The \texttt{gridpapers} package

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v1.0.2 from 2021/03/27

All development happens at the repo: \url{https://github.com/mcnees/LaTeX-Graph-Paper}.

1 Introduction

Make your own quadrille, graph, hex, etc. paper! Uses the PGF/TikZ package for \LaTeX, which should be part of any modern \TeX installation. Lots of preset defaults to get started with ease, yet all colors and spacing are customizable.

There are example .tex files in the \texttt{examples} directory to help get you started with customization. Each tex file has an almost-empty body, with a \texttt{\usepackage} statement that you can customize. For example, engineer-pad.tex looks like this:

\begin{verbatim}
\documentclass{article}
\usepackage[pattern=majmin, colorset=engineer]{gridpapers}
\begin{document}
\thispagestyle{empty}
``
\end{document}
\end{verbatim}

(The " in the body forces a non-empty body, or else latex wouldn't generate a PDF).

2 Usage

2.1 Options

Your graph paper is configured through a number of key/value options to the \texttt{\usepackage} command. Let’s go through these options.

\begin{itemize}
  \item \texttt{pattern=\{\textit{name}\}}
    \begin{itemize}
      \item Default: \texttt{std}
    \end{itemize}
  \end{itemize}

Which of the predefined patterns to use for the page or textarea background. The current list of pattern names is: \texttt{std, stdeight, majmin, dot, hex, hexup, tri, iso, lightcone, ruled, doubleruled}. We describe each of these patterns in Sec. 2.2. Patterns come with...
default page geometry (size and margins; see geometry), and default ‘fullness’ (whether they fill the page or not; see options fullpage and textarea).

colorset={⟨name⟩} Color presets. Valid color preset names are: std, precocious, ghostly, brickred, engineer, plumpad. A preset determines the majorcolor, minorcolor, and bgcolor all at once. But, you can start from a preset and then override some colors.

majorcolor={⟨color⟩} Override the preset “major” color. This can be a named color, or using the syntax from xcolor to mix colors together.

minorcolor={⟨color⟩} Override the preset “minor” color. As above.

colorset={⟨name⟩} bgcolor={⟨color⟩} Override the preset background color. As above.

patternsize={⟨length⟩} Override the preset pattern size. The meaning of this length argument is different for each pattern; see Sec. 2.2 for more.

dotsize={⟨length⟩} Controls the size of the dots themselves for pattern=dot.

fullpage Make the pattern fill the whole page.

textarea Make the pattern fill only the text area of the document. At most one of the fullpage or textarea can be specified. If one is specified, it will override the default ‘fullness’ setting of the pattern.

geometry={⟨geometry spec⟩} Page geometry specification, using the syntax of the geometry package. This specification will override the pattern’s default page geometry. However, if the geometry package was loaded before gridpapers, this option will be ignored.

### 2.2 Patterns

The current set of patterns:

- **std**: Quadrille, ten squares per inch. The patternsize option controls the side of a square. Default is patternsize=0.1in.

- **stdeight**: Quadrille, eight squares per inch. The patternsize option controls the side of a square. Default is patternsize=0.125in.

- **majmin**: Graph paper, eight squares per inch with a major grid every half-inch. The patternsize option controls the side of a small square (the larger squares are four times bigger). Default is patternsize=0.125in.

- **dot**: Grid of dots. The size of an individual dot is set by dotsize. The patternsize option controls the distance between dots. Default is patternsize=0.1in.

- **hex**: Grid of hexagons. The patternsize option controls the side length of a hexagon. Default is patternsize=0.1666in.

- **hexup**: Grid of hexagons, rotated 90 degrees from the default orientation. The patternsize option controls the side length of a hexagon. Default is patternsize=0.1666in.

- **tri**: Triangle grid. The patternsize option controls the side length of a triangle. Default is patternsize=0.25in.

- **iso**: Isometric grid. The patternsize option controls the side length of a triangle. Default is patternsize=0.25in.
lightcone A grid with light cones (45° lines) on a square grid. The `patternsize` option controls the side of a horizontal square (not the tipped square). Default is `patternsize=0.25in`.

ruled Ruled page with bold lines. The `patternsize` option controls the vertical distance between lines. Default is `patternsize=0.2in`.

doubleruled Ruled page with bold lines alternating with light lines. The `patternsize` option controls the vertical distance between neighboring lines. Default is `patternsize=0.125in`.

