

## On typesetting an English–Japanese book

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### Abstract

Improving the English skills of non-native undergraduate students has important implications and can often be directly linked to students’ futures, particularly in the IT field. The edition of a bilingual lecture textbook is thus meaningful, notably by considering English as the “major” book language and students’ mother tongue the “minor”, supporting one. Yet, from a  $\text{\LaTeX}$  point of view, this is far from being trivial. In this article,  $\text{\LaTeX}$  methods are given together with guidelines to support the realisation of a bilingual textbook. The especially technically demanding English–Japanese scenario is considered.

### 1 Introduction

Proficiency in English by undergraduate students is, in numerous countries, wishful thinking. Nevertheless, this competence is often a condition for successful graduate studies and thus ought not be overlooked—the earlier the better for students to acknowledge this reality. It is thus pedagogically relevant to provide students with bilingual textbooks.

Herein, we consider the technically demanding English–Japanese scenario, with English being the language of the main text, and Japanese being the “supporting” language (for the sake of generality, we mostly refer to these two languages as the major and minor ones). When it comes to technical considerations for the realisation of such a textbook with  $\text{\LaTeX}$ , several challenges arise, starting with the manipulation of distinct writing systems and thus typography.

The objective of this paper is to give  $\text{\LaTeX}$  techniques and guidelines to support an edition of such bilingual material while remaining as flexible as possible: the standard `book` class is used and the redefinition of standard commands is avoided to retain as much compatibility as possible.

Beginning with type (textual) considerations, we then address page layout issues before going on with the complex customisation topic, as for page headers, and a PDF-specific discussion. Finally, some statistics are given regarding the usage of such bilingual material as a lecture textbook.

Although bilingual editions are not rare in literature, they are seldom produced for technical texts. For instance in Japanese, authors sometimes rely on marginal notes to provide original English terms when the Japanese transliteration remains unclear [7].

### 2 Type considerations

Especially to facilitate the English and Japanese font manipulation, we rely on a Unicode-capable  $\text{\TeX}$  system. While  $\text{\XeTeX}$  is an option, we favour  $\text{\LuaTeX}$  for its wider coverage of micro-typographic features with the `microtype` package [10].

The `fontspec` package [9] is used to load the English and Japanese fonts. The language of the main text being English, the `\setmainfont` command sets the English font. For the Japanese font, a new font switch is defined with the `\newfontfamily` command. Because it is often the case that the heights of the glyphs of the fonts do not match, the Japanese font is scaled as follows:

```
\newfontfamily\yu[
  BoldFont = {YuGothB.ttc},
  Scale = MatchLowercase
]{YuGothR.ttc}
```

In this example, `\yu` is defined to switch to the Yu Gothic Regular (“游ゴシック Regular”) typeface, scaled down to match the main text (i.e., English text) lower case font height. And, the corresponding bold type face is manually set.

Finally, text written in the minor language, here Japanese, is printed in `\small` size, and the `polyglossia` package [6] is used to set the major language, here English, as the default language.

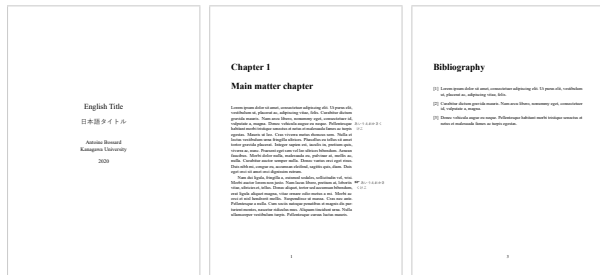
### 3 Page layout issues

When editing bilingual material, it is likely that a special page layout be required. For instance, in the case of English–Japanese edition, the JIS B5 paper format is a strong candidate. Hence, we rely on the `geometry` package [11]. Furthermore, one key aspect of bilingual editions is the usage of margin notes: it is indeed very valuable to the reader to have margin notes written in the minor language to provide supporting information to the main text written in the major language (see for instance the statistics given in Section 6). A line width of eight Japanese characters in the margin is acceptable. Because several margin notes can be displayed consecutively, it is desirable to use indentation to help the reader split them. Recalling that minor language text is printed in `\small`, we rely on the macro

```
\newcommand\marginnote[1]{\marginpar{%
  \small\hangindent=5pt\hangafter=1 #1}}
```

to insert margin notes. Moreover, when the margin note consists of multiline Japanese text, it can be easily inserted with

```
\marginnote{\yu\cjkskanstart Japanese text\par}
```



**Figure 1:** Switching between the no-margin and margin layouts: the title page and bibliography are horizontally centred on the page since they need no margin.

where `\yu` is the Japanese font switch as declared above and the macro `\cjkskanstart` (used together with `\par`) has been defined in [4]. This method to typeset a Japanese paragraph is also used in the main text when needed, for instance to include an author biography in both languages.

