prerex.sty: Prerequisite Charts in LaTeX

Version 6.0

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1 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; see the example chart in Figure 1 on page 2. In addition to the usual [pdf]LaTeX output, auxiliary files will be generated containing image-map data for the hyperlinked nodes in the diagram and a shell script for cropping a PNG image obtained from the [pdf]LaTeX output.

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).

2 Terminology

A prerequisite chart consists of a number of *course boxes*, linked by *arrows*. Courses are either *half* or *full*, and may be *required*. 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. A line of text may be placed anywhere on the chart.
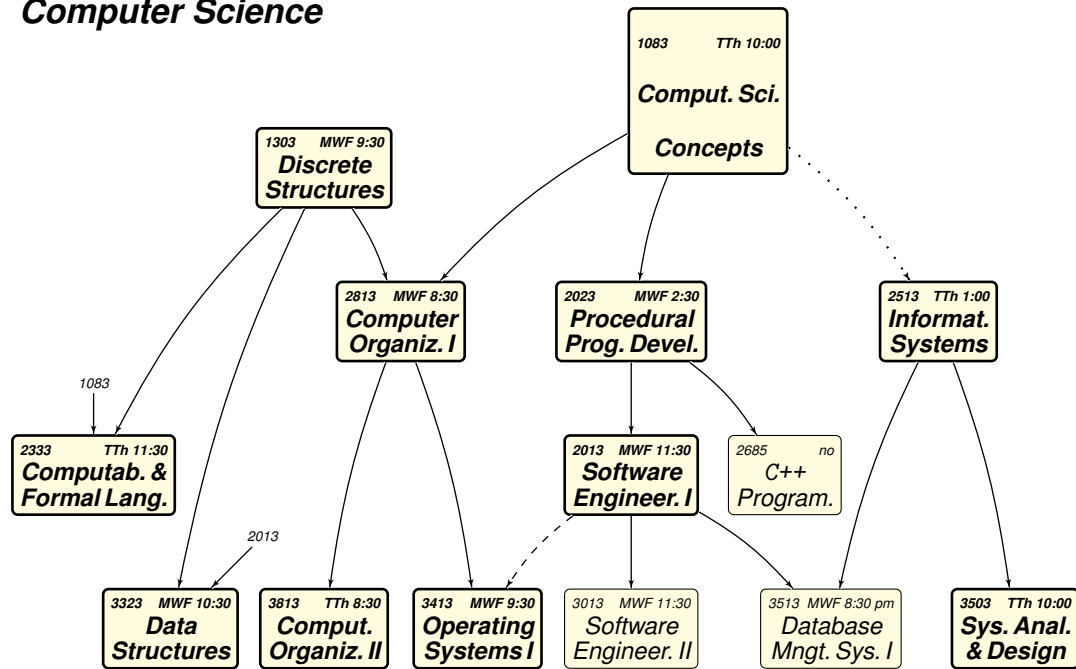
3 Coordinate System

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.

4 Usage

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

        \begin{chart} ⋯ \end{chart}

Computer Science

| 1083 TTh 10:00 |
| **Comput. Sci. Concepts** |

| 1303 MWF 9:30 |
| **Discrete Structures** |

| 2813 MWF 8:30 |
| **Computer Organiz. I** |

| 2023 MWF 2:30 |
| **Procedural Prog. Devel.** |

| 2513 TTh 1:00 |
| **Informat. Systems** |

1083

| 2333 TTh 11:30 |
| **Computab. & Formal Lang.** |

2013

| 2013 MWF 11:30 |
| **Software Engineer. I** |

| 2685 no |
| C++ Program. |

| 3323 MWF 10:30 |
| **Data Structures** |

| 3813 TTh 8:30 |
| **Comput. Organiz. II** |

| 3413 MWF 9:30 |
| **Operating Systems I** |

| 3013 MWF 11:30 |
| Software Engineer. II |

| 3513 MWF 8:30 pm |
| Database Mngt. Sys. I |

| 3503 TTh 10:00 |
| **Sys. Anal. & Design** |

Notes

- A solid arrow ⟶ indicates a required prerequisite, a dotted arrow ⋯⋯➤ indicates a corequisite (to be taken before or concurrently), and a dashed arrow ‑‑‑➤ indicates a recommended prerequisite. Core courses are in ⏢**bold**⏢ boxes; other courses (i.e., options or prerequisites) are in ⏢light⏢ boxes.

