

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 `exp\l3` for checking what \LaTeX 3 really brought to facilitate package development (expansion control, seq, prop, keys, int, bool, fp, dim, ...).

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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, pushes the **docstrip** mastery to a *black magic* level.

2 Kiviat chart

2.1 Usage

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

`\begin{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

***** *<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*).

2.1.1 Dimensions

`\begin{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 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.

2.1.2 Set

`\begin{set}` `set (env)` is used to add a new set to the kiviatchart. Accepts an optional argument [`<clist>`] which is comma separated list of keywords and values :

`\end{set}` `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

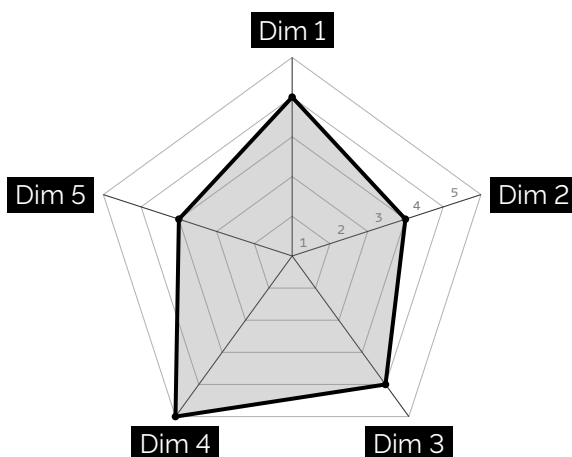
`\value` `\value{<int>}` is used to add a value to the set.

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.

2.2 Examples

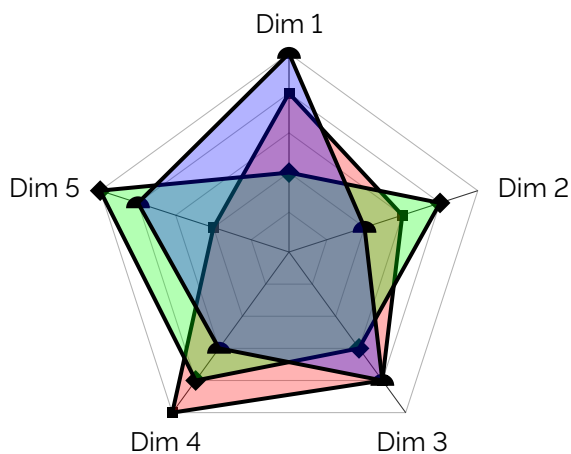
2.2.1 Simple

Use `label-cs` to call `\textinv` to format the labels.



```
% scale is passed to tikzpicture
\begin{kiviatchart}[scale=0.75]
% Define all the dimensions
\begin{dims}[
  label-cs=textinv,
  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 one or several sets.
% Each value corresponds to
% the dimension at the same
% index in dims
\begin{set}
\value{4}
\value{3}
\value{4}
\value{5}
\value{3}
\end{set}
\end{kiviatchart}
```

2.2.2 Multi-set



```
% scale is passed to tikzpicture
\begin{kiviatchart}[scale=0.75]
  \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}
  % red set
  \begin{set}[
    fill=red,
    % big rectangle dots
    dot-options={
      fill,rectangle,
      inner sep=2pt
    }
  ]
    \value{4}
    \value{3}
    \value{4}
    \value{5}
    \value{2}
  \end{set}
  % green set
  \begin{set}[
    fill=green,
    % big diamond dots
    dot-options={
      fill,diamond,
      inner sep=2pt
    }
  ]
    \value{2}
    \value{4}
    \value{3}
    \value{4}
    \value{5}
  \end{set}
  % blue set
  \begin{set}[
    fill=blue,
    % big semicircle dots
    dot-options={
      fill,semicircle,
      inner sep=2pt
    }
  ]
    \value{5}
    \value{2}
    \value{4}
    \value{3}
    \value{4}
  \end{set}
\end{kiviatchart}
```

