

# The `asymptote` package

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## Abstract

This package provides integration of inline and external Asymptote graphics within a  $\text{\LaTeX}$  document.

## Contents

### 1 Introduction

This is the documentation for the  $\text{\LaTeX}$  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  $\text{\LaTeX}$  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/`, then 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:

**height** Height of the figure

**width** Width of the figure

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

**viewportheight** Viewport height for 3D figures

**viewportwidth** Viewport width for 3D figures

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

## 3 Processing the document

After running  $\text{\LaTeX}$  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 T<sub>E</sub>X 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.

```
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\asydir{}
77 \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.

```

78 \newif\ifASYPDF
79 \ifxetex
80 \ASYPDFtrue
81 \else
82 \ifpdf
83 \ASYPDFtrue
84 \fi
85 \fi
86 \ifASYPDF
87 \def\AsyExtension{pdf}
88 \else
89 \def\AsyExtension{eps}
90 \fi

```

## 4.5 Bug squashing

```

91 \def\unquoteJobname#1"#2"#3\relax{%
92 \def\rawJobname{#1}%
93 \ifx\rawJobname\empty
94 \def\rawJobname{#2}%
95 \fi
96 }
97 \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

```

98 \def\fixstar#1*#2\relax{%
99 \def\argtwo{#2}%
100 \ifx\argtwo\empty
101 \gdef\Jobname{#1}%
102 \else
103 \fixstar#1-#2\relax
104 \fi
105 }
106 \expandafter\fixstar\rawJobname*\relax

```

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

```

107 \def\Ginclude@eps#1{%
108 \message{<#1>}%
109 \bgroup
110 \def\@tempa{!}%

```

```

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

```

## 4.6 Input/Output

```

126 \immediate\openout\AsyPreStream=\jobname.pre\relax
127 \AtEndDocument{\immediate\closeout\AsyPreStream}

128 \def\WriteAsyLine#1{%
129 \immediate\write\AsyStream{\detokenize{#1}}%
130 }

131 \def\globalASYdefs{
132 \def\WriteGlobalAsyLine#1{%
133 \expandafter\g@addto@macro
134 \expandafter\globalASYdefs
135 \expandafter{\detokenize{#1^^J}}%
136 }

```

## 4.7 Commands for verbatim processing environments

```

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

```

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

```

145 \begingroup
146 \catcode'\^M=12 \endlinechar=-1\relax%
147 \gdef\xAsymptote{%
148 \expandafter\ProcessAsymptoteLine%
149 }
150 \gdef\ProcessAsymptoteLine#1^M{%
151 \def\@tempa{#1}%
152 {%
153 \escapechar=-1\relax%

```

```

154     \xdef\@tempb{\string\end\string\{\CurrentAsymptote\string\}}%
155   }%
156   \ifx\@tempa\@tempb%
157     \edef\next{\endgroup\noexpand\end{\CurrentAsymptote}}%
158   \else%
159     \ThisAsymptote{#1}%
160     \let\next\ProcessAsymptoteLine%
161   \fi%
162   \next%
163 }
164 \endgroup

```

## 4.8 User interface

```

165 \newcommand\asy[1][]{%
166   \stepcounter{asy}%
167   \setkeys{ASYkeys}{#1}%

```

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

```

168   \ifASYattach
169     \ASYinlinefalse
170   \fi
171   \ifx\asydir\empty\else
172     \def\ASYprefix{\asydir/}%
173   \fi
174   \immediate\write\AsyPreStream{%
175     \noexpand\inputIfFileExists{%
176       \ASYprefix\noexpand\jobname-\the\c@asy.pre}{-}{-}%
177   }
178   \asy@write@graphic@header
179   \let\ThisAsymptote\WriteAsyLine
180   \ProcessAsymptote{asy}%
181 }

182 \def\endasy{%
183   \asy@finalise@stream
184   \asy@input@graphic
185 }

186 \def\asy@write@graphic@header{%
187   \immediate\openout\AsyStream=\ASYprefix\jobname-\the\c@asy.asy\relax
188   \gdef\AsyFile{\ASYprefix\Jobname-\the\c@asy}%
189   \immediate\write\AsyStream{%
190     if(!settings.multipleView) settings.batchView=false;^^J%
191     \ifxetex
192       settings.tex="xelatex";^^J%
193     \else\ifASYPDF
194       settings.tex="pdflatex";^^J%
195     \fi\fi
196     \ifASYinline
197       settings.inlinetex=true;^^J%
198     deletepreamble();^^J%