3 Examples

3.1 Plenty of customization

Let’s say you want to use the `tri` pattern, which by default fills the page. But you want it to fill just the textarea of an A4 page with 2cm margins, and you want the triangles to be .75cm long. Finally, you like the colors of the engineer set, but want a white background. Then you would write:

\begin{verbatim}
\usepackage[pattern=tri, patternsize=0.75cm, textarea, colorset=engineer, bgcolor=white, geometry={a4paper, margin=2cm}]{gridpapers}
\end{verbatim}

3.2 Custom colors

Using named or blended custom colors is demonstrated in the example file `custom-colors.tex`:

\begin{verbatim}
\documentclass{article}
\usepackage{xcolor}
% See the documentation of the xcolor package to learn about different color models for specifying colors
\definecolor{mydeepgreen}{rgb}{0.07, 0.56, 0.04}
% You can easily mix colors by using the ! syntax from xcolor. Here we use it to mix 40% of our color with 60% white.
\usepackage[pattern=majmin, majorcolor=mydeepgreen, minorcolor=mydeepgreen!40]{gridpapers}
\begin{document}
\thispagestyle{empty}
~
\end{document}
\end{verbatim}
4 Implementation

\NeedsTeXFormat{LaTeX2e}[1994/06/01]
\ProvidesPackage{gridpapers}[2021/03/27 v1.0.2 Graph paper backgrounds]
\RequirePackage{xkeyval}
\RequirePackage{kvoptions}
\RequirePackage{xcolor}
\RequirePackage{tikz}
\usetikzlibrary{patterns.meta,calc}
\RequirePackage{tikzpagenodes}
%% everypage has been superseded -- try to use the new builtin
%% approach, but fall back to everypage-1x if needed
%% This code is roughly taken from the new everypage code
\ifundefined{AddToHook}{% 
  \IfFileExists{everypage-1x.sty}{% 
    \RequirePackage{everypage-1x} %
  }{\RequirePackage{everypage}}% 
}\{\%\}
\newcommand*{\AddEverypageHook}[1]{% 
  \AddToHook{shipout/background}{\put(1in,-1in){#1}}}
\RequirePackage{pagecolor}

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Option parsing
%% Declare switches for processing the options.
\newif\ifGP@geometrypreviouslyloaded
\newif\ifGP@fullnessset
\newif\ifGP@fullpage
\newif\ifGP@textarea
\GP@geometrypreviouslyloadedfalse
\GP@fullnesssetfalse
\GP@fullpagefalse
\GP@textareafalse
\SetupKeyvalOptions{%
  family=GP, %
  prefix=GPOpt@%}
\DeclareStringOption[std]{pattern}
\DeclareStringOption[std]{colorset}
\DeclareStringOption{majorcolor}
\DeclareStringOption{minorcolor}
\DeclareStringOption{bgcolor}
\DeclareStringOption{patternsize}
\DeclareStringOption[.7pt]{dotsize}
\DeclareVoidOption{fullpage}{\GP@fullpagetrue}
\DeclareVoidOption{textarea}{\GP@textareatrue}
\DeclareStringOption{geometry}
\ProcessKeyvalOptions*

%% Can only have one of fullpage or textarea
\ifGP@fullpage
  \PackageError{gridpapers}{% Can not specify both fullpage and textarea, please remove one option}{}
\fi
\GP@fullnesssettrue
\fi
\ifGP@textarea
  \GP@fullnesssettrue
\fi

%% We keep track of this to know whether or not we would be overriding a previously-set page geometry
\@ifpackageloaded{geometry}{
  \GP@geometrypreviouslyloadedtrue
}{
  \GP@geometrypreviouslyloadedfalse
  \PassOptionsToPackage{\GPOpt@geometry}{geometry}
  \RequirePackage{geometry}
}

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Actual package code
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Some nice colors.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\definecolor{plum}{rgb}{0.36078, 0.20784, 0.4}
\definecolor{chameleon}{rgb}{0.30588, 0.60392, 0.023529}
\definecolor{cornflower}{rgb}{0.12549, 0.29020, 0.52941}
\definecolor{scarlet}{rgb}{0.8, 0, 0}
\definecolor{brick}{rgb}{0.64314, 0, 0}
\definecolor{sunrise}{rgb}{0.80784, 0.36078, 0}
\definecolor{rosiebg}{RGB}{250,247,232}
\definecolor{rosiegrid}{RGB}{186,137,113}

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% The color to use for the null directions when drawing lightcones.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\colorlet{lightlines}{scarlet!30}

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Pre-defined Color schemes
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Here are some pre-defined color schemes for the paper background and the major and minor grid lines. These are switched by using the option colorset=<name>. The allowed values for colorset are in the list below.

