else
174     \def\ASYasydir{\asydir/}%
175   \fi
176   \def\ASYprefix{\ASYlatexdir\ASYasydir}%
177 }
```

## 4.8   User interface

```
178 \newcommand\asy[1][]{%
179   \stepcounter{asy}%
180   \setkeys{ASYkeys}{#1}%
```

Disable the "inline" option if "attach" is enabled:

```
181   \ifASYattach
182     \ASYinlinefalse
183   \fi
184   \asy@init
185   \immediate\write\AsyPreStream{%
186     \noexpand\InputIfFileExists{%
187       \ASYprefix\noexpand\jobname-\the\c@asy.pre}{}{}%
188   }
189   \asy@write@graphic@header
190   \let\ThisAsymptote\WriteAsyLine
191   \ProcessAsymptote{asy}%
192 }

193 \def\endasy{%
194   \asy@finalise@stream
195   \asy@input@graphic
196 }

197 \def\asy@write@graphic@header{%
```

```
198  \immediate\openout\AsyStream=\ASYasydir\jobname-\the\c@asy.asy\relax
199  \gdef\AsyFile{\ASYprefix\Jobname-\the\c@asy}%
200  \immediate\write\AsyStream{%
201    if(!settings.multipleView) settings.batchView=false;^^J%
202    \ifxetex
203      settings.tex="xelatex";^^J%
204    \else\ifASYPDF
205        settings.tex="pdflatex";^^J%
206    \fi\fi
207    \ifASYinline
208      settings.inlinetex=true;^^J%
209      deletepreamble();^^J%
210    \fi
211    defaultfilename="\Jobname-\the\c@asy";^^J%
212    if(settings.render < 0) settings.render=4;^^J%
213    settings.outformat="";^^J%
214    \ifASYattach
215      settings.inlineimage=false;^^J%
216      settings.embed=false;^^J%
217      settings.toolbar=true;^^J%
218    \else
219      settings.inlineimage=true;^^J%
220      settings.embed=true;^^J%
221      settings.toolbar=false;^^J%
222      viewportmargin=(2,2);^^J%
223    \fi
224    \globalASYdefs
225  }%
226 }
227 \def\asy@expand@keepAspect{%
228   \ifASYkeepAspect keepAspect=true%
229   \else keepAspect=false%
230   \fi%
231 }

232 \def\asy@finalise@stream{%
```

Setting size(). Only inserted if one of the dimensions is set explicitly (i.e., if both height and width are not empty).

```
233    \ifx\ASYwidth\@empty
234      \ifx\ASYheight\@empty
235        % write nothing!
236      \else
237        \immediate\write\AsyStream{size(0,\ASYheight,\asy@expand@keepAspect);}%
238      \fi
239    \else
240      \ifx\ASYheight\@empty
241        \immediate\write\AsyStream{size(\ASYwidth,0,\asy@expand@keepAspect);}%
242      \else
243        \immediate\write\AsyStream{size(\ASYwidth,\ASYheight,\asy@expand@keepAspect);}%
244      \fi
```

```latex
245    \fi
```
Setting `viewportsize=()`. Same logic as for `size()`.
```latex
246  \ifx\ASYviewportwidth\@empty
247    \ifx\ASYviewportheight\@empty
248      % write nothing!
249    \else
250      \immediate\write\AsyStream{viewportsize=(0,\ASYviewportheight);}%
251    \fi
252  \else
253    \ifx\ASYviewportheight\@empty
254      \immediate\write\AsyStream{viewportsize=(\ASYviewportwidth,0);}%
255    \else
256      \immediate\write\AsyStream{%
257        viewportsize=(\ASYviewportwidth,\ASYviewportheight);}%
258    \fi
259  \fi
260  \immediate\closeout\AsyStream
261 }
262 \def\asy@input@graphic{%
263  \ifASYinline
264    \IfFileExists{"\AsyFile.tex"}{%
265      \catcode`:=12\relax
266      \@@input"\AsyFile.tex"\relax
267    }{%
268      \PackageWarning{asymptote}{file `\AsyFile.tex' not found}%
269    }%
270  \else
271    \IfFileExists{"\AsyFile.\AsyExtension"}{%
272      \ifASYattach
273        \ifASYPDF
274          \IfFileExists{"\AsyFile+0.pdf"}{%
275            \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile+0".pdf}}%
276          }{%
277            \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile".pdf}}%
278          }%
279        \else
280          \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile.eps"}}%
281        \fi
282        \textattachfile{\AsyFile.\AsyExtension}{\phantom{\copy\ASYbox}}%
283        \vskip-\ht\ASYbox
284        \indent
285        \box\ASYbox
286      \else
287        \ifASYPDF
288          \includegraphics[hiresbb]{"\AsyFile".pdf}%
289        \else
290          \includegraphics[hiresbb]{"\AsyFile.eps"}%
291        \fi
292      \fi
```

