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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 LaTeX’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

\begin{itemize}
  \item \texttt{\worldflag[opts]{xx}} draws the flag \texttt{xx} with the optional parameters \texttt{opts} as a particular TikZ-picture.
  \item \texttt{\flagsdefault[opts]} sets default values for the options \texttt{opts} for subsequent flags.
\end{itemize}

\textbf{Options:}

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

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

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

The \texttt{width} of a flag defaults to 15 mm, it can be overridden with the option \texttt{width}. If one of the dimensions \texttt{width} or \texttt{length} is set to 0 pt (which is the default value for \texttt{length}), its value results from the proper aspect ratio \texttt{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 \texttt{width} is set to 0 pt, \texttt{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:**
- **stretch=0** The size of the maple leaf remains unchanged.
- **stretch=1** The ratio of the widths – maple leaf and pale – remains unchanged; the maple leaf has to shrink.

**Denmark:**
- **stretch=0** The distance from the vertical bar to the hoist remains unchanged.
- **stretch=1** 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 supressed 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”)

```latex
\begin{tikzpicture}
\node [draw] at (0,0) {Austria};
\node [draw] at (1,0) {Croatia};
\end{tikzpicture}
```
Commands:
\pic (xy) [country=xx,...] at pos {worldflag};
draws the flag xx and gives it the name xy; the flag is
centered at the coordinate pos.

\flagsdefault[opts]
sets default values for the options opts.

Options:
width=dimension
sets the flag width, default: 15 mm.

length=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=dimension
sets the line width of the frame around the flag, de-
default: 0.2 mm.

framecolor=colorname
sets the color of the flag frame, default: black!60.

stretch=number
controls stretching and shrinking of geometric shapes
when the aspect ratio differs from its proper value.
causes a millimeter-grid drawn on the flag.

goebembelm
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=α
rotates the flag α degrees around its center.

turn=β
rotates the flag β degrees around the (imaginary) flag-
pole.

hang=γ
lets the flag “hang down” γ degrees from the (imagi-
nary) flag pole.

The following example illustrates the usage of the special coordinates:

Code:
\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)--+(0,0) (de-sw)--+(0,0);
\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}
The option \texttt{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 \texttt{pic-element}. Hence it is not possible to give it a default value with the command \texttt{flagsdefault}.

\begin{tikzpicture}
\flagsdefault[width=12mm,length=18mm]
\foreach \c/\n in {HU/0,SK/1,IT/6,SI/7}
  \pic [country=\c,rotate=\n*45]
    at (\n*45:24mm) \{worldflag\};
\foreach \c/\n in {CZ/2,DE/3,LI/4,CH/5}
  \pic [country=\c,rotate=\n*45-180]
    at (\n*45:24mm) \{worldflag\};
\end{tikzpicture}

The option \texttt{turn} lets the flag rotate around the imaginary flagpole with a given angle $\beta$ (in degrees). The length of the flag will \textit{seemingly} shrink with a factor of $\cos \beta$. With a value of $\beta = 180$ the flag will just appear mirrored. The option \texttt{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 \texttt{rotate}, \texttt{turn} and \texttt{hang}.

\begin{tikzpicture}[x=1mm,y=1mm]
\def\w{30}
\def\d{20}
\pgfdeclarehorizontalshading{flagpole}
{30mm}{color(0mm)=(white);
  color(1mm)=(brown); color(2mm)=(black)}
\flagsdefault[width=15mm,hang=20]
\pic (gb) [country=GB,rotate=-\w]
  at (\d,0) \{worldflag\};
\pic (us) [country=US,rotate=\w,turn=180]
  at (-\d,0) \{worldflag\};
\fill [shading=flagpole,shading angle=-\w,
  rotate around={-\w:(gb-nw)}]
  (gb-nw)++(-2,-60)-|cycle;
\fill [shading=flagpole,shading angle=\w,
  rotate around={\w:(us-nw)}]
  (us-nw)++(2,-60)-|cycle;
\end{tikzpicture}
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 configuration files, no other actions; that’s it.