\define@choicekey*{GP}{colorset}[%
  % std, precocious, ghostly, brickred, engineer, plumpad
  \val
  \nr
]{%
  \ifcase\nr\relax
  % std
  \colorlet{minorcolor}{cornflower!30}
  \colorlet{majorcolor}{cornflower!50}
  \colorlet{lightlines}{scarlet!30}
  \colorlet{lightlines}{scarlet!30}
}
\newcommand{\GP@declarehexpat}{
\tikzdeclarepattern{
  name=hexagons,
  type=uncolored,
  bounding box={(0,0) and (3*\GP@patternsize,0.866025*2*\GP@patternsize)},
  tile size={((3*\GP@patternsize,0.866025*2*\GP@patternsize)},
  parameters={\tikzhexrotate},
  tile transformation={rotate=\tikzhexrotate},
  defaults={
    rotate/.store in=\tikzhexrotate,rotate=0,
  },
  code={
    \pgfsetlinewidth{0.6pt}
    \pgftransformshift{\pgfpoint{0mm}{0.866025*\GP@patternsize}}
    \pgfpathmoveto{\pgfpoint{0mm}{0mm}}
    \pgfpathlineto{\pgfpoint{0.5*\GP@patternsize}{0mm}}
    \pgfpathlineto{\pgfpoint{\GP@patternsize}{-0.866025*\GP@patternsize}}
    \pgfpathlineto{\pgfpoint{2*\GP@patternsize}{-0.866025*\GP@patternsize}}
    \pgfpathlineto{\pgfpoint{2.5*\GP@patternsize}{0mm}}
    \pgfpathlineto{\pgfpoint{3*\GP@patternsize}{0mm}}
    \pgfpathmoveto{\pgfpoint{0.5*\GP@patternsize}{0mm}}
    \pgfpathlineto{\pgfpoint{\GP@patternsize}{0.866025*\GP@patternsize}}
    \pgfpathlineto{\pgfpoint{2*\GP@patternsize}{0.866025*\GP@patternsize}}
    \pgfpathlineto{\pgfpoint{2.5*\GP@patternsize}{0mm}}
    \pgfusepath{stroke}
  }
}
}

\newcommand{\GP@declaretripat}{
\tikzdeclarepattern{
  name=triangles,
  type=uncolored,
  bounding box={(0,0) and (\GP@patternsize,2*0.866025*\GP@patternsize)},
  tile size={((\GP@patternsize,2*0.866025*\GP@patternsize)},
  parameters={\tikztrirotate},
  tile transformation={rotate=\tikztrirotate},
  defaults={
    rotate/.store in=\tikztrirotate,rotate=0,
  },
  code={
    \pgfsetlinewidth{0.6pt}
    \pgftransformshift{\pgfpoint{0mm}{0mm}}
    \pgfpathmoveto{\pgfpoint{0mm}{0mm}}
    \pgfpathlineto{\pgfpoint{\GP@patternsize}{2*0.866025*\GP@patternsize}}
    \pgfpathlineto{\pgfpoint{0mm}{2*0.866025*\GP@patternsize}}
    \pgfpathmoveto{\pgfpoint{0mm}{0.866025*\GP@patternsize}}
    \pgfpathlineto{\pgfpoint{\GP@patternsize}{0mm}}
    \pgfpathlineto{\pgfpoint{2*\GP@patternsize}{0mm}}
    \pgfpathlineto{\pgfpoint{2.5*\GP@patternsize}{0mm}}
    \pgfpathmoveto{\pgfpoint{2*\GP@patternsize}{0mm}}
    \pgfpathlineto{\pgfpoint{\GP@patternsize}{0mm}}
  }
}
}
%% This section sets up a routine for filling the squares in a grid with null lines.
%
%% Still can't figure out the correct pattern shift!!
\newcommand{\GP@declarelightconepat}{
\pgfkeys{...
% pgfkeys{...
\tikzdeclarepattern{
  name=lightcones,
  type=uncolored,
  parameters={\myshift},
  bounding box={(0,0) and (\GP@patternsize,\GP@patternsize)},
  tile size={\GP@patternsize,\GP@patternsize},
  tile transformation={
    shift=\myshift,
  },
  defaults={
    myshift/.store in=\myshift,myshift={(0,0)},
  },
  code={
    %% TODO Make the dashing an option
    \tikzset{lightlines/.style={line width=0.4pt,dash=on 0.05cm off 0.05cm phase 0.025cm}}
    \draw [lightlines] (0,0) -- (\GP@patternsize,\GP@patternsize);
    \draw [lightlines] (0,\GP@patternsize) -- (\GP@patternsize,0);
  },
}
\%\% Stein (@duetosymmetry on Twitter).