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

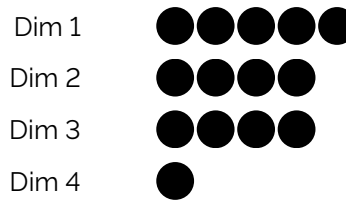
3 Ball chart

3.1 Usage

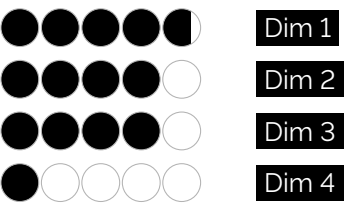
<code>\begin{ballchart}</code>	Environment that hold a ball chart. Accepts an optional argument [<i><clist></i>] which is comma separated list of keywords and values :		
<code>\end{ballchart}</code>			
n	<i><int></i>		5
	The number of circles per bar		
gap	<i><dim></i>		1ex
	Gap between bars		
cgap	<i><dim></i>		1pt
	Gap between circles		
radius	<i><dim></i>		2.5mm
	Radius of the circles		
label-cs	<i><str></i>		identity
	Macro name to format labels		
fill-options	<i><prop></i>		{fill=black}
	TikZ options to fill the balls with		
draw-options	<i><prop></i>		{draw=none}
	TikZ options to draw the balls with		
label-options	<i><prop></i>		{left}
	TikZ options for dimensions axis		
label-cs	<i><str></i>		identity
	Macro name to format labels		
label-pos	<i><str></i>		left
	Position of the label. Should be <code>left</code> , <code>right</code> , <code>above</code> , <code>below</code> , <code>above right</code> , <code>above left</code> , <code>below right</code> or <code>below left</code>		
value-cs	<i><str></i>		nop
	cs name to format values with		
*	<i><keyval></i>		
	All other options are passed to <code>tikzpicture</code> (<i>env</i>)		
\value	<code>\value{<label>}{<percent>}</code> is used to add a new bar.		

3.2 Examples

3.2.1 Simple

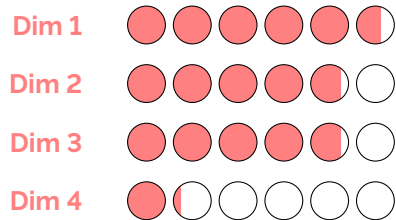


```
\begin{ballchart}
  \value{Dim 1}{95}
  \value{Dim 2}{80}
  \value{Dim 3}{80}
  \value{Dim 4}{20}
\end{ballchart}
```



```
\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}
```

3.2.2 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}
```

4 Bar chart

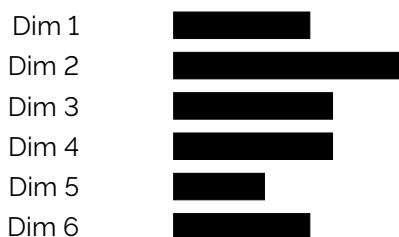
4.1 Usage

<code>\begin{barchart}</code>	Environment that hold a bar chart. Accepts an optional argument [<i><clist></i>] which is comma separated list of keywords and values :	
<code>\end{barchart}</code>		
<code>width</code>	<i><dim></i>	3cm
	Maximum width	
<code>height</code>	<i><dim></i>	3.5mm
	Bar height	

gap	$\langle dim \rangle$	1ex
	Gap between bars	
fill-options	$\langle prop \rangle$	{fill=none}
	TikZ options to fill the bar with	
draw-options	$\langle prop \rangle$	{fill=black}
	TikZ options to draw the bar with	
label-options	$\langle prop \rangle$	{}
	TikZ options for dimensions axis	
label-cs	$\langle str \rangle$	identity
	Macro name to format labels	
label-pos	$\langle str \rangle$	left
	Position of the label. Should be left, right, above, below, above right, above left, below right or below left	
value-cs	$\langle str \rangle$	nop
	cs name to format values with	
*	$\langle keyval \rangle$	
	All other options are passed to tikzpicture (env)	
\value	$\backslash value\{\langle label \rangle\}\{\langle percent \rangle\}$ is used to add a new bar.	

4.2 Examples

4.2.1 Simple

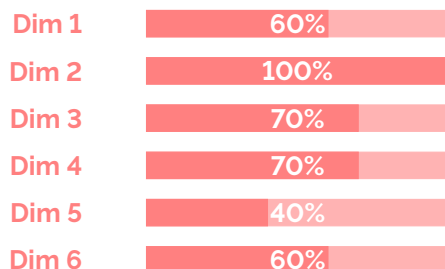


```
\begin{barchart}
  \value{Dim 1}{60}
  \value{Dim 2}{100}
  \value{Dim 3}{70}
  \value{Dim 4}{70}
  \value{Dim 5}{40}
  \value{Dim 6}{60}
\end{barchart}
```



```
\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}
```


4.2.2 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}
```

