The `l3charts` package

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https://git.itsufficient.me/latex/l3charts

Abstract

This package defines a few simple TikZ charts that can be drawn using LaTeX environments. This has mainly been developed as an experimentation of `expl3` for checking what LaTeX3 really brought to facilitate package development (expansion control, `seq`, `prop`, `keys`, `int`, `bool`, `fp`, `dim`,`msg`, ...).

Contents

1 About this documentation

I doubt that LaTeX will have one day a modern documentation system as powerful as `cargo doc` due to its typeless and syntaxless nature. In my opinion LaTeX literate programming with `docstrip` is just an ugly hack that turns the code and the documentation unmaintainable, and it's probably the component of LaTeX which aged the most.

So I chose to write the documentation separately and borrowed much of the style from the `microtype` package which by the way (if you are still curious about it), pushes the `docstrip` mastery to a *black magic* level.

2 Motivation

This package has been developed mainly to typeset a fancy résumé but perhaps it could be used in other contexts too. I didn't want to write Tikz charts directly in the document as it would have turned a simple typesetting file into an unreadable document, and I would have forgotten every details after just a few months.

I wouldn't have the patience to develop this with LaTeX or TeX either, but I was curious enough about `expl3` to try an implementation. You should probably take this package as a rough tutorial on how to develop with `expl3` because it uses nearly all the types defined in the reference documentation (expansion control, `seq`, `prop`, `keys`, `int`, `bool`, `fp`, `dim`, `msg`, ...) in straightforward ways.

TeX will always be that dusty tech you can't ignore because but there are so many (unmatched) packages coming from academic circles, but `expl3` gives a touch of modernity and facilitates a lot package development by allowing to easily bridge TeX packages (here LaTeX and Tikz).

3 Kiviat chart

3.1 Usage

The kiviat chart or *radar chart* allows to represent one or several set along several dimensions.

`\begin{kiviatchart}`
`\end{kiviatchart}`

Environment that hold a kiviat chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

`radius` ⟨*dim*⟩ `3.5cm`

Maximal diagram radius

`units` ⟨*int*⟩ `5`

Set the scale of units from 0 to the given number

`rounded` ⟨*bool*⟩ `false`

Use circles for the scale and curves for the sets instead of polygons

`*` ⟨*keyval*⟩

All other options are passed to `tikzpicture` (*env*)

A `kiviatchart` (*env*) should begin with a `dims` (*env*), followed by one or several `set` (*env*).

3.1.1 Dimensions

`\begin{dims}`
`\end{dims}`

Environment that hold the definition of all dimensions. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

`radius` ⟨*dim*⟩ `kiviatchart (env) radius`

Radius to put dimension labels on

`label-on` ⟨*int*⟩ `1`

Dimension axis index (between 1 and number of dimensions) to put the labels on. In case of invalid value (0), the units labels are hidden.

`dim-options` ⟨*prop*⟩ `{opacity=0.8}`
TikZ options for drawing dimensions axis with

`unit-options` ⟨*prop*⟩ `{opacity=0.3}`
TikZ options for drawing unit polygons with

`label-options` ⟨*prop*⟩ `{opacity=0.5,above,xshift=1.5mm}`
TikZ options drawing for unit labels

`label-cs` ⟨*str*⟩ `identity`
Name of the cs used to format labels

`unit-cs` ⟨*str*⟩ `tinytt`
Name of the cs used to format unit scale

`angle` ⟨*fp*⟩ `90`
Angle of the first dimension

`\value` `\value[`⟨*clist*⟩`]{`⟨*label*⟩`}` is used to add a dimension to the kiviat chart. `[`⟨*clist*⟩`]` is passed to TikZ to draw the nodes corresponding to the labels.