- Timetable abbreviations: M, T, W, Th, F=Mon, Tue, Wed, Thur, Fri, resp.; no=not offered.

- …

Figure 1: A Prerequisite Chart

within which the commands described in the following sub-sections 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, and the \grid command, if present, should precede other chart commands.

4.1 Course Boxes

The commands producing course boxes have the following forms:

> \halfcourse *x,y* :{ *code* }{ *title* }{ *timetable* }
>
> \reqhalfcourse *x,y* :{ *code* }{ *title* }{ *timetable* }
>
> \fullcourse *x,y* :{ *code* }{ *title* }{ *timetable* }
>
> \reqfullcourse *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.

4.2 Mini Course Boxes and Text-Lines

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

> \mini *x,y* :{ *code* }

A text-line is produced by a command of the form

> \text *x,y* :{ *line of text* }

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 if more than one line is desired.

4.3 Arrows

Arrows between course boxes (or minis or text-lines) are produced by commands of the form

> \prereq x_0, y_0, x_1, y_1 :
>
> \coreq x_0, y_0, x_1, y_1 :
>
> \recomm x_0, y_0, x_1, y_1 :

These produce, respectively, solid, dotted, and dashed arrows from the course box (or mini or text-line) centered at coordinates x_0, y_0 to the entity centered at coordinates x_1, y_1.

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 $x_0, y_0, x_1, y_1; c$:
>
> \coreqc $x_0, y_0, x_1, y_1; c$:
>
> \recommc $x_0, y_0, x_1, y_1; c$:

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 for all arrows, the user program may redefine the \DefaultCurvature command.
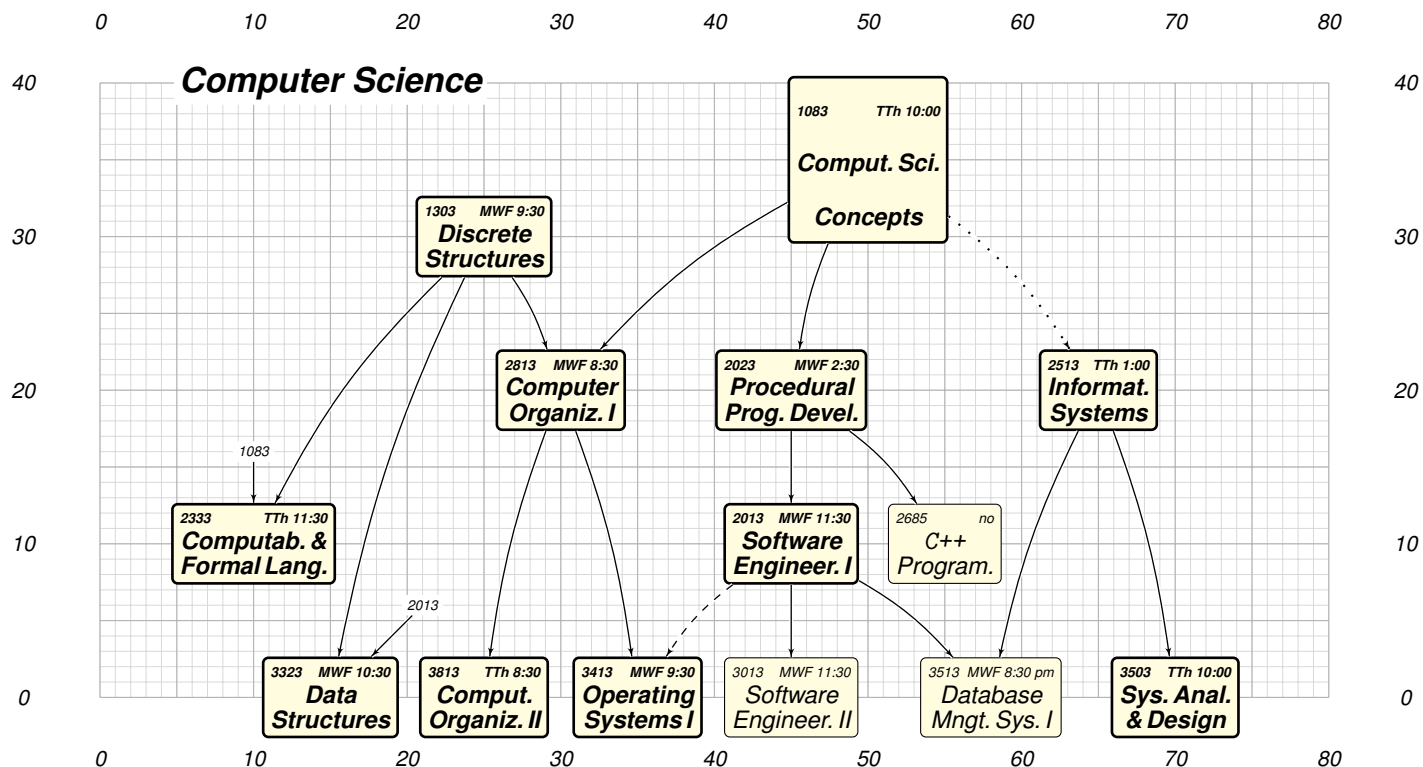
Figure 2: A Prerequisite Chart with a Coordinate Grid