So, the page layout needs, in addition, to take into account this usage of the margin. And, since header text is hardly avoidable, the page layout needs to be set up accordingly. Such a particular layout can be obtained with the following `geometry` settings:

```
\usepackage[
  paper=b5j, includemp, marginparwidth=70pt
]{geometry}
```

With `includemp`, the margin is considered as part of the text body, which is important for headers as detailed in Section 4, and also for horizontal centering of the text on the page if needed. The margin width is adjusted for eight Japanese characters.

Although margin notes are critical in such a scenario, they would feel out of place on certain pages such as the title page. The layout switching feature of `geometry` is used to make the document margin visible or not. Thus, we rely on the

```
\newgeometry{includemp, nomarginpar}
```

command to temporarily disable the margin, as before the title page, and use the `\restoregeometry` command to restore the margin layout.<sup>1</sup>

This is illustrated in Figure 1, with three sample pages: the title page, using the no-margin layout, the first page of a main matter chapter, using the margin layout and showing sample margin notes in the minor language and the first page of the bibliography, using the no-margin layout.

<sup>1</sup> We specify the additional `geometry` options `vcentering`, `asymmetric` and `hcentering` as well as setting `width` and `textheight`. Since these are design-specific, they are omitted here for the sake of clarity and conciseness.

## 4 Customisation

The customisation of the page headers, chapter pages, table of contents and index are described in this section.

### 4.1 Page headers

We rely on the `titleps` package [1] to customise headers (as opposed to, say, `fancyhdr` [12]) since we use the `titlesec` package [2] for chapter page customisation. The page header includes the margin, so the header rule needs to do the same. We calculate how much the header needs to be extended as follows:

```
\newlength\hdrextension
\setlength\hdrextension{\marginparwidth}
\addtolength\hdrextension{\marginparsep}
```

Then, two layout switching commands are declared accordingly:

```
\newcommand\geomonglayout{% no-margin layout
  \newgeometry{includemp, nomarginpar}
  \widenhead[Opt][Opt]{Opt}{Opt}% no extension
\newcommand\geomgrestore{% margin layout
  \restoregeometry
  \widenhead[Opt][\hdrextension]
  {Opt}{\hdrextension}}% rule extension
```

Because we use an asymmetric layout as per the `geometry` package definition, the margin is always on the right side of the page. The detailed page style information, including header typesetting, is given in Section 4.2.

### 4.2 Chapter pages and marks

We rely on the `titlesec` package, loaded as follows:

```
\usepackage[pagestyles, extramarks]{titlesec}
```

Chapter titles are given a subtitle in the minor language (i.e., translation) via the command `\mychaptersubtitle`. They are typeset as follows:

```
\newcommand\mychaptersubtitle{}
\titleformat{name=\chapter}[display]
  {\normalfont}
  {\LARGE\sffamily}
  \chaptertitlename\ \thechapter}
  {24pt}{\Huge\bfseries}
  [\large\mdseries\mychaptersubtitle]
```

The chapter page style stays simple:

```
\renewpagestyle{plain}{\small}{
  \setfoot}{\thechapter}{}}
```

The page style of the other pages includes a ruled header. Marks are used to retrieve the title in the major language. Headers conventionally alternate

between the chapter and section titles. A new page style is declared and set as follows. Note the usage of the commands `\ifthechapter` and `\ifthesection`, provided by `titlesec`, to handle unnumbered chapters and sections.

```
\newpagestyle{hdrgenstyle}{\small}[
  \headrule
  \sethead[\thepage]{}% even page left, centre
  [\ifthechapter{\chaptertitlename
    \ \toptitlemarks\thechapter .
    \ \topshortmark\mychaptertitle}
    {\topshortmark\mychaptertitle}]%ev. right
  {\ifthesection{\bottitlemarks\thesection .
    \ \botshortmark\mysectiontitle}
    {\botshortmark\mychaptertitle}]% odd left
  ]{\thepage}% odd page centre, right
\pagestyle{hdrgenstyle} % general page style
```

A chapter could be created without relying on `titlesp's` extramarks feature simply with

```
\chapter{title\ \subtitle}\chaptermark{title}
```

to similarly set the chapter subtitle and the header text in the major language only. However, this simpler method would only work in the case of chapters directly created with the `\chapter` command and thus not with the `bibliography`, table of contents, and so on. So, it is wiser to customise the chapter page with `\titleformat` whose “after-code” is a command like `\chapsubtitle` which is redefined before `\chapter` for regular chapters and before `\tableofcontents`, `\bibliography`, etc., for such special chapters. Note that this technique is similar to that of `titlesp's` extramarks.