3.1.2 Set

`\begin{set}` `\end{set}` `set` (*env*) is used to add a new set to the kiviat chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

`dot-options` ⟨*prop*⟩ `{fill,circle,inner sep=1pt}`
Options for polygon node

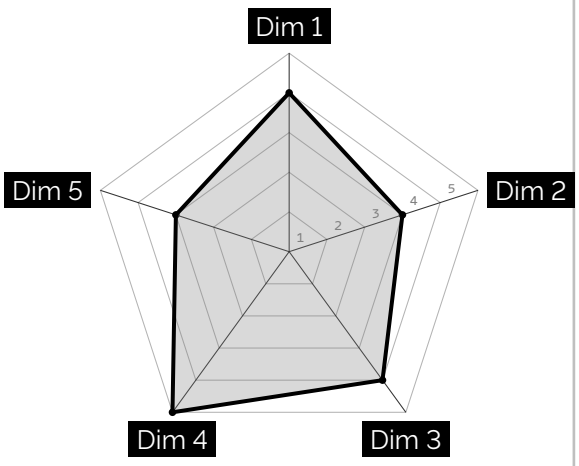
`*` ⟨*keyval*⟩ `color=black,line width=1.5pt,opacity=1,fill opacity=0.3,fill=gray`
All other options are passed to `\draw` cs which draws the polygon

`\value` `\value{`⟨*int*⟩`}` is used to add a value to the set.

There must be the same number of `\value` inside `set` (*env*) and `dims` (*env*), and each `\value` corresponds to the dimension in `dims` (*env*) at the same index.

3.2 Examples

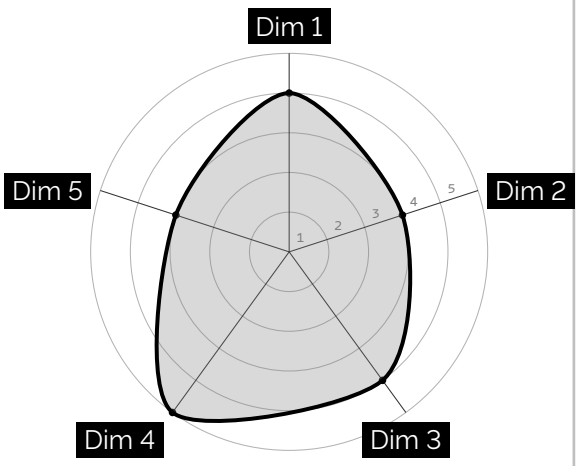
3.2.1 Simple




```
% scale is passed to tikzpicture
\begin{kiviatchart}[scale=0.75]
  % Define the dimensions
  \begin{dims}[
      % inverted labels
      label-cs=textinv,
      % value scale on dim2 axis
      label-on=2]
    % Specify placement of each
    % labels
    \value[above]{Dim 1}
    \value[right]{Dim 2}
    \value[below]{Dim 3}
    \value[below]{Dim 4}
    \value[left]{Dim 5}
  \end{dims}

  % Add least one set should
  % be defined.
  \begin{set}
    \value{4} % Dim 1
    \value{3} % Dim 2
    \value{4} % Dim 3
    \value{5} % Dim 4
    \value{3} % Dim 5
  \end{set}
\end{kiviatchart}
```