5 Bubble chart

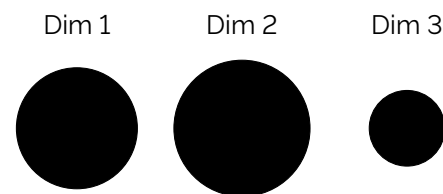
5.1 Usage

<code>\begin{bubblechart}</code>	Environment that hold a bubble chart. Accepts an optional argument [<i><clist></i>] which is comma separated list of keywords and values :		
<code>\end{bubblechart}</code>			
radius	<i><dim></i>		1cm
	Max radius		
gap	<i><dim></i>		1ex
	Gap between bubbles		
fill-options	<i><prop></i>		{fill=none,draw=none}
	TikZ options to fill/draw the background with		
draw-options	<i><prop></i>		{fill=black}
	TikZ options to fill/draw the bubble with		
label-cs	<i><str></i>		identity
	Macro name to format labels		
label-pos	<i><str></i>		above
	Position of the label. Should be left, right, above, below, above right, above left, below right or below left		
value-cs	<i><str></i>		nop
	cs name to format values with		
vertical	<i><bool></i>		false
	Stack the bubble vertically instead of horizontally		
*	<i><keyval></i>		
	All other options are passed to <code>tikzpicture</code> (<i>env</i>)		

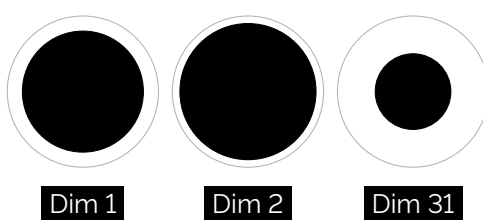
`\value` `\value{⟨label⟩}{⟨percent⟩}` is used to add a new bubble.

5.2 Examples

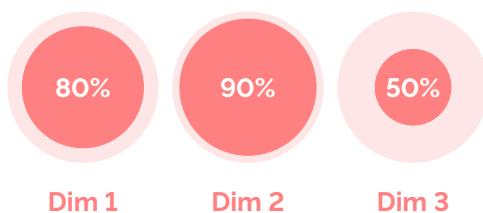
5.2.1 Horizontal



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

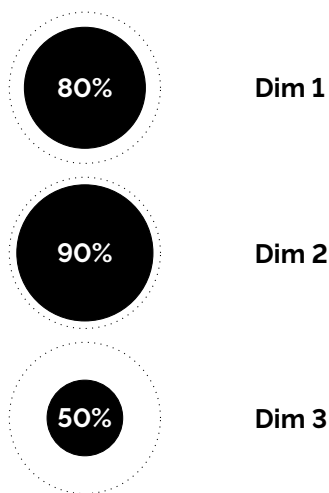


```
\begin{bubblechart}[
  % inverted labels
  label-cs=textinv,
  % below bubble
  label-pos=below,
  % show borders
  fill-options={
    fill=none,
    draw=black!30}]
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{bubblechart}
```



```
\begin{bubblechart}[
  % label in red
  label-cs=redbf,
  % below bubble
  label-pos=below,
  % show value
  value-cs=whitebf,
  % 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}
```

5.2.2 Vertical



```
\begin{bubblechart}[
  % stack bubbles vertically
  vertical,
  % label in bold
  label-cs=textbf,
  % show values
  value-cs=whitebf,
  % 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}
```

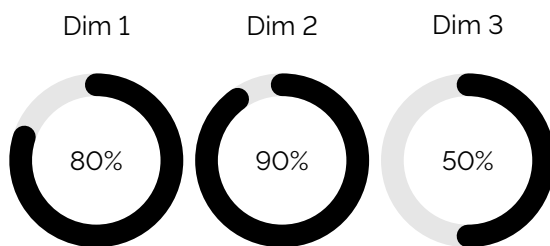
6 Radial chart

6.1 Usage

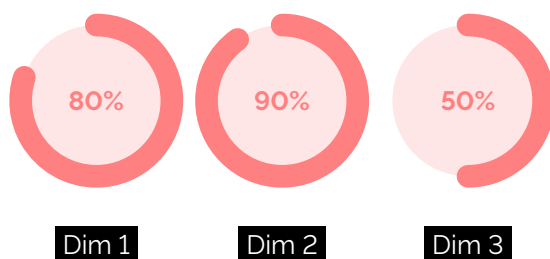
<code>\begin{radialchart}</code>	Environment that hold a radial chart. Accepts an optional argument [<i><clist></i>] which is comma separated list of keywords and values :		
<code>\end{radialchart}</code>			
radius	<i><dim></i>		1cm
	Max radius		
gap	<i><dim></i>		2.5ex
	Gap between radials		
line width	<i><dim></i>		3mm
	Line width to draw the radials with		
fill-options	<i><prop></i>	{fill=none,draw=black!10}	
	TikZ options to fill/draw the center of the radial with		
draw-options	<i><prop></i>	black	
	TikZ options to draw the radial with		
label-options	<i><prop></i>	{}	
	TikZ options drawing for unit labels		
label-cs	<i><str></i>	identity	
	cs name to format labels with		
label-pos	<i><str></i>	above	
	Position of the label. Should be left, right, above, below, above right, above left, below right or below left		
value-cs	<i><str></i>	identity	
	cs name to format values with		
vertical	<i><bool></i>	false	
	Stack radials vertically instead of horizontally		
*	<i><keyval></i>	line cap=round	
	All other options are passed to <code>tikzpicture</code> (<i>env</i>)		

