scrartcl

KOMA-script articles with komadown

Johan Larsson

2019-03-23

Contents

1 Motivation

The default LaTeX template for R Markdown and, by proxy, **pandoc** take liberties with the original design of LaTeX documents. The title page is compressed, margins are minimized, and first-line indentation is usurped by paragraph spacing. This makes sense for markdown documents that are intended for several output formats since consistency between those are important to uphold. From a typographical standpoint, however, the design leaves much to desire.

Without delving into the details of this, I think it suffices to say that the design of LaTeX documents have been wrought with care and should only be meddled with if one knows what they are doing.

This, coincidentally, is the case with the KOMA-Script bundle, which is a reimagining of the original LaTeX classes article, book, letter, and book. In many ways, the KOMA-Script classes are incontrovertible upgrades to the original classes, adding a significant deal of functionality to boot.

In addition to this, **komadown** pulls in a small set of other packages to handle the different needs that KOMA-Script does not cover. All in all, the package interface introduces

- an interface to `\KOMAoptions`, which makes the majority of KOMA-Script accessible to the user,
- automatic or manual headers and footers using yaml metadata,
- caption customization via the **caption** package,
- author and affiliation setups via the **authblk** package, and
- font combinations with excellent support for math (mostly using the **newtx** package).

In addition to this, **komadown** also leans on the bookdown package to provide support for cross-references of tables, figures, theorems, sections, and equations in R Markdown syntax.

My minor role in this is to provide a LaTeX template for **pandoc** and interface for **R** to make it easier for R users to draw on the power of KOMA-Script (and friends).

2 Installation

Install **komadown** by running `install.packages("komadown")`. If you are running RStudio, this will set you up to begin a KOMA-Script article with **komadown**'s default template (which this document is based on) simply by going `File -> New File -> R Markdown` and picking the *scrartcl* template. The code that makes this work is borrowed from rticles.

Besides installing the package, the only other necessary step is to include

```
---
output: komadown::scrartcl
---
```

somewhere in the metadata. This will eventually call `pdf_document2()` from **bookdown** and then LaTeX a `.tex` document, producing `PDF` output.

3 Settings

Most of the settings for **KOMA-Script** are called using a metadata block called `KOMAoptions`, which takes items in the `element=value` form. For instance, this document uses this option to switch headings to versions similar to the standard classes using

```
---
KOMAoptions:
```

```
  - headings=standardclasses
---
```

The reader is referred to the **KOMA-script** manual for information on the many options available. Of special interest may be the `DIV` argument – which we will talk about next.

3.1 Type area calculations

One of the strengths of **KOMA-Script** is its facilities for intelligently computing type-area layouts. The core LaTeX classes work well out-of-the-box if the default font options (size, family, line spread) are used. However, if the user wants to forego Latin/Computer Modern for another font family or simply change its size, these settings no longer fullfill their purpose of keeping the text at an adequate number of words per line.

The core classes solution to this is to use the **geometry** package and modify the margins manually, but this might take several attempts to get right and moreover requires that the user knows to get the proportions right.

KOMA-Script solves this automatically using an algorithm. This involes the `DIV=x` setting, which is implemented in **komadown** via the metadata block `classoption`. The simplest use of `DIV` is to set it to `default`.

```
---
classoption:
  - DIV=calc
---
```

This uses a predefined table based on the paper size and default font to arrive at a type area.

A more advanced use of `DIV` might be to set it to `calc`, in which case a `DIV` size is calculated based on the other options given KOMA-Script, such as `BCOR` (binding correction). `calc` also bases its calculations on the current font settings, but because the calculations are performed at the time when the

document class is loaded and hence *before* any font packages are included, it does not make sense to set `DIV` for this reason alone. To get around this, one can use the `KOMAoptions` block. `KOMAoptions` are called after font packages are loaded, and hence if the user specifies `DIV=last` (if `DIV=calc` was set in `classoption`) or `DIV=calc` here, it will successfully adapt the type area.

3.2 Headers and footers

Headers and footers can be specified via the following syntax.

```
---
header:
  - pos: r
    first: "scrartcl"
    next: "komadown"
footers:
  - pos: l
    next: "\today"
---
```

`pos` gives alignment of the header—one of `r`, `l`, and `c` for right, left, and center respectively. `first` is the text for the header or footer on the first page and `next` for the latter pages. First and next are optional but pos is *not*.

Additionally, the user can set

```
---
automark: yes
---
```

which will then create a running header displaying the current section in the left spot of the header (which is the setting used in this vignette).

3.3 Tables

There is a custom macro in place that ensures that ensures that figures in tables are formatted as tabular-lining. See Table 1.

Table 1. A table showcasing number formatting in tables.

Fruit	Price ($)
Apple	2.29
Orange	0.91

Compare this with the number format for the section figures, which are old style (non-proportional) figures. This behavior, however, relies specifically on the use of the `fontpack: true` option, since it involves macros related specifically to the **libertinus** package.

3.4 Captions

Captions can be customized using the `caption` metadata block.

```
---
caption:
  - labelfont: bf
  - labelsep: period
  - font: small
---
```

The reader is referred to documentation for the caption package to read about the various settings.