\%\% We have to delay this definition until after \GP@patternsize is
\%\% redefined (by the pattern selection and/or user override)
\newcommand{\GP@declaredotpat}{
\newcommand{\GP@patternforonly
\{\dotgrid\}%% name
\pgfdeclarepatternformonly
{\pgfpoint{-0.5*\GP@patternsize}{-0.5*\GP@patternsize}}%% lower left
{\pgfpoint{0.5*\GP@patternsize}{0.5*\GP@patternsize}}%% upper right
{\pgfpoint{\GP@patternsize}{\GP@patternsize}}%% tile size
{%% shape description
\pgfpathcircle{\pgfqpoint{0pt}{0pt}}{\GPOpt@dotsize}
\pgfusepath{fill}
}
}

\%\% Begin pattern execution infrastructure
\%\% Begin pattern definition code
\define@boolkey{GP}{patterndefaultfullness}{}
\newcommand{\GP@patterndefaultgeometry}{}
\newcommand{\GP@patterndefaultsize}{}

\%\% Pattern-definer-helper
\%\% The interface is:
\%\% \GP@setpattern
\%\% {<true for default fullpage, false for default text area>}
\%\% {<default geometry config>}
\%\% {<default pattern size>} %% NOTE, not tile length
\%\% {<contents of inner pattern code>}
\%\% This inner code will be set by the choicekey pattern=...
\newcommand{\GP@innerpatterncode}{}
\%\% This is the "outer" code to hook into every page
\newcommand{\GP@patterncode}{% No blank lines in this code!
\begin{tikzpicture}[remember picture, overlay]
\tikzset{
\ifGP@fullpage
\coordinate (a) at (current page.south west);
\coordinate (b) at (current page.north east);
\else
\coordinate (a) at (current page text area.south west);
\coordinate (b) at (current page text area.north east);
\fi
\GP@innerpatterncode
\end{tikzpicture}
}
\newcommand{\GP@setpattern}[4]{%
\setkeys{GP}{patterndefaultfullness=#1}
\renewcommand{\GP@patterndefaultgeometry}{#2}
\renewcommand{\GP@patterndefaultsize}{#3}
\renewcommand{\GP@innerpatterncode}{#4}
%
\define@choicekey*{GP}{pattern}{\val}{nr}%%
% Allowed values for pattern:
% {std, stdeight, majmin, dot, hex, hexup, tri, iso, lightcone, ruled, doubleruled}(%
\ifcase(nr)relax
% 3.6 \% std
% \GP@setpattern{false}{letterpaper, margin=0.2in}{0.1in}{%
% \draw[style=minorgrid, shift={(a)}] (0,0) grid [step=\GP@patternsize] (b);
% \draw[style=majorgrid] (a) rectangle (b);
% \or
% \% stdeight
% \GP@setpattern{false}{letterpaper, margin=0.1875in}{0.125in}{%
% \draw[style=minorgrid, shift={(a)}] (0,0) grid [step=\GP@patternsize] (b);
% \draw[style=majorgrid] (a) rectangle (b);
% \or
% \% majmin
% \GP@setpattern{false}{letterpaper, margin=0.25in}{0.125in}{%
% \draw[style=minorgrid, shift={(a)}] (0,0) grid [step=4*\GP@patternsize] (b);
% \draw[style=majorgrid] (a) rectangle (b);
% \or
% \% dot
% \GP@setpattern{true}{0.1in}{%
% \fill [pattern=dotgrid, pattern color=minorcolor] (a) rectangle (b);
% \}
% \% std
% \GP@setpattern{false}{letterpaper, margin=0.2in}{0.1in}{%
% \draw[style=minorgrid, shift={(a)}] (0,0) grid [step=\GP@patternsize] (b);
% \draw[style=majorgrid] (a) rectangle (b);
% \or
% \% stdeight
% \GP@setpattern{false}{letterpaper, margin=0.1875in}{0.125in}{%
% \draw[style=minorgrid, shift={(a)}] (0,0) grid [step=\GP@patternsize] (b);
% \draw[style=majorgrid] (a) rectangle (b);
% \or
% \% majmin
% \GP@setpattern{false}{letterpaper, margin=0.25in}{0.125in}{%