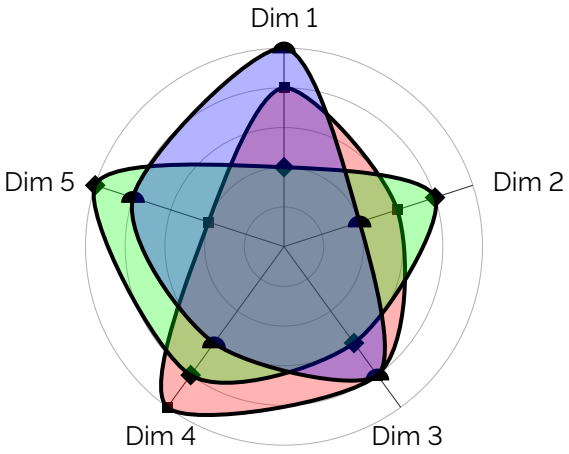
3.2.2 Rounded




```
% rounded replace polygons by circles
% curves
\begin{kiviatchart}[
  scale=0.75,
  rounded]
  % Define the dimensions
  \begin{dims}[
      % inverted labels
      label-cs=textinv,
      % value scale on dim2 axis
      label-on=2]
    % Specify placement of each
    % labels
    \value[above]{Dim 1}
    \value[right]{Dim 2}
    \value[below]{Dim 3}
    \value[below left]{Dim 4}
    \value[left]{Dim 5}
  \end{dims}

  % Add least one set should
  % be defined.
  \begin{set}
    \value{4} % Dim 1
    \value{3} % Dim 2
    \value{4} % Dim 3
    \value{5} % Dim 4
    \value{3} % Dim 5
  \end{set}
\end{kiviatchart}
```

3.2.3 Multi-set




```
\begin{kiviatchart}[
  scale=0.75,
  rounded]
\begin{dims}[
      % bigger radius for labels
      radius=3.7cm,
      % hide unit labels
      label-on=0]
    \value[above]{Dim 1}
    \value[right]{Dim 2}
    \value[below]{Dim 3}
    \value[below]{Dim 4}
    \value[left]{Dim 5}
  \end{dims}

  \begin{set}[% red set
      fill=red,
      % big rectangle dots
      dot-options={
        fill,rectangle,
        inner sep=2pt
      }]
    \value{4} % Dim 1
    \value{3} % Dim 2
    \value{4} % Dim 3
    \value{5} % Dim 4
    \value{2} % Dim 5
  \end{set}

  \begin{set}[% green set
      fill=green,
      % big diamond dots
      dot-options={
        fill,diamond,
        inner sep=2pt
      }]
    \value{2} % Dim 1
    \value{4} % Dim 2
    \value{3} % Dim 3
    \value{4} % Dim 4
    \value{5} % Dim 5
  \end{set}

  \begin{set}[% blue set
      fill=blue,
      % big semicircle dots
      dot-options={
        fill,semicircle,
        inner sep=2pt
      }]
    \value{5} % Dim 1
    \value{2} % Dim 2
    \value{4} % Dim 3
    \value{3} % Dim 4
    \value{4} % Dim 5
  \end{set}
\end{kiviatchart}
```

3.3 To do

At the moment the environments are not user friendly. We could provide basic sanity checks, with error messages when theses rules are violated :

- one and only one `dims` (*env*) declared before any `set` (*env*)
- at least 3 dimensions are declared
- all `set` (*env*) have the same number of `\value` than the `dims` (*env*)
- `\value` in `set` (*env*) is between 0 and `units`

4 Ball chart

4.1 Usage

`\begin{ballchart}` `\end{ballchart}` Environment that hold a ball chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

`n` ⟨*int*⟩ `5`
The number of circles per bar

`gap` ⟨*dim*⟩ `1ex`
Gap between bars

`cgap` ⟨*dim*⟩ `1pt`
Gap between circles

`radius` ⟨*dim*⟩ `2.5mm`
Radius of the circles

`label-cs` ⟨*str*⟩ `identity`
Macro name to format labels

`fill-options` ⟨*prop*⟩ `{fill=black}`
TikZ options to fill the balls with

`draw-options` ⟨*prop*⟩ `{draw=none}`
TikZ options to draw the balls with

`label-options` ⟨*prop*⟩ `{left}`
TikZ options for dimensions axis

`label-cs` ⟨*str*⟩ `identity`
Macro name to format labels

`label-pos` ⟨*str*⟩ `left`
Position of the label. Possible values :

- `left`, `right`
- `above`, `below`
- `above right`, `above left`
- `below right`, `below left`