```

```

199 \fi
200 defaultfilename="\Jobname-\the\c@asy";^^J%
201 if(settings.render < 0) settings.render=4;^^J%
202 settings.outformat="";^^J%
203 \ifASYattach
204     settings.inlineimage=false;^^J%
205     settings.embed=false;^^J%
206     settings.toolbar=true;^^J%
207 \else
208     settings.inlineimage=true;^^J%
209     settings.embed=true;^^J%
210     settings.toolbar=false;^^J%
211     viewportmargin=(2,2);^^J%
212 \fi
213 \globalASYdefs
214 }%
215 }
216 \def\asy@expand@keepAspect{%
217 \ifASYkeepAspect keepAspect=true%
218 \else keepAspect=false%
219 \fi%
220 }
221 \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).
222 \ifx\ASYwidth\@empty
223     \ifx\ASYheight\@empty
224         % write nothing!
225     \else
226         \immediate\write\AsyStream{size(0,\ASYheight,\asy@expand@keepAspect);}%
227     \fi
228 \else
229     \ifx\ASYheight\@empty
230         \immediate\write\AsyStream{size(\ASYwidth,0,\asy@expand@keepAspect);}%
231     \else
232         \immediate\write\AsyStream{size(\ASYwidth,\ASYheight,\asy@expand@keepAspect);}%
233     \fi
234 \fi
    Setting viewportsize=(). Same logic as for size(). Note that \ASYviewportwidth
    varies according to \ASYattach, by default, so it needs to be fully expanded before
    checking if it equals zero.
235 \edef\ASYviewportwidth{\ASYviewportwidth}% locally "freeze" viewportwidth
236 \ifx\ASYviewportwidth\@empty
237     \ifx\ASYviewportheight\@empty
238         % write nothing!
239     \else
240         \immediate\write\AsyStream{viewportsize=(0,\ASYviewportheight);}%
241     \fi

```



```

242 \else
243   \ifx\ASYviewportheight\@empty
244     \immediate\write\AsyStream{viewportsize=(\ASYviewportwidth,0);}
245   \else
246     \immediate\write\AsyStream{%
247       viewportsize=(\ASYviewportwidth,\ASYviewportheight);}
248   \fi
249 \fi
250 \immediate\closeout\AsyStream
251 }

252 \def\asy@input@graphic{%
253   \ifASYinline
254     \IfFileExists{"\AsyFile.tex"}{%
255       \catcode'\:=12\relax
256       \@input"\AsyFile.tex"\relax
257     }{%
258       \PackageWarning{asymptote}{file '\AsyFile.tex' not found}%
259     }%
260   \else
261     \IfFileExists{"\AsyFile.\AsyExtension"}{%
262       \ifASYattach
263         \ifASYPDF
264           \IfFileExists{"\AsyFile+0.pdf"}{%
265             \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile+0".pdf}}%
266           }{%
267             \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile".pdf}}%
268           }%
269         \else
270           \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile.eps"}}%
271         \fi
272         \textattachfile{\AsyFile.\AsyExtension}{\phantom{\copy\ASYbox}}%
273         \vskip-\ht\ASYbox
274         \indent
275         \box\ASYbox
276       \else
277         \ifASYPDF
278           \includegraphics[hiresbb]{"\AsyFile".pdf}%
279         \else
280           \includegraphics[hiresbb]{"\AsyFile.eps"%
281         \fi
282       \fi
283     }{%
3D PRC figures require inline mode.
284     \IfFileExists{"\AsyFile.tex"}{%
285       \catcode'\:=12
286       \@input"\AsyFile.tex"\relax
287     }{%
288       \PackageWarning{asymptote}{%
289         file '\AsyFile.\AsyExtension' not found%