The default settings (the ones above) produce captions with bold face for the label and a dot separator (Figure 1).

4 Cross-references

Cross-references are available in markdown syntax via the **bookdown** package. The basic syntax is `\@ref(label)` where `label` will differ depending on context:

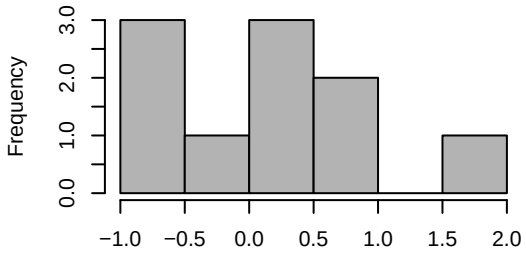

Figure 1. A plot with the default caption settings.

Figures `label` will be `fig:id` where `id` is the label given the chunk the figure is produced by. Note that this requires the `fig.cap` argument to be set or else there won't be a `\figure` environment to attach the label to.

Sections Add `{#id}` to the end of the section name and you can reference it with `\@ref(id)`.

Equations Add `(\#eq:id)` inside the math environment and you will be able to refer to it by `\@ref(eq:id)`

Theorems Add `label="id"` to the theorem chunk and you will be able to refer to it by `\@ref(prefix:id)` where prefix depends on the type of theorem. See this table for a description of the various prefixes.

5 Fonts

komadown uses a combination of libertinus and inconsolata by default. Currently, the pertinent font package block looks like this:

```
\usepackage{amsthm}
\usepackage{libertinus}
\usepackage{textcomp}
\usepackage[scaled=0.96,varqu,varl]{inconsolata}
\usepackage{mathtools}
\usepackage[lcgreekalpha]{libertinust1math}
```

```
\usepackage[scr=boondoxo]{mathalfa}
\useosf
```

The user is as usual free to choose whatever combination they wish by setting `fontfamily` in the YAML metadata.

All of the font settings can also be set or modified with the metadata blocks `addtokomafont` and `setkomafont`; the former modifies the current options – the latter resets them. Both use the subitems `element` and `commands`. This document, for instance, using the following settings to modify description lists to use a roman font instead of the **KOMA-Script** default of sans-serif.

```
---
setkomafont:
  - element: descriptionlabel
    commands: \normalfont\scshape\bfseries
---
```

As always, please refer to the **KOMA-Script** manual for a thorough take on this.

6 Math

Math is typeset using the **libertinust1math** package by Michael Sharpe. Note that the **mathtools** package is also loaded to make available some extra functionality if needed, as well as **mathalfa** and **bm** if they are available on the system.

In the following example, we show the objective function for the elastic net-penalized version of least-squares regression.

$$\min_{\beta_0,\beta} \left\{ \frac{1}{n} \sum_{i=1}^{n} \left(y_i - \beta_0 - \boldsymbol{\beta}' \mathbf{x}_i \right)^2 + \lambda \left[(1-\alpha) ||\beta||_2^2 + \alpha ||\beta||_1 \right] \right\}.$$

7 Bibliography style

The default bibliography style is the *Vancouver Style* (Patrias 2007), which has been authored by Michael Berkowitz and been included in the package (licensed under CC BY-SA 3.0. It can be replaced with any `.csl` style using the usual **pandoc** interface or any configuration via `biblatex` or ‘`natbib`.

8 Author blocks

The komadown template includes scripting for author blocks as well; in fact, you *must* use the author blocks. The settings are somewhat involved compared to the usual author calls.

```
author:
  - name: "Johan Larsson"
affil:
  - name: "Lund Unviversity"
```

`affil` is, of course, optional. We use the **authblk** package for this. If you have several authors you use the `id` tag to match authors to their affiliations.

```
author:
  - name: "Johan Larsson"
    id: 1
  - name: "John Doe"
    id: 1
affil:
  - name: "Lund University"
    id: 1
```

and the authors will link up with the affiliation.

9 Design choices

I've attempted to leave most of the design choices at their default values, putting most of my personal preferences in the default template instead in order to make them easy to shake off. However, there are a few things that I have opted to modify. They are

- table captions are always placed on top,
- `number_sections` in the call to `rmarkdown::pdf_document()` is set to `TRUE` by default, and
- the default bibliography style is set to the *Uniform Requirements* style (also known as Vancouver).

10 This document

This document uses the following YAML metadata setup.

```yaml
---
title: "scrartcl"
subtitle: "KOMA-script articles with komadown"
author:
  - name: "Johan Larsson"
    affil: "Lund University"
date: "2019-03-23"
automark: yes
colorlinks: yes
fontpack-libertine: yes
classoption:
  - DIV=calc
  - headsepline=true
header:
  - pos: ro
    next: komadown
```

```
caption:
  - labelfont=bf
  - labelsep=period
  - font=small
setkomafont:
  - element: descriptionlabel
    commands: \normalfont\scshape\bfseries
KOMAoptions:
  - headings=standardclasses
  - DIV=last
output: komadown::scrartcl
---
```

References

Patrias, Karen. 2007. *Citing Medicine*. 2nd ed. National Library of Medicine. https://www.ncbi.nlm.nih.gov/books/NBK7262/.