

The `asymptote` package

John Bowman, Tom Prince, and Will Robertson

2012/08/25 v1.27

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/`, 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 \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_EX 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     }
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   \begin{group}
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   \end{group}
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 }
```