```

```

290     }%
291     }%
292     }%
293 \fi
294 }

295 \def\asydef{%
296   \let\ThisAsymptote\WriteGlobalAsyLine
297   \ProcessAsymptote{asydef}%
298 }

299 \newcommand\asyinclude[2][{}]{%
300   \begingroup
301   \stepcounter{asy}%
302   \setkeys{ASYkeys}{#1}%
303   \ifASYattach
304     \ASYinlinefalse
305   \fi
306   \ifx\asydir\empty\else
307     \def\ASYprefix{\asydir/}%
308   \fi
309   \immediate\write\AsyPreStream{%
310     \noexpand\inputIfFileExists{%
311       \ASYprefix\noexpand\jobname-\the\c@asy.pre}{-}{-}%
312   }
313   \asy@write@graphic@header
314   \IfFileExists{#2.asy}{%
315     \CatchFileDef\@tempa{#2.asy}{%
316       \let\do\@makeother
317       \dospecials
318       \endlinechar=10\relax
319     }
320   }{
321     \IfFileExists{#2}{%
322       \CatchFileDef\@tempa{#2}{%
323         \let\do\@makeother
324         \dospecials
325         \endlinechar=10\relax
326       }
327     }{
328       \PackageWarning{asymptote}{file #2 not found}%
329     }
330   }
331   \immediate\write\AsyStream{\unexpanded\expandafter{\@tempa}}%
332   \asy@finalise@stream
333   \asy@input@graphic
334   \endgroup
335 }

336 \newcommand{\ASYanimategraphics}[5][{}]{%
337   \IfFileExists{_#3.pdf}{%
338     \animategraphics[#1][#2]{_#3}{#4}{#5}%

```

```

339 }{}
340 }

```

## 4.9 Keys for graphics processing

```

341 \newcommand\asysetup[1]{\setkeys{ASYkeys}{#1}}
342 \define@key{ASYkeys}{dir}{%
343   \def\asydir{#1}%
344 }
345 \def\ASYwidth{}
346 \define@key{ASYkeys}{width}{%
347   \edef\ASYwidth{\the\dimexpr#1\relax}%
348 }
349 \def\ASYheight{}
350 \define@key{ASYkeys}{height}{%
351   \edef\ASYheight{\the\dimexpr#1\relax}%
352 }
353 \define@key{ASYkeys}{keepAspect}[true]{%
354   \ifthenelse{\equal{#1}{true}}
355     {\ASYkeepAspecttrue}
356     {\ASYkeepAspectfalse}%
357 }
358 \def\ASYviewportwidth{\ASYdefaultviewportwidth}
359 \def\ASYdefaultviewportwidth{%
360   \ifASYattach \empty \else \the\linewidth \fi
361 }
362 \define@key{ASYkeys}{viewportwidth}{%
363   \edef\ASYviewportwidth{\the\dimexpr#1\relax}%
364 }
365 \def\ASYviewportheight{}
366 \define@key{ASYkeys}{viewportheight}{%
367   \edef\ASYviewportheight{\the\dimexpr#1\relax}%
368 }
369 \define@key{ASYkeys}{inline}[true]{%
370   \ifthenelse{\equal{#1}{true}}
371     {\ASYinlinetrue}
372     {\ASYinlinefalse}%
373 }
374 \define@key{ASYkeys}{attach}[true]{%
375   \ifthenelse{\equal{#1}{true}}
376     {\ASYattachtrue}
377     {\ASYattachfalse}%
378 }

```