

NAME

prerex.sty – a LaTeX document style for prerequisite charts

DESCRIPTION

prerex.sty defines macros that **[pdf]latex** can use to draw charts consisting of labelled course boxes linked by arrows that represent pre- and co-requisite requirements. If **pdf_lat_ex** is used, auxiliary files will be generated as follows: image-map data and xlink commands for the hyperlinked nodes in the diagram and a shell script to crop a PNG image generated from a Postscript or PDF chart.

If the source file satisfies the constraints of the **prerex(5)** format, a chart description may be edited using the **prerex(1)** interactive editor (as well as any conventional text editor).

TERMINOLOGY

A prerequisite chart consists of several *course boxes*, linked by *arrows*. Courses are either *half* or *full*, and may be *required* or *optional* (or neither). Each course box can contain a course *code* (upper left corner), a course *title* (lower half), and *timetable* information (upper right corner). An arrow can be either a *prerequisite* (solid), a *corequisite* (dotted), or *recommended* (dashed). When a conventional arrow would be inappropriate, it is possible to use a *mini* course "box" (consisting of just a course code) just above a target box. An arbitrary line of text may be placed anywhere on the chart.

COORDINATE SYSTEM

A conventional two-dimensional Cartesian coordinate system is used to specify the locations of diagram elements. The origin (where $x = 0$ and $y = 0$) is at the lower-left corner of the diagram. The diagram height is configurable; the width is determined by the values of `\textwidth` and an adjustable `\unit` length, which defines the absolute value of a coordinate unit. It is possible to put a coordinate grid with labelled axes in the background of a chart. The coordinates of a *box*, *mini*, or *text-line* are those of its centre point. An *arrow* is described by the coordinates of the centre points of its source and target boxes/minis/text-lines.

USAGE

The command `\usepackage{prerex}` should appear in the document preamble. This will define a LaTeX environment

```
\begin{chart} ... \end{chart}
```

within which the following commands may be used to produce course boxes, minis, text-lines, and arrows. The order of commands is not significant except that the commands for the source and target boxes of an arrow should *precede* the command for the arrow.

COURSE BOXES

The commands producing course boxes have the following forms:

```
\halfcourse x,y:{code}{title}{timetable}
\fullcourse x,y:{code}{title}{timetable}
\reqhalfcourse x,y:{code}{title}{timetable}
\reqfullcourse x,y:{code}{title}{timetable}
\opthalfcourse x,y:{code}{title}{timetable}
\optfullcourse x,y:{code}{title}{timetable}
```

where x,y are the coordinates of the *centerpoint* of the box, relative to the origin of the coordinate system at the lower-left corner of the diagram. The *code*, *title*, and *timetable* arguments are arbitrary (well-bracketed) text, possibly with LaTeX markup.

The following are similar but take an additional argument to specify the (non-default) background color of the course box:

```
\halfcoursec x,y:{code}{title}{timetable}{color}
\fullcoursec x,y:{code}{title}{timetable}{color}
```

```

\reqhalfcoursesec x,y:{code}{title}{timetable}{color}
\reqfullcoursesec x,y:{code}{title}{timetable}{color}
\opthalfcoursesec x,y:{code}{title}{timetable}{color}
\optfullcoursesec x,y:{code}{title}{timetable}{color}

```

MINI COURSE BOXES AND TEXT LINES

A mini course "box" is produced by a command of the form

```
\mini x,y:{code}
```

The following instruction places a line of text centered at the coordinates:

```
\text x,y:{text-line}
```

There are several differences between minis and text-lines. The maximum length allowed for a course-code may be less than that for a text-line. A sans-serif font and a reduced font size is used for a course-code. A course-code may be hyperlinked but a text-line is not (except when the coordinate grid is on). A **\parbox** command may be used in the *text-line* argument if more than one line is desired.