3.1 Flag description file

Every flag description file has the following structure:

```
\begin{flagdescription}{\xi}
\definecolor{red}{RGB}{r,g,b}
\definecolor{gold}{RGB}{r,g,b}
\ldots
\framecode{code}
\end{flagdescription}
```

1. All commands describing the geometry of a flag have to be within the environment `flagdescription`. This environment requires a parameter `\xi`, 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 `\xi` is further processed using \pgfmathparse, it 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 `y`-coordinate of 1) and performs the coordinate transformation according to the options `turn` and `hang`. The inner scope shifts the coordinate system to the flag center. That shift is only for rotation and positioning of the flag within a TikZ-picture. For the flag description the origin of the coordinate system remains on the lower left corner of the flag.

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

2. Every flag has proprietary shadings of colors. Hence even common colors have to be redefined for every flag separately.
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.

*code* is the drawing path for the frame around the flag. In (the most common) case of a rectangular shape of the flag (an exception is e.g. the flag of Nepal) *code* can be left empty; a rectangular frame is drawn automatically in that case.

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`.

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>
<th>Macro:</th>
</tr>
</thead>
<tbody>
<tr>
<td>\flagwidth</td>
<td>\stretchfactor</td>
</tr>
<tr>
<td>\flaglength</td>
<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* (stored in the macro `\flagstretch`) as follows and can be used in the flag description:

\[
f_s = 1 + \frac{l - l_0}{l_0} \cdot s, \quad \text{with} \quad f_s \ldots \text{the variable} \ \ \stretchfactor \\
l_0 \ldots \text{proper aspect ratio of the flag} \\
l \ldots \text{actual aspect ratio of the flag} \\
s \ldots \text{value of the user specified option} \ \ \stretch
\]
In the following example the yellow diamonds keep their *distances* to the borders of the flag (hoist and fly, respectively), when the flag is stretched or compressed, the white diamonds keep their *relative positions* on the flag in that case.

---

**Code:**

```latex
\def\diamond#1#2{% 
\begin{scope}[shift={#2}]
 \fill [#1] (3/20,0)--(0,4/20)--(-3/20,0)--(0,-4/20);
 \end{scope}\
\end{scope}%
\def\drawflag{%
\begin{tikzpicture}
\begin{flagdescription}{2/3}
 \background{cyan}
 \diamond{yellow}{(0.5,0.75)}
 \diamond{yellow}{(\flaglength,0.75)-(0.5,0)}
 \diamond{white}{(0.5*\stretchfactor,0.25)}
 \diamond{white}{(\flaglength,0.25)-(0.5*\stretchfactor,0)}
\end{flagdescription}
\end{tikzpicture}\
\drawflag\par\medskip
\newdimen\flaglength\flaglength=40mm
\def\flagstretch{1}\drawflag
```

---

**Result:**

![Flag with diamonds](attachment:image.png)

### 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`. 
Geometric flag elements:

\begin{flagdescription}{\xi}
  \end{flagdescription} environment for the flag with aspect ratio $\xi$

\framecode{path} drawing path for the frame around the flag; if path is empty, a rectangular frame is drawn.

\hstripesII{c_1}{c_2} partitions the flag into two horizontal stripes with the colors $c_1$ and $c_2$.

\hstripesIII{c_1}{c_2}{c_3} three horizontal stripes with the colors $c_1, \ldots, c_3$.

\hstripesIV{c_1}{c_2}{c_3}{c_4} four horizontal stripes with the colors $c_1, \ldots, c_4$.

\vstripesII{c_1}{c_2} partitions the flag into two vertical stripes with the colors $c_1$ and $c_2$.

\vstripesIII{c_1}{c_2}{c_3} three vertical stripes with the colors $c_1, \ldots, c_3$.

\hbar{c}{y}{w} horizontal bar with the color $c$ and the line width $w$ at the $y$-coordinate $y$.

\vbar{c}{x}{w} vertical bar with the color $c$ and the line width $w$ at the $x$-coordinate $x$.

\chevron{c}{x} isosceles triangle at the hoist with the color $c$ and the vertex at the $x$-coordinate $x$.

\starV{c}{p}{r}{\alpha} 5-pointed star as a complex polygon with the fill color $c$, an outer radius $r$, an angle $\alpha$ at the coordinate $p$.

