Worldflags

Drawing flags with TikZ

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1 Introduction

*Worldflags* is a package for drawing flags using TikZ. Currently the national flags of all independent nations are included, additionally some other flags of various organizations; there’s more to come.

A particular flag is selected via a parameter; for national flags that is the two-letter country code (i.e. the domain name). A flag can be drawn in two ways:

- as a single TikZ-picture within ordinary text
- as a picture element *within* a TikZ-picture

The appearance of a flag (size, frame etc.) can be adapted using optional parameters.

The description of every flag resides in a particular flag description file *worldflag_xx.tex*, wherein *xx* is the parameter for selecting a particular flag, as listed in section 4. That saves memory and computing time on the one hand, as only the required flags have to be loaded. On the other hand, the package can easily be extended by adding new flag description files.

Some flags with complicated emblems (e.g. Afghanistan, Ecuador) require a lot of memory. Thus an expansion of *TeX*’s main memory size is recommended.

The flag descriptions are based on the construction sheets in [1] (thanks to Mello Luchtenberg for that great website), complex emblems have been taken from the svg-files on Wikipedia and have been translated into Tikz via Inkscape (with a reasonable amount of manual post editing).
2 Usage

2.1 Flags as single TikZ-pictures

Commands:
\worldflag[opts]{xx} \hspace{1em} draws the flag xx with the optional parameters opts as a particular TikZ-picture.
\flagsdefault[opts] \hspace{1em} sets default values for the options opts for subsequent flags.

Options:
width=dimension \hspace{1em} sets the flag width, default: 15 mm.
length=dimension \hspace{1em} sets the flag length; if set to 0 pt (default), the length is calculated according to the proper aspect ratio of the flag.
framewidth=dimension \hspace{1em} sets the line width of the frame around the flag, default: 0.2 mm.
framecolor=colorname \hspace{1em} sets the color of the flag frame, default: black!60.
stretch=number \hspace{1em} controls stretching and shrinking of geometric shapes when the aspect ratio differs from its proper value.
grid \hspace{1em} causes a millimeter-grid drawn on the flag as an aid for constructing new flags.
noemblem \hspace{1em} supresses the drawing of an emblem, which is part of many flags.
emblem \hspace{1em} enforces the drawing of an emblem onto the flag which is otherwise supressed (currently only applies to the flags of Austria and Germany).
emblemdefault \hspace{1em} restores the default behavior for drawing emblems.

\worldflag{xx} draws a flag, selected by the parameter xx, as a single TikZ-picture. Section 4 lists all available flags and their selection code xx. Various properties of the flag can be specified with additional optional parameters as key-value pairs.

\flagsdefault[opts] specifies default values for the Options opts for subsequent flags.

The width of a flag defaults to 15 mm, it can be overridden with the option width. If one of the dimensions width or length is set to 0 pt (which is the default value for length), its value results from the proper aspect ratio width/length, which is proprietary to every flag. E. g. the Swiss flag is quadratic, it has an aspect ratio of 1:1, the British flag has an aspect ratio of 1:2. If width is set to 0 pt, length must be specified. If both dimensions are specified, flags loose their proper aspect ratio but get the same size:
If both width and length of a flag are specified, which differs from its proper aspect ratio, some geometries on the flag will unavoidably get distorted. There is presumably no general rule whether certain distances on the flag should remain unchanged in that case, or certain ratios – as flag owners do not intend to distort their flags – but that behavior can be influenced for many flags applying the option `stretch`. If `stretch` is set to 0 (which is default), certain distances and sizes on the flag remain unchanged, when the flag is stretched; if set to 1, certain ratios remain unchanged in that case. Values within the range of 0...1 are possible to get a compromise between both cases.