ARROWS

Arrows between course boxes (or from a mini or text-line to a course box) are produced by commands of the form

```
\prereq x0,y0,x1,y1:
```

```
\coreq x0,y0,x1,y1:
```

```
\recomm x0,y0,x1,y1:
```

These produce, respectively, solid, dotted, and dashed arrows from the course box (or mini or text-line) centered at coordinates $x0,y0$ to the course box centered at coordinates $x1,y1$.

Arrows by default have a non-zero curvature (unless they are very short). It is possible to override the default curvature for a particular arrow by using the instructions

```
\prereqc x0,y0,x1,y1;c:
```

```
\coreqc x0,y0,x1,y1;c:
```

```
\recommc x0,y0,x1,y1;c:
```

where c is an integer in the range 0-100 specifying the desired curvature; for example, $c=0$ will produce a *straight* arrow. To change the default curvature, the user program may redefine the **\DefaultCurvature** command.

WEB LINKS

Course boxes (including minis) may be hyperlinked. The default URL for course boxes is *./course-code.html* where *course-code* is the *code* argument of the course box. The URL scheme may be changed by the user by re-defining the **\CourseURL** command.

COORDINATE GRID

The following command produces a coordinate grid, which is useful for editing a diagram:

```
\grid
```

The grid lines will be covered by course boxes and arrows. The **\grid** command also redefines the **\CourseURL** command so that, if the mouse cursor is placed over a box or mini in (some) PDF viewers, the *coordinates* of the box, mini, or text-line will be displayed as follows: in the status bar in **xpdf** and **gpdf**, and in a "tooltip" in recent versions of **kpdf** (now re-named **okular**), **evince**, and the Adobe Reader. Similarly, the coordinates of the source and target boxes of arrows are displayed if the mouse hovers over the mid-point of an arrow. Such coordinate displays make it easier to edit chart descriptions. When the grid is on, the mid-point of every arrow is highlighted by a "bullet".

The **prerex** package at <http://mirror.ctan.org/graphics/prerex/> has a patch for **kpdf/okular**(1) to make it display URIs in tooltips and also capture coordinates of course boxes, arrows and background points in the

X selection clipboard (for pasting into a command being composed at the **prerex**(1) prompt). There is also a GUI frontend **vprerex**(1) to the **prerex**(1) editor which incorporates a minimalistic prerex-enabled PDF viewer.

STAND-ALONE COMMANDS

The following commands may be used outside a **chart** environment, such as in the explanatory notes for a chart:

```
\solidarrow
\dottedarrow
\dashedarrow
\lightbox
\boldbox
\dashedbox
```

CONFIGURATION

The following are defined by the style file but may be re-defined by the user:

```
\newcommand{\DefaultCurvature}{20}
```

where the argument should be in the range 0-100; 0 means no curvature.

```
\newcommand{\CourseURL}[3]{#3.html}
```

where the arguments supplied at the call are the x and y coordinates of the box or mini and the course code.

```
\newcommand{\background}{LightYellow}
```

where *LightYellow* is defined by

```
\definecolor{LightYellow}{rgb}{1.0, 1.0, 0.878431}
```

```
\setlength{\unit}{5.7816pt}
```

which defines the absolute size of a coordinate unit; this yields 10 pixels per coordinate unit if the chart is converted to an image at 125 dpi.

```
\newcommand{\dpi}{125}
```

```
\newcommand{\PixelsPerUnit}{10}
```

These must be re-defined together if the image-map data are to be correct.

```
\setcounter{diagheight}{75}
```

which is the y -coordinate of the top of the diagram (reduced to 65 in landscape mode); the nominal diagram width is $\text{textwidth} / \text{unit} + 10$.