```
293       }{%
   3D PRC figures require inline mode.
294       \IfFileExists{"\AsyFile.tex"}{%
295         \catcode':=12
296         \@@input"\AsyFile.tex"\relax
297       }{%
298         \PackageWarning{asymptote}{%
299           file '\AsyFile.\AsyExtension' not found%
300         }%
301       }%
302     }%
303   \fi
304 }
305 \def\asydef{%
306   \let\ThisAsymptote\WriteGlobalAsyLine
307   \ProcessAsymptote{asydef}%
308 }
309 \newcommand\asyinclude[2][]{%
310   \begingroup
311   \stepcounter{asy}%
312   \setkeys{ASYkeys}{#1}%
313   \ifASYattach
314     \ASYinlinefalse
315   \fi
316   \asy@init
317   \immediate\write\AsyPreStream{%
318     \noexpand\InputIfFileExists{%
319       \ASYprefix\noexpand\jobname-\the\c@asy.pre}{}{}%
320   }%
321   \asy@write@graphic@header
322   \IfFileExists{#2.asy}{%
323     \CatchFileDef\@tempa{#2.asy}{%
324       \let\do\@makeother
325       \dospecials
326       \endlinechar=10\relax
327     }%
328   }{%
329     \IfFileExists{#2}{%
330       \CatchFileDef\@tempa{#2}{%
331         \let\do\@makeother
332         \dospecials
333         \endlinechar=10\relax
334       }%
335     }{%
336       \PackageWarning{asymptote}{file #2 not found}%
337       \def\@tempa{}%
338     }%
339   }%
340   \immediate\write\AsyStream{\unexpanded\expandafter{\@tempa}}%
```

```
341    \asy@finalise@stream
342    \asy@input@graphic
343    \endgroup
344 }

345 \newcommand{\ASYanimategraphics}[5][]{%
346    \IfFileExists{_#3.pdf}{%
347      \animategraphics[{#1}]{#2}{_#3}{#4}{#5}%
348    }{}%
349 }
```

## 4.9    Keys for graphics processing

```
350 \newcommand\asysetup[1]{\setkeys{ASYkeys}{#1}}

351 \define@key{ASYkeys}{dir}{%
352    \def\asydir{#1}%
353 }
354 \def\ASYwidth{}
355 \define@key{ASYkeys}{width}{%
356    \edef\ASYwidth{\the\dimexpr#1\relax}%
357 }
358 \def\ASYheight{}
359 \define@key{ASYkeys}{height}{%
360    \edef\ASYheight{\the\dimexpr#1\relax}%
361 }
362 \define@key{ASYkeys}{keepAspect}[true]{%
363    \ifthenelse{\equal{#1}{true}}
364      {\ASYkeepAspecttrue}
365      {\ASYkeepAspectfalse}%
366 }
367 \def\ASYviewportwidth{}
368 \define@key{ASYkeys}{viewportwidth}{%
369    \edef\ASYviewportwidth{\the\dimexpr#1\relax}%
370 }
371 \def\ASYviewportheight{}
372 \define@key{ASYkeys}{viewportheight}{%
373    \edef\ASYviewportheight{\the\dimexpr#1\relax}%
374 }

375 \define@key{ASYkeys}{inline}[true]{%
376    \ifthenelse{\equal{#1}{true}}
377      {\ASYinlinetrue}
378      {\ASYinlinefalse}%
379 }
380 \define@key{ASYkeys}{attach}[true]{%
381    \ifthenelse{\equal{#1}{true}}
382      {\ASYattachtrue}
383      {\ASYattachfalse}%
384 }
```