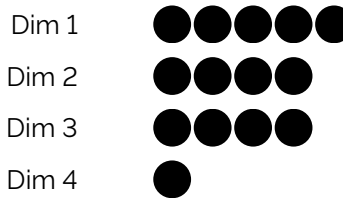
`value-cs` ⟨*str*⟩ `nop`
cs name to format values with

`*` ⟨*keyval*⟩
All other options are passed to `tikzpicture` (*env*)

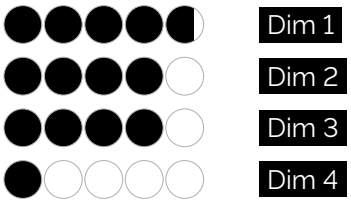
`\value` `\value{`⟨*label*⟩`}{`⟨*percent*⟩`}` is used to add a new bar.

4.2 Examples

4.2.1 Simple

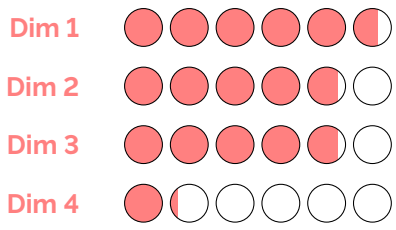



```
\begin{ballchart}
  \value{Dim 1}{95}
  \value{Dim 2}{80}
  \value{Dim 3}{80}
  \value{Dim 4}{20}
\end{ballchart}
```




```
\begin{ballchart}[
    % inverted labels
    label-cs=textinv,
    % to the right
    label-pos=right,
    % closer to the bar
    label-options={xshift=-8mm},
    % show circle
    draw-options={draw=black!30}]
  \value{Dim 1}{95}
  \value{Dim 2}{80}
  \value{Dim 3}{80}
  \value{Dim 4}{20}
\end{ballchart}
```

4.2.2 Delimited




```
\begin{ballchart}[
    % 6 circles per bar
    n=6,
    % red labels
    label-cs=redbf,
    % closer to bar
    label-options={xshift=4mm},
    % bigger gap
    gap=1.5ex,
    cgap=3pt,
    % fill in red
    fill-options={fill=red!50},
    % black circle
    draw-options={draw=black}]
  \value{Dim 1}{95}
  \value{Dim 2}{80}
  \value{Dim 3}{80}
  \value{Dim 4}{20}
\end{ballchart}
```

5 Bar chart

5.1 Usage

`\begin{barchart}` `\end{barchart}` Environment that hold a bar chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

`width` ⟨*dim*⟩ `3cm`

Maximum width

`height` ⟨*dim*⟩ `3.5mm`
Bar height

`gap` ⟨*dim*⟩ `1ex`
Gap between bars

`fill-options` ⟨*prop*⟩ `{fill=none}`
TikZ options to fill the bar with

`draw-options` ⟨*prop*⟩ `{fill=black}`
TikZ options to draw the bar with

`label-options` ⟨*prop*⟩ `{}`
TikZ options for dimensions axis

`label-cs` ⟨*str*⟩ `identity`
Macro name to format labels

`label-pos` ⟨*str*⟩ `left`
Position of the label. Possible values :

- `left`, `right`
- `above`, `below`
- `above right`, `above left`
- `below right`, `below left`

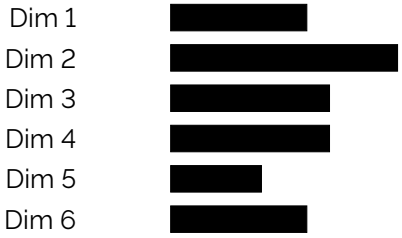
`value-cs` ⟨*str*⟩ `nop`
cs name to format values with

`*` ⟨*keyval*⟩
All other options are passed to `tikzpicture` (*env*)

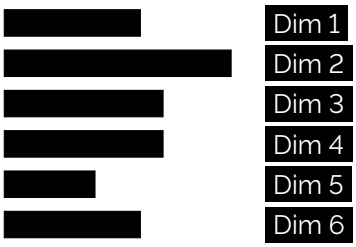
`\value` `\value{`⟨*label*⟩`}{`⟨*percent*⟩`}` is used to add a new bar.