The following examples illustrate that behavior:

**Canada:**
- ```latex
   \text{stretch}=0
   \text{The size of the maple leaf remains unchanged.}
   \text{stretch}=1
   \text{The ratio of the widths – maple leaf and pale – remains unchanged; the maple leaf has to shrink.}
   ```

**Denmark:**
- ```latex
   \text{stretch}=0
   \text{The distance from the vertical bar to the hoist remains unchanged.}
   \text{stretch}=1
   \text{The ratio of the distances to the hoist and to the fly remains unchanged.}
   ```

The option `grid` causes a millimeter-grid drawn over the flag. That is primarily a measuring aid for the construction of new flags.

The options `framecolor` and `framewidth` set the color and the line width of the frame drawn around the flag, respectively. The default value for the line width is 0.2 mm, the default color is `black!60`. If `framewidth` is set to 0 mm (or 0 pt), no frame is drawn at all.
Many flags have an emblem on it, e.g. a coat of arms or a special symbol. Those emblems are often very complex and require a lot of computing time and memory. The depiction of such an emblem can be suppressed with the option `noemblem`, either for the sake of saving computing time (for drafts) or just because simplified version of the flag is required. Some countries distinguish between a civil flag without an emblem and a state flag containing an emblem.

Some flags don’t have an emblem by default, but an emblem is available for special purposes. In that case the depiction of the emblem can be enforced with the option `emblem`. Currently that only applies to the country flags of Austria and Germany (more will come). The option `emblemdefault` restores the default behavior for drawing emblems.

The emblem (i.e. the coat of arms) in the Austrian flag is suppressed by default, the emblem in the Croatian flag is depicted default.

### 2.2 Flags as picture elements within a TikZ-picture

Within a Tikz-picture the flags are available as `pic`-Elements named `worldflag`. A particular flag is selected with the option `country`. Unlike nodes, `pic`-elements cannot be referenced by name, but named nodes and coordinates within the `pic`-element can be referenced. Hence every flag has special coordinates for referencing:

- `-0` ... center of flag
- `-nw` ... upper left corner (“north-west”)
- `-ne` ... upper right corner (“north-east”)
- `-sw` ... lower left corner (“south-west”)
- `-se` ... lower right corner (“south-east”)
- `-n` ... top edge center (“north”)
- `-e` ... fly edge center (“east”)
- `-w` ... hoist edge center (“west”)
- `-s` ... bottom edge center (“south”)
**Commands:**

\( \text{\texttt{pic}} \) \((xy)\) [\text{\texttt{country}=xx,...}] \text{\texttt{at pos \{worldflag\};}} \)

draws the flag \(xx\) and gives it the name \(xy\); the flag is centered at the coordinate \(pos\).

\( \text{\texttt{flagsdefault}}[\text{\texttt{opts}}] \)

sets default values for the options \(opts\).

**Options:**

- width=\texttt{dimension}  
  sets the flag width, default: 15 mm.

- length=\texttt{dimension}  
  sets the flag length; if set to 0 pt (default), the length is calculated according to the proper aspect ratio of the flag.

- framewidth=\texttt{dimension}  
  sets the line width of the frame around the flag, default: 0.2 mm.

- framecolor=\texttt{colortname}  
  sets the color of the flag frame, default: \texttt{black!60}.

- stretch=\texttt{number}  
  controls stretching and shrinking of geometric shapes when the aspect ratio differs from its proper value.

- grid  
  causes a millimeter-grid drawn on the flag.

- noemblem  
  supresses the drawing of an emblem onto the flag.

- emblem  
  enforces the drawing of an emblem onto the flag.

- emblemdefault  
  restores the default behavior for drawing emblems.

- rotate=\texttt{\alpha}  
  rotates the flag \(\alpha\) degrees around its center.

- turn=\texttt{\beta}  
  rotates the flag \(\beta\) degrees around the (imaginary) flag-pole.

- hang=\texttt{\gamma}  
  lets the flag “hang down” \(\gamma\) degrees from the (imaginary) flag pole.

