

# 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:

**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  $\text{\LaTeX}$  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  $\text{\TeX}$  distributions. (E.g., Fedora until recently still shipped  $\text{\TeX}$ .) 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     }
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{asyptote}{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().
235 \ifx\ASYviewportwidth\@empty
236     \ifx\ASYviewportheight\@empty
237         % write nothing!
238     \else
239         \immediate\write\AsyStream{viewportsize=(0,\ASYviewportheight);}%
240     \fi
241 \else
242     \ifx\ASYviewportheight\@empty

```



```

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

251 \def\asy@input@graphic{%
252   \ifASYinline
253     \IfFileExists{"\AsyFile.tex"}{%
254       \catcode'\relax
255       \@@input"\AsyFile.tex"\relax
256     }{%
257       \PackageWarning{asymptote}{file '\AsyFile.tex' not found}%
258     }%
259   \else
260     \IfFileExists{"\AsyFile.\AsyExtension"}{%
261       \ifASYattach
262         \ifASYPDF
263           \IfFileExists{"\AsyFile+0.pdf"}{%
264             \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile+0".pdf}}%
265           }{%
266             \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile".pdf}}%
267           }%
268         \else
269           \setbox\ASYbox=\hbox{\includegraphics[hiresbb]{"\AsyFile.eps"}}%
270         \fi
271         \textattachfile{\AsyFile.\AsyExtension}{\phantom{\copy\ASYbox}}%
272         \vskip-\ht\ASYbox
273         \indent
274         \box\ASYbox
275       \else
276         \ifASYPDF
277           \includegraphics[hiresbb]{"\AsyFile".pdf}%
278         \else
279           \includegraphics[hiresbb]{"\AsyFile.eps"%
280         \fi
281       \fi
282     }{%
3D PRC figures require inline mode.
283     \IfFileExists{"\AsyFile.tex"}{%
284       \catcode'\relax
285       \@@input"\AsyFile.tex"\relax
286     }{%
287       \PackageWarning{asymptote}{%
288         file '\AsyFile.\AsyExtension' not found%
289       }%
290     }%

```

```

291     }%
292 \fi
293 }

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

298 \newcommand\asyinclude[2][{}]{%
299   \begingroup
300   \stepcounter{asy}%
301   \setkeys{ASYkeys}{#1}%
302   \ifASYattach
303     \ASYinlinefalse
304   \fi
305   \ifx\asydir\empty\else
306     \def\ASYprefix{\asydir/}%
307   \fi
308   \immediate\write\AsyPreStream{%
309     \noexpand\InputIfFileExists{%
310       \ASYprefix\noexpand\jobname-\the\c@asy.pre}{-}{-}%
311   }%
312   \asy@write@graphic@header
313   \IfFileExists{#2.asy}{%
314     \CatchFileDef\@tempa{#2.asy}{%
315       \let\do\@makeother
316       \dospecials
317       \endlinechar=10\relax
318     }%
319   }{%
320     \IfFileExists{#2}{%
321       \CatchFileDef\@tempa{#2}{%
322         \let\do\@makeother
323         \dospecials
324         \endlinechar=10\relax
325       }%
326     }{%
327       \PackageWarning{asymptote}{file #2 not found}%
328       \def\@tempa{}%
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{}
359 \define@key{ASYkeys}{viewportwidth}{%
360   \edef\ASYviewportwidth{\the\dimexpr#1\relax}%
361 }
362 \def\ASYviewportheight{}
363 \define@key{ASYkeys}{viewportheight}{%
364   \edef\ASYviewportheight{\the\dimexpr#1\relax}%
365 }
366 \define@key{ASYkeys}{inline}[true]{%
367   \ifthenelse{\equal{#1}{true}}
368     {\ASYinlinetrue}
369     {\ASYinlinefalse}%
370 }
371 \define@key{ASYkeys}{attach}[true]{%
372   \ifthenelse{\equal{#1}{true}}
373     {\ASYattachtrue}
374     {\ASYattachfalse}%
375 }
```