5.2 Examples

5.2.1 Simple

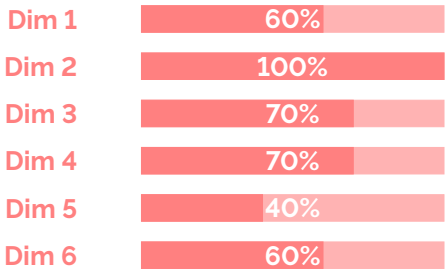



```
\begin{barchart}
  \value{Dim 1}{60}
  \value{Dim 2}{100}
  \value{Dim 3}{70}
  \value{Dim 4}{70}
  \value{Dim 5}{40}
  \value{Dim 6}{60}
\end{barchart}
```




```
\begin{barchart}[
    % inverted labels
    label-cs=textinv,
    % to the right
    label-pos=right,
    % closer to bar
    label-options={xshift=-8mm}]
  \value{Dim 1}{60}
  \value{Dim 2}{100}
  \value{Dim 3}{70}
  \value{Dim 4}{70}
  \value{Dim 5}{40}
  \value{Dim 6}{60}
\end{barchart}
```

5.2.2 Gauge




```
\begin{barchart}[
    % 4cm wide bars
    width=4cm,
    % inverted labels
    label-cs=redbf,
    % closer to bar
    label-options={xshift=4mm},
    % show values
    value-cs=whitebfp,
    % bigger gap
    gap=1.5ex,
    % bar in red
    draw-options={
      draw=red!50,
      fill=red!50},
    % show borders in red
    fill-options={
      fill=red!30,
      draw=red!30}]
  \value{Dim 1}{60}
  \value{Dim 2}{100}
  \value{Dim 3}{70}
  \value{Dim 4}{70}
  \value{Dim 5}{40}
  \value{Dim 6}{60}
\end{barchart}
```

6 Bubble chart

6.1 Usage

`\begin{bubblechart}`
`\end{bubblechart}`

Environment that hold a bubble chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

radius ⟨*dim*⟩ `1cm`

Max radius

gap ⟨*dim*⟩ `1ex`

Gap between bubbles

fill-options ⟨*prop*⟩ `{fill=none,draw=none}`

Ti*k*Z options to fill/draw the background with

draw-options ⟨*prop*⟩ `{fill=black}`

Ti*k*Z options to fill/draw the bubble with

label-cs ⟨*str*⟩ `identity`

Macro name to format labels

label-pos ⟨*str*⟩ `above`

Position of the label. Possible values :

- `left`, `right`
- `above`, `below`
- `above right`, `above left`
- `below right`, `below left`

value-cs ⟨*str*⟩ `nop`

cs name to format values with

vertical ⟨*bool*⟩ `false`

Stack the bubble vertically instead of horizontally

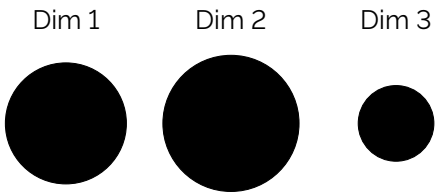
***** ⟨*keyval*⟩

All other options are passed to `tikzpicture` (*env*)

`\value` `\value{`⟨*label*⟩`}{`⟨*percent*⟩`}` is used to add a new bubble.