% \draw[style=minorgrid, shift={(a)}] (0,0) grid [step=4*\GP@patternsize] (b);
% \draw[style=majorgrid] (a) rectangle (b);
% \or
% \% dot
% \GP@setpattern{true}{0.1in}{%
% \fill [pattern=dotgrid, pattern color=minorcolor] (a) rectangle (b);
% \}
\or
\% hex
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\% Hex grid
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\GP@setpattern{true}{}{0.1666in}{%
\fill [pattern=hexagons,pattern color=minorcolor] (a) rectangle (b);
} \or
\% hexup
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\% Hex-up grid
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\GP@setpattern{true}{}{0.1666in}{%
\fill [pattern={hexagons[rotate=90]},pattern color=minorcolor] (a) rectangle (b);
} \or
\% tri
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\% Triangle grid, adjust triangle size in the preamble
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\GP@setpattern{true}{}{0.25in}{%
\fill [pattern=triangles,pattern color=minorcolor] (a) rectangle (b);
} \or
\% iso
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\% Isometric grid
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\GP@setpattern{true}{}{0.25in}{%
\fill [pattern={triangles[rotate=90]}, pattern color=minorcolor] (a) rectangle (b);
} \or
\% lightcone
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\% A grid with light cones.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\GP@setpattern{false}{letterpaper, margin=.125in}{0.25in}{%
\fill [pattern={lightcones[myshift={(a)}]}] (a) rectangle (b);
} \or
\% ruled
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\% Ruled page with bold lines every 0.2in or 0.25in
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\GP@setpattern{false}{letterpaper, body={8in,10.8in}}{0.2in}{%
\fill [pattern={lightcones[myshift={(a)}]}] (a) rectangle (b);
} \endlayout
\GP@setpattern{false}{letterpaper, margin=.25in}{0.125in}
\draw[style=minorgrid, shift={(a)}] (0,0) grid [ystep=\GP@patternsize, xstep=\paperwidth] (b);
\draw[style=majorgrid, shift={(a)}] (0,0) grid [ystep=2*\GP@patternsize, xstep=\paperwidth] (b);
\draw[style=majorgrid] (a) rectangle (b);
\fi

\ifGP@fullnessset
\else
\ifKV@GP@patterndefaultfullness
\GP@fullpagetrue
\else
\GP@fullpagefalse
\fi
\fi

\ifGP@geometrypreviouslyloaded
\PackageWarning{gridpapers}{'geometry' package was previously loaded, will not use pattern defaults.}
\else
\expandafter\geometry\expandafter{\GP@patterndefaultgeometry}
\expandafter\geometry\expandafter{\GPOpt@geometry}
\fi

\ifx\GPOpt@patternsize\@empty
% Use the pattern's preferred length
\renewcommand{\GP@patternsize}{\GP@patterndefaultsize}
\else
% Override with the user's choice
\renewcommand{\GP@patternsize}{\GPOpt@patternsize}
\fi

%% Now that everything has been set up, we can finally define the
%% patterns with the correct lengths.
\GP@declarehexpat
\GP@declaretripat
\GP@declarelightconepat
\GP@declaredotpat

%% Set the background color.
Change History

v1.0.0  v1.0.2
General: Converted to DTX file . . . . . . 1  

v1.0.1  
General: Hotfix: old installs don’t have 
General: Replace triangle and hexagon 

everypage-1x, use everypage . . . . . . 1  
'ghostly' colorset . . . . . . . . . . . . . . . 1