6.2 Examples

6.2.1 Horizontal

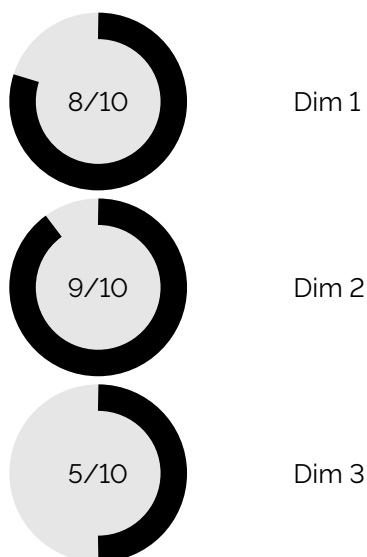


```
\begin{radialchart}
  \value{Dim 1}{80}
  \value{Dim 2}{90}
  \value{Dim 3}{50}
\end{radialchart}
```



```
\begin{radialchart}[
  % inverted label,
  label-cs=textinv,
  % below radial,
  label-pos=below,
  % in red bold.
  value-cs=redbf,
  % 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}
```

6.2.2 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}
```

7 Arc chart

7.1 Usage

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

`\end{arcchart}`

radius	$\langle dim \rangle$	1cm
	Radius of outer arc	
gap	$\langle dim \rangle$	2.5ex
	Gap between arcs	
line width	$\langle dim \rangle$	4mm
	Line width to draw the arc with	
fill-options	$\langle prop \rangle$	{fill=none,draw=black!10}
	TikZ options to fill/draw the background of the arcs with	
draw-options	$\langle prop \rangle$	black
	TikZ options to draw the arcs with	
label-options	$\langle prop \rangle$	{}
	TikZ options drawing for unit labels	
label-cs	$\langle str \rangle$	identity
	cs name to format labels with	
label-pos	$\langle str \rangle$	right
	Label position relative to radial. Should be <code>left</code> , <code>center</code> or <code>right</code>	
value-options	$\langle prop \rangle$	
	TikZ options to draw values with	
value-cs	$\langle str \rangle$	nop
	cs name to format values with	
value-angle	$\langle fp \rangle$	90
	Angle at which to draw the values	
*	$\langle keyval \rangle$	line cap=round
	All other options are passed to <code>tikzpicture</code> (<i>env</i>)	

7.2 Examples

7.2.1 Simple

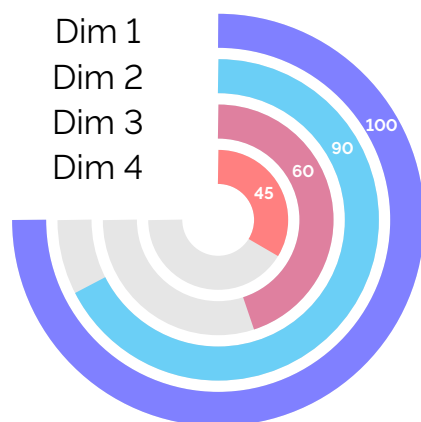


```

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

```

7.2.2 Colorful



```
\begin{arcchart}[
  % bigger radius,
  radius=2.5cm,
  % and gap
  gap=1.5mm,
  % show values
  value-cs=whitebf,
  % at 30°
  value-angle=30,
  % centered labels
  label-pos=center,
  % 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}
```

8 Macros

8.1 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\%}
```

8.2 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

	<code>\NewDocumentCommand\textinv{m}{\colorbox{black}{\textcolor{white}{#1}}}</code>
<code>\redbf</code>	Macro used to format its argument as bold and red
	<code>\NewDocumentCommand\redbf{m}{\textcolor{red!50}{\textbf{#1}}}</code>
<code>\redbfp</code>	Macro used to format its argument as bold and red with appended %
	<code>\NewDocumentCommand\redbfp{m}{\textcolor{red!50}{\textbfp{#1}}}</code>
<code>\whitebf</code>	Macro used to format its argument as bold and white
	<code>\NewDocumentCommand\whitebf{m}{\textcolor{white}{\textbf{#1}}}</code>
<code>\whitebfp</code>	Macro used to format its argument as bold and white with appended %
	<code>\NewDocumentCommand\whitebfp{m}{\textcolor{white}{\textbfp{#1}}}</code>

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10 Changes

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