The following define the thicknesses of the three kinds of arrows, and the thickness of bold boxes:

```
\newcommand{\solidwidth}{0.5pt}
```

```
\newcommand{\dottedwidth}{0.8pt}
```

```
\newcommand{\dashedwidth}{0.5pt}
```

```
\newcommand{\boldwidth}{1.0pt}
```

The following command is used to change to a smaller size for course codes, timetable information, and mini-course codes:

```
\newcommand{\smallsize}{\resize{-3}}
```

The following command defines the baseline adjustment for the stand-alone arrows and boxes; this parameter is font-dependent.

`\newcommand{\baselineAdj}{-0.5ex}`

DEPENDENCIES

This implementation of **prerex.sty** uses **pgf** (version 3.0 or later) with add-on package **tikz**. The following additional packages are used: **resize**, **calc**, **ifpdf**, **multido**, **textcomp**, **zref-savepos** and **hyperref**. Either **pdflatex**(1) or **latex**(1) followed by **dvips**(1) (and possibly **ps2pdf**(1)) or **latex**(1) followed by **dvipdfmx**(1) may be used.

To convert a chart to a compact but reasonably high-quality image, it is suggested to use the **convert**(1) tool of **ImageMagick**(1) as follows:

`convert -density 125 chart.ps chart.png`

or

`convert -density 125 chart.pdf chart.png`

The density parameter specifies the number of pixels per inch; if this is too small, the image is of poor quality, and if it is too large, the image file is too big. By default, the shell script generated by **prerex.sty** crops the image at the southeast corner. It is possible to use a PNG compression application such as **optipng**(1) to reduce the file-size of the cropped image (without loss of quality).

To convert a PDF chart to SVG (Scaleable Vector Graphic) format, it is recommended to use **pdf2svg**(1), obtainable from <http://www.cityinthesky.co.uk/opensource/pdf2svg/>.

IMPLEMENTATION DETAILS

To improve the appearance, boxes are drawn with slightly rounded corners. The half-course boxes are assigned a minimum height to give a more uniform appearance to horizontal rows of such boxes. The mini and text boxes have white frames and their fill colour is white, which is assumed to be the background colour of the chart. A text box is not normally hyperlinked; however, if the coordinate grid is on, it is hyperlinked and its chart coordinates are encoded in the URI.

Arrows with a small height and arrows whose source and target points have equal x or y coordinates are always drawn straight (using a specialized and simpler macro) unless an explicit non-zero curvature argument is provided. If the coordinate grid is on, a hyperlink with the source and target coordinates is placed at the mid-point of the arrow. A wider background white edge is drawn below an arrow to improve the appearance of crossing arrows; the background also ensures visibility of the arrow when the coordinate grid is on. A thin white arrow (with a visible arrowhead) is drawn beneath the visible arrow to obtain a thin arrowhead.

When the coordinate grid is drawn, the **CourseURL** command is re-defined to pass node coordinates in URIs. Also, two "anchor" hyperlinks are inserted at the southwest and northeast corners of the diagram to allow prerex-enabled PDF viewers to compute chart coordinates.

To support HTML versions of charts, **prerex.sty** (when processed by **pdflatex**(1)) generates a script to crop a chart image at the southeast corner, allowing descriptive notes below the chart to be treated as ordinary text. Also, it generates image-map data for use with an HTML image map and xlink data for use with a SVG image. To obtain absolute page coordinates, the **zsavepos**, **zposx** and **zposy** commands are used; the page coordinates are converted into pixel coordinates.

LICENSE

prerex.sty and this document may be distributed and/or modified under the conditions of the LaTeX Project Public License.

AUTHOR

R. D. Tennent (rdt@cs.queensu.ca)

SEE ALSO

ImageMagick(1), **convert**(1), **dvipdfmx**(1), **dvips**(1), **evince**(1), **gpdf**(1), **kpdf**(1), **latex**(1), **okular**(1), **optipng**(1), **pdf2svg**(1), **pdflatex**(1), **prerex**(1), **prerex**(5), **ps2pdf**(1), **tikz**(1), **pgf**(1), **vprerex**(1), and **xpdf**(1).