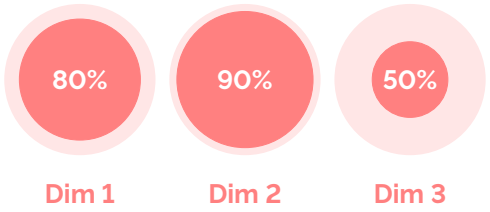
6.2 Examples

6.2.1 Horizontal



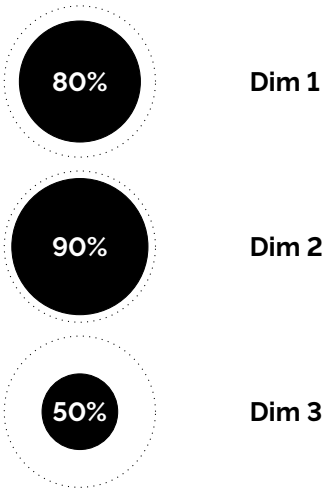

```
\begin{bubblechart}
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{bubblechart}
```


```
\begin{bubblechart}[
    % inverted labels
    label-cs=textinv,
    % below bubble
    label-pos=below,
    % show borders
    fill-options={
      fill=none,
      draw=black!30}]
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{bubblechart}
```




```
\begin{bubblechart}[
    % label in red
    label-cs=redbf,
    % below bubble
    label-pos=below,
    % show value
    value-cs=whitebfp,
    % bubble in red
    draw-options={
      draw=red!50,
      fill=red!50},
    % background in light red
    fill-options={
      fill=red!10}]
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{bubblechart}
```

6.2.2 Vertical




```
\begin{bubblechart}[
    % stack bubbles vertically
    vertical,
    % label in bold
    label-cs=textbf,
    % show values
    value-cs=whitebfp,
    % to the right
    label-pos=right,
    % show max as dotted line
    fill-options={
      fill=none,
      draw=black,
      dotted}]
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{bubblechart}
```

7 Radial chart

7.1 Usage

`\begin{radialchart}` `\end{radialchart}` Environment that hold a radial chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

`radius` ⟨*dim*⟩ `1cm`
Max radius

`gap` ⟨*dim*⟩ `2.5ex`
Gap between radials

`line width` ⟨*dim*⟩ `3mm`
Line width to draw the radials with

`fill-options` ⟨*prop*⟩ `{fill=none,draw=black!10}`
TikZ options to fill/draw the center of the radial with

`draw-options` ⟨*prop*⟩ `black`
TikZ options to draw the radial with

`label-options` ⟨*prop*⟩ `{}`
TikZ options drawing for unit labels

`label-cs` ⟨*str*⟩ `identity`
cs name to format labels with

`label-pos` ⟨*str*⟩ `above`
Position of the label. Possible values :

- `left`, `right`
- `above`, `below`
- `above right`, `above left`
- `below right`, `below left`

`value-cs` ⟨*str*⟩ `identity`
cs name to format values with

`vertical` ⟨*bool*⟩ `false`

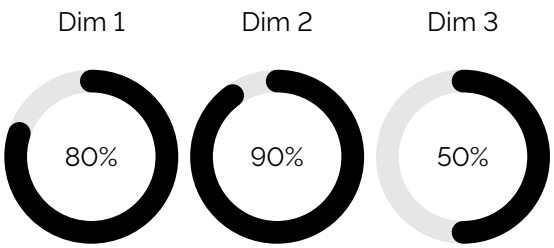
Stack radials vertically instead of horizontally

* ⟨*keyval*⟩ `line cap=round`

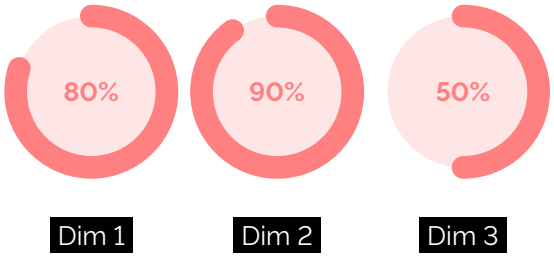
All other options are passed to `tikzpicture` (*env*)