4.4 Web Links

Course boxes and 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; see Section 8.

4.5 Coordinate Grid

The following command produces a coordinate grid with labelled axes, which is useful while editing a diagram:

```
\grid
```

This is normally placed before all the other chart commands so that grid lines are in the background, covered by course boxes, minis, text-lines, and arrows, as in Figure 2 on page 4.

The \grid command also redefines the CourseURL command so that, in suitable PDF viewers, if the mouse cursor is placed over a box, mini, or midpoint of an arrow, the *coordinates* of the box/mini/textline (or the coordinates of the source *and* target of the arrow) will be displayed as follows: in the status bar in xpdf and gpdf, and in a "tooltip" in recent versions of kpdf/okular, evince, and the Acrobat Reader. This coordinate display make it easier to edit chart descriptions.

The prerex package at http://www.ctan.org/tex-archive/graphics/prerex/ has a patch for kpdf (recently incorporated into okular) to allow capture coordinates of course boxes, arrows, and background points in the X selection clipboard (for pasting into a command being composed at the prerex prompt). There is also a GUI frontend vprerex to the prerex editor which incorporates a minimalistic prerex-enabled PDF viewer.

4.6 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	light
\boldbox	**bold**

5 Dependencies

This implementation of `prerex.sty` uses `pgf` (version 1.18 or later) with add-on package `tikz`. The following additional packages are used: `multido`, `relsize`, `calc`, `ifthen`, `textcomp`, `zref-savepos`, and `hyperref`. *Either* `pdflatex` *or* `latex` (followed by `dvips` and, possibly, `ps2pdf`) may be used.

6 Conversion to Portable Network Graphic (PNG) Format

To convert a chart (in Postscript or PDF format) to a reasonably high-quality image, it is suggested to use the `convert` tool of the `ImageMagick` package 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` to reduce the file-size of the cropped image (without loss of quality).

An auxiliary file containing image-map data for the hyperlinked nodes in the chart is also generated; consult a reference on the HTML language for an explanation of (client-side) image maps.

7 Installation

1. install the most recent version of `pgf` from `http://sourceforge.net/projects/pgf/`.

2. copy `prerex.sty` to *your-texmf-tree*/tex/latex/misc

3. copy `doc/prerex.{tex,pdf}` to *your-texmf-tree*/doc/latex/misc

4. if necessary, refresh the TEX database (e.g., `texhash`)

5. copy `man/prerex.sty.7` to sub-directory `man7` of a man directory on your `MANPATH`

6. test by doing

   ```
   $ man 7 prerex.sty
   $ make chart.pdf
   ```

8 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 have to 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 `\textwidth` $\div$ `\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{\smallersize}{\relsize{-3}}
```

9 Implementation Details

9.1 Boxes

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.

9.2   Arrows

Arrows with a small height and arrows whose source and target points have equal x or y coordinates are always draw 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.

9.3   Coordinate Grid and Associated Changes

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.

9.4   Chart Images

To support HTML versions of charts, `prerex.sty` 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. To obtain absolute page coordinates, the `zsavepos`, `zposx` and `zposy` commands are used; the page coordinates are converted into pixel coordinates for cropping and image-map use.

10   License

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