The following example illustrates the usage of the special coordinates:

**Code:**

\begin{verbatim}
\begin{tikzpicture}[draw=cyan,>=stealth,x=1mm,y=1mm]
\pic (de) [country=DE,emblem] {worldflag};
\draw (de-e)--++(45:5) node [above right,cyan] {fly};
\draw (de-w)--++(45:14) node [above right,cyan] {hoist};
\draw (de-0)--++(45:14) node [above right,cyan] {coat of arms};
\draw (de-nw)--++(-5,0) (de-sw)--++(-5,0);
\draw [->] ($(de-nw)-(4,0)$)--($(de-sw)-(4,0)$) node [midway,above,rotate=90,cyan] {width};
\draw [->] ($(de-sw)-(0,6)$)--($(de-se)-(0,6)$) node [midway,above,cyan] {length};
\end{tikzpicture}
\end{verbatim}

**Result:**

![Diagram of a flag with special coordinates marked]
The option `rotate` causes the flag to be rotated around the flag center with a given angle in degree.

Note: That option is not proprietary to flags, it is a general option for any pic-element. Hence it is not possible to give it a default value with the command `flagsdefault`.

---

The option `turn` lets the flag rotate around the imaginary flagpole with a given angle $\beta$ (in degrees). The length of the flag will seemingly shrink with a factor of $\cos \beta$. With a value of $\beta = 180$ the flag will just appear mirrored. The option `hang` lets the flag “hang down” from the imaginary flagpole with a given angle $\gamma$ (in degrees); the flag will be sheared and compressed accordingly.

The following example shows a combination of `rotate`, `turn` and `hang`.

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The following example shows a combination of `rotate`, `turn` and `hang`. 
3 Internals

This section is intended for those who want to extend the worldflag package and create new flags. Those who just want to use the package and draw existing flags, need not read it.

Every flag resides in a particular “flag description file” named worldflag_xx.tex, wherein xx is the code for selecting a flag. Extending the package with new flags is quite easy: Just a flag description file for every new flag has to be written and put into a directory, where \TeX can find it. No configuraion files, no other actions; that’s it.

3.1 Flag description file

Every flag description file has the following structure:

\begin{flagdescription}{ξ}
\definecolor{red}{RGB}{r,g,b}
\definecolor{gold}{RGB}{r,g,b}
\end{flagdescription}

\begin{enumerate}
\item All commands describing the geometry of a flag have to be within the environment flagdescription. This environment requires a parameter ξ, which specifies the proper aspect ratio width/length of a flag. Using that parameter, the flag length is calculated from the flag width (or vice versa). As ξ is further processed using \pgfmathparse, can be specified as a floating point number or as a ratio of two (preferably integer) numbers.

Furthermore, two nested scopes are opened: The outer scope sets the drawing unit to \flagwidth (note: the top edge of a flag has always a \textit{y}-coordinate of 1) and performs the coordinate transformation according to the options \texttt{turn} and \texttt{hang}. The inner scope shifts the coordinate system to the flag center.

In the sequel, the special coordinates \texttt{-0}, \texttt{-n}, \texttt{-ne}, \texttt{-e}, \texttt{-se}, \texttt{-s}, \texttt{-sw}, \texttt{-w} and \texttt{-nw} are established – as described in section 2.2.

\item Every flag has proprietary shadings of colors. Hence even common colors have to be redefined for every flag separately.
\end{enumerate}
TikZ commands for drawing and filling of shapes make up the core of a flag description file. A couple of macros (see section 3.3) for common geometric figures facilitate the creation of the flag image.

This command draws a rectangular frame around the flag. The line width, set with the option \framewidth, is stored in the dimension register \flagframe; the frame color, set with the option \framecolor, is stored in the macro \framecolor. For non-rectangular flags (e.g. Nepal) the flag frame has to be programmed “manually”.

At the end of the environment a millimeter-grid is drawn onto the flag, if invoked with the option grid and the two previously opened scopes are closed again.