7.2 Examples

7.2.1 Horizontal

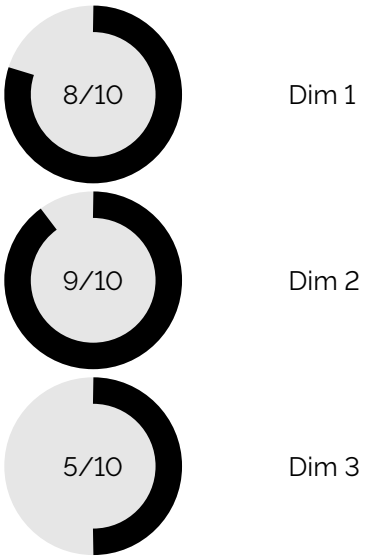



```
\begin{radialchart}
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{radialchart}
```




```
\begin{radialchart}[
    % inverted label,
    label-cs=textinv,
    % below radial,
    label-pos=below,
    % in red bold.
    value-cs=redbfp,
    % ring is red
    draw-options={red!50},
    % disk is light red
    fill-options={
      fill=red!10}]
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{radialchart}
```

7.2.2 Vertical




```
\begin{radialchart}[
    % stack radials vertically
    vertical,
    % label as tenth fraction
    value-cs=tenrate,
    % to the right
    label-pos=right,
    % thicker line
    line width=3.5mm,
    % with rect end
    line cap=butt,
    % same color for disk and ring
    fill-options={
      draw=black!10,
      fill=black!10}]
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{radialchart}
```

8 Arc chart

8.1 Usage

`\begin{arcchart}` `\end{arcchart}` Environment that hold an arc chart. Accepts an optional argument `[`⟨*clist*⟩`]` which is comma separated list of keywords and values :

radius ⟨*dim*⟩ — `1cm`
Radius of outer arc

gap ⟨*dim*⟩ — `2.5ex`
Gap between arcs

line width ⟨*dim*⟩ — `4mm`
Line width to draw the arc with

fill-options ⟨*prop*⟩ — `{fill=none,draw=black!10}`
TikZ options to fill/draw the background of the arcs with

draw-options ⟨*prop*⟩ — `black`
TikZ options to draw the arcs with

label-options ⟨*prop*⟩ — `{}`
TikZ options drawing for unit labels

label-cs ⟨*str*⟩ — `identity`
cs name to format labels with

value-options ⟨*prop*⟩
TikZ options to draw values with

value-cs ⟨*str*⟩ — `nop`
cs name to format values with

value-angle ⟨*fp*⟩ — `90`
Angle at which to draw the values

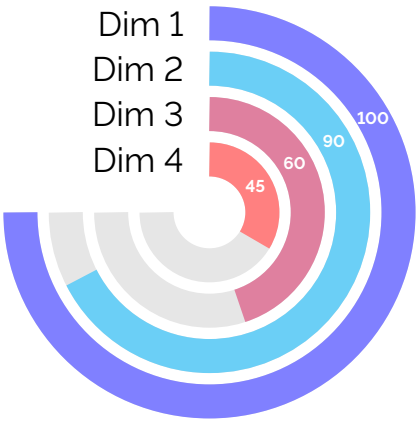
***** ⟨*keyval*⟩ — `line cap=round`
All other options are passed to `tikzpicture` (*env*)

8.2 Examples

8.2.1 Simple


```
\begin{arcchart}
  \value{Dim 1}{100}
  \value{Dim 2}{90}
  \value{Dim 3}{60}
  \value{Dim 4}{45}
\end{arcchart}
```

8.2.2 Colorful




```
\begin{arcchart}[
    % bigger radius,
    radius=2.5cm,
    % and gap
    gap=1.5mm,
    % show values
    value-cs=whitebf,
    % at 30°
    value-angle=30,
    % thicker line width,
    line width=4.5mm,
    % with square end
    line cap=butt]
  % each ring has its own color
  \value[blue!50]{Dim 1}{100}
  \value[cyan!50]{Dim 2}{90}
  \value[purple!50]{Dim 3}{60}
  \value[red!50]{Dim 4}{45}
\end{arcchart}
```

9 Macros

9.1 Package

These are macros defined in `l3charts.sty` and used as default value for `label-cs` or `value-cs` options.