\starVI{c}{p}{r}{\alpha} 6-pointed star as a complex polygon with the fill color $c$, an outer radius $r$, an angle $\alpha$ at the coordinate $p$.

\moon{c}{p_1}{r_1}{p_2}{r_2} crescent moon with the fill color $c$, as a difference set of two generating circles with the radii $r_1$, $r_2$, and center coordinates $p_1$ and $p_2$.

\starn{c}{n}{p}{r_1}{r_2}{\alpha} $n$-pointed star with the fill color $c$, an outer radius $r_1$, an inner radius $r_2$ and an angle $\alpha$ at the coordinate $p$.

\begin{tikzpicture} \begin{flagdescription}{3/4}
  \hstripesIII{cyan}{white}{red}
  \end{flagdescription} \end{tikzpicture}

\begin{tikzpicture} \begin{flagdescription}{3/4}
  \vstripesIII{cyan}{white}{red}
  \end{flagdescription} \end{tikzpicture}

The macros $\hstripesII$, $\hstripesIII$, $\hstripesIV$, $\vstripesII$, $\vstripesIII$ partition the flag into an according number of horizontal or vertical colored stripes.
\texttt{\textbackslash 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{\textbackslash hbar} draws a horizontal bar of given width and color at a specified $y$-coordinate across the flag; \texttt{\textbackslash vbar} does the same vertically. \texttt{\textbackslash chevron} draws an isosceles triangle with a given height over the hoist.

\begin{verbatim}
\begin{tikzpicture} \begin{flagdescription}{3/4}
\background{cyan}
\hbar{white}{0.5}{0.3}
\vbar{white}{0.5}{0.3}
\end{flagdescription} \end{tikzpicture}
\quad
\begin{tikzpicture} \begin{flagdescription}{3/4}
\chevron{cyan}{1}
\end{flagdescription} \end{tikzpicture}
\end{verbatim}

\texttt{\textbackslash 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{verbatim}
\begin{tikzpicture} \begin{flagdescription}{3/4}
\unionjack{0mm}{0mm}{\flaglength}{\flagwidth}
\end{flagdescription} \end{tikzpicture}
\quad
\begin{tikzpicture} \begin{flagdescription}{3/4}
\colorlet{blue}{black}
\definecolor{red}{rgb}{0.9,0.6,0}
\unionjack{0mm}{5mm}{10mm}{\flagwidth}
\end{flagdescription} \end{tikzpicture}
\end{verbatim}

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

\begin{verbatim}
\begin{tikzpicture} \begin{flagdescription}{1/3}
\background{cyan}
\starV{white}{(1,0.5)}{0.3}{0}
\starVI{white}{(2,0.5)}{0.3}{0}
\end{flagdescription} \end{tikzpicture}
\quad\par
\begin{tikzpicture} \begin{flagdescription}{1/3}
\background{cyan}
\starn{white}{9}{(2,0.5)}{0.4}{0.15}{0}
\draw (2,0.5)circle(0.4) (2,0.5)circle(0.15);
\moon{white}{(1,0.45)}{0.4}{(1.1,0.6)}{0.36}
\draw (1,0.45)circle(0.4) (1.1,0.6)circle(0.36);
\end{flagdescription} \end{tikzpicture}
\end{verbatim}
4 Flags

4.1 National Flags of sovereign states
4.2 Flags of other countries and territories
4.3 Austrian federal states

Vienna (AT-W)  
Lower Austria (AT-N)  
Upper Austria (AT-O)  
Salzburg (AT-S)  
The Tyrol (AT-T)  
Vorarlberg (AT-V)  
Carinthia (AT-K)  
Styria (AT-St)  
Burgenland (AT-B)

4.4 Other Flags

European Union (EU)  
United Nations (UNO)  
WHO (WHO)  
UNESCO (UNESCO)  
NATO (NATO)  
Christian Flag (Christian)  
Buddhist Flag (Buddhism)  
Red Cross (RedCross)  
Red Crescent (RedCrescent)  
Red Crystal (RedCrystal)  
Olympics (Olympics)  
Jolly Roger (JollyRoger)
4.5 Nautical Signal Flags
5 Links