### 3.2 Variables

The properties of a flag are kept in variables, which are dimension registers or macros. Those variables are either set by the user via specifying options or are calculated internally. Most of those variables are used internally, only the following few variables are used in the code for the flag description:

<table>
<thead>
<tr>
<th>Dimension registers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>\flagwidth \hspace{1em}</td>
</tr>
<tr>
<td>width of the flag (vertical extent)</td>
</tr>
<tr>
<td>\flaglength \hspace{1em}</td>
</tr>
<tr>
<td>length of the flag (horizontal extent)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro:</th>
</tr>
</thead>
<tbody>
<tr>
<td>\stretchfactor \hspace{1em}</td>
</tr>
<tr>
<td>factor for stretching of certain geometries</td>
</tr>
</tbody>
</table>

\flagwidth and \flaglength specify the width and length of a flag. They are set by the user with the options width and length or are calculated from each other at the begin of the environment flagdescription internally. \flagwidth is the unit for coordinates and lengths in the flag description.

\stretchfactor is a factor for stretching certain x-coordinates, when the whole flag is stretched (or compressed), i.e. when the aspect ratio differs from its proper value. It is calculated from the user option stretch and can be used in the flag description.

### 3.3 Commands

A couple of commands for common geometric elements on flags facilitate the flag description. To avoid accidental name clashes with other packages, the visibility of those commands is confined to the environment flagdescription.
The macros `\hstripesII`, `\hstripesIII`, `\hstripesIV`, `\vstripesII`, `\vstripesIII` partition the flag into an according number of horizontal or vertical colored stripes.
\texttt{\background} fills the entire rectangular area of the flag with color; note: a flag needs neither a frame around it nor a background on principle. \texttt{\hbar} draws a horizontal bar of given width and color at a specified \(y\)-coordinate across the flag; \texttt{\vbar} does the same vertically. \texttt{\chevron} draws an isosceles triangle with a given height over the hoist.

\begin{tikzpicture} \begin{flagdescription}{3/4} \background{cyan} \hbar{white}{0.5}{0.3} \vbar{white}{0.5}{0.3} \end{flagdescription} \end{tikzpicture}

\texttt{\Union Jack} draws the Union Jack (which is part of a couple of flags) between a lower left and an upper right point. Their coordinates – \(x_1, y_1, x_2, y_2\) – are separate parameters, which \textit{must} be specified as dimensions (i.e. using a unit), not just as numbers. The colors \texttt{blue}, \texttt{red} and \texttt{white} can be redefined arbitrarily.

\begin{tikzpicture} \begin{flagdescription}{3/4} \unionjack{0mm}{0mm}{\flaglength}{\flagwidth} \end{flagdescription} \end{tikzpicture}

The various types of stars \texttt{\starnV} \texttt{\starnVI} \texttt{\starn} and \texttt{\moon} are self-explanatory. In the following example \texttt{\starn} and \texttt{\moon} are overlayed with the generating circles.

\begin{tikzpicture} \begin{flagdescription}{1/3} \background{cyan} \starnV{white}{(1,0.5)}{0.3}{0} \starnVI{white}{(2,0.5)}{0.3}{0} \end{flagdescription} \end{tikzpicture}
4 Flags

4.1 National Flags of sovereign states

Afghanistan (AF)
Albania (AL)
Algeria (DZ)
Andorra (AD)

Angola (AO)
Antigua & Barbuda (AG)
Argentina (AR)
Armenia (AM)

Australia (AU)
Austria (AT)
Azerbaijan (AZ)
Bahamas (BS)

Bahrain (BH)
Bangladesh (BD)
Barbados (BB)
Belarus (BY)

Belgium (BE)
Belize (BZ)
Benin (BJ)
Bhutan (BT)

Bolivia (BO)
Bosnia & Herzegovina (BA)
Botswana (BW)
Brazil (BR)
4.2 Flags of other countries and territories

- Abkhazia (Abkhazia)
- Antarctica (AQ)
- Artsakh (Artsakh)
- French Guiana (GF)
- Greenland (GL)
- Niue (NU)
- Somaliland (Somaliland)
- Transnistria (Transnistria)
- Western Sahara (EH)

4.3 Other Flags

- European Union (EU)
- United Nations (UNO)
- NATO (NATO)
- Red Cross (RedCross)
5 Links