`\tinytt` Macro used to format its argument as tiny monospace

```
\cs_set:Npn \tinytt #1 {\texttt{\tiny #1}}
```

`\identity` Macro used to return the first argument as is

```
\cs_set:Npn \identity #1 {#1}
```

`\nop` Macro used to consume the first argument and do nothing

```
\cs_set:Npn \nop #1 {}
```

`\percent` Macro used to append a percent to its argument

```
\cs_set:Npn \percent #1 {#1\%}
```

9.2 Examples

These macros are defined for the examples presented in this document and are not part of the module `l3charts.sty`.

`\textbfp` Macro used to format its argument as bold with appended %

```
\NewDocumentCommand\textbfp{m}{\textbf{\percent{#1}}}
```

`\tenrate` Macro used to format its argument as fraction of ten

```
\ExplSyntaxOn
\NewDocumentCommand\tenrate{m}{\int_eval:n{#1/10}/10}
\ExplSyntaxOff
```

`\textinv` Macro used to format its argument as white text on black background

```
\NewDocumentCommand\textinv{m}{\colorbox{black}{\textcolor{white}{#1}}}
```

`\redbf` Macro used to format its argument as bold and red

```
\NewDocumentCommand\redbf{m}{\textcolor{red!50}{\textbf{#1}}}
```

`\redbfp` Macro used to format its argument as bold and red with appended %

```
\NewDocumentCommand\redbfp{m}{\textcolor{red!50}{\textbfp{#1}}}
```

`\whitebf` Macro used to format its argument as bold and white

```
\NewDocumentCommand\whitebf{m}{\textcolor{white}{\textbf{#1}}}
```

`\whitebfp` Macro used to format its argument as bold and white with appended %

```
\NewDocumentCommand\whitebfp{m}{\textcolor{white}{\textbfp{#1}}}
```

10 Index

Numbers in upright shape refer to the *page* where the corresponding entry is described (bold face) resp. occurs.

11 Changes

0.7.1 (2023/01/04)

- add a `rounded` option to `kiviatchart` (*env*) to use circles for the scale and curves for the sets.

0.7.0 (2022/08/01)

- add a `arcchart` (*env*)
- rename `line-width` to `line width` for consistency with TikZ
- use choice to restrict values on `label-pos`
- remove spurious ; and replace `c_space_tl` by ~

0.6.1 (2022/07/26)

- add a `label-on` option for `dims` (*env*) of `kiviatchart` (*env*)

0.6.0 (2022/07/26)

- draw `kiviatchart` (*env*) dimensions clockwise with a starting `angle` of 90
- allow value of 0 for `set` (*env*)
- rename `labels-radius` to `radius` and move to `dims` (*env*)

0.5.1 (2022/07/19)

- remove hard coded % in value.

0.5.0 (2022/07/18)

- convert all $\langle fp \rangle$ to $\langle dim \rangle$ for usability
- rename `v-sep` and `h-sep` options of `ballchart` (*env*) to `gap` and `cgap` for consistency

0.4.0 (2022/07/17)

- add values to `bubblechart` (*env*)
- label positioning on `barchart` (*env*) and `ballchart` (*env*)
- swap `fill-options` and `draw-options` for `barchart` (*env*) for consistency

0.3.0 (2022/07/15)

- add a `radialchart` (*env*) to draw radials
- add a vertical mode to `bubblechart` (*env*) and allow positioning of the label
- swap `fill-options` and `draw-options` for `bubblechart` (*env*) for consistency

0.2.0 (2022/07/04)

- define a document class borrowed from `microtype`

0.1.0 (2022/07/01)

- Initial version