Hence, the command `\newchapter` to create a new chapter is defined as follows:

```
\newcommand\mychaptertitle{}
\newshortmark\mychaptertitle
\newcommand\newchapter[2]{
  \renewcommand\mychaptertitle{#1}
  \renewcommand\mychaptersubtitle{#2}
  \chapter{#1}\shortmark\mychaptertitle}
```

its two arguments being the chapter title and subtitle, typically in the major and minor language, respectively. Commands to create sections are defined similarly (`\newsection`, `\mysectiontitle`). Sample output with both a numbered and an unnumbered chapter is given in Figure 2.

Finally, because automatically generated chapters like the table of contents do not call our command `\newchapter` to create the chapter, the subtitle given to the chapter title in the minor language and the extra mark for the header text need to be



**Figure 2:** Ruled header including the margin, chapter marks and chapter page customisation (e.g., subtitle).

additionally specified. Such special chapters are thus created as follows, the table of contents in this example:

```
\cleardoublepage
\renewcommand\mychaptertitle{\contentsname}
\renewcommand\mychaptersubtitle{\ \you 目次}
\shortmark\mychaptertitle % set the header mark
\tableofcontents
```

### 4.3 Table of contents and index

It is useful for readers to have TOC entries in both the major and minor languages. Hence, we create each TOC entry from the section (e.g., chapter, section, subsection) title (major language information) and subtitle (minor language information). To this end, the `\chapter` call inside the previously-defined command `\newchapter` is updated as follows:

```
\chapter[#1\ \textmd{#2}]{#1}
  \shortmark\mychaptertitle
```

Again, the same approach is used for lower levels (e.g., sections, subsections). Sample output which illustrates both numbered and unnumbered chapters is given in Figure 3.

Contents		目次	
Front matter chapter		目次	
1 Main matter chapter	1	目次	1
1.1 A section		目次	
1.2 Another section	2	目次	2
Back matter chapter	6	目次	6
Bibliography	7	目次	7

**Figure 3:** A sample table of contents with bilingual entries. The effect of header marks can be noticed on the second page.

Regarding the generation of the index, several multilingual index systems exist; since we are considering here the English–Japanese scenario, it may be wise to rely on `kameindex` (see [3] for more information on `kameindex` and multilingual indexes in general). `kameindex` can be combined with `imakeidx` to obtain, for example, a three-column index:

```
\makeindex[noautomatic, columns=3]
```

Just as with the table of contents, the index chapter title, subtitle and header mark are set before calling `\printindex`.

## 5 PDF specifics

As nowadays electronic publishing often complements traditional, paper-based publishing, it is worth paying some attention to specific features of the former. Although the `hyperref` package can generate PDF bookmarks [8], it is arguably desirable to also have bilingual PDF bookmarks.

The bookmark generated by `hyperref` is labelled with the title specified by the sectioning commands such as `\chapter` and `\section`, with the short title being favoured when set. Hence, there is little to do for the chapters (and other levels) that are created with the `\newchapter` command since a bilingual short title is set for the table of contents as explained previously. However, while an entry of the table of contents relies on the new line command `\` to separate its title and subtitle, this is not applicable for PDF bookmarks. This can be handled with the conditional command `\texorpdfstring` provided by `hyperref`. The call to `\chapter` in `\newchapter` is refined as follows:

```
\chapter[#1\texorpdfstring{\textmd}{ - }{#2}]{#1}
```

In this case, the title and subtitle are separated with a dash in the bookmark label and with a line break in the table of contents.

`hyperref` issues a warning when a `TeX` command—typically a font selection command for the minor language—is included in `#2`, the subtitle. In such a case, `hyperref` (happily) skips the command, so it does not appear in the bookmark label. So, while the warning can be safely ignored, it can also be avoided by using once more the `\texorpdfstring` command inside the subtitle string.

Next, we consider the chapters that are automatically generated and absent from the table of contents (thus not put in the PDF table of contents by `hyperref`), typically the table of contents itself, and the bookmarked pages that do not correspond to a new chapter, such as the title page. These two cases are handled with the appropriate `hyperref` command as exemplified below with a bookmark for the table of contents:

```
\currentpdfbookmark{\contentsname\ - 目次}{lnk1}
```

This is typically called after `\cleardoublepage`.

Next, for the chapters that are manually added to the table of contents—typically the bibliography and index—we combine the `\addcontentsline` and `\texorpdfstring` commands, as exemplified below with a table of contents entry and the corresponding bookmark for the bibliography:

```
\newcommand\myformat[1]{\mdseries\yu #1}
\addcontentsline{toc}{chapter}{\bibname
\texorpdfstring{\myformat}{ - }{参考文献}}
```

Here, we have also shown another solution to completely avoid `TeX` commands inside a PDF string.

Finally, to avoid garbled text in the PDF strings such as bookmark labels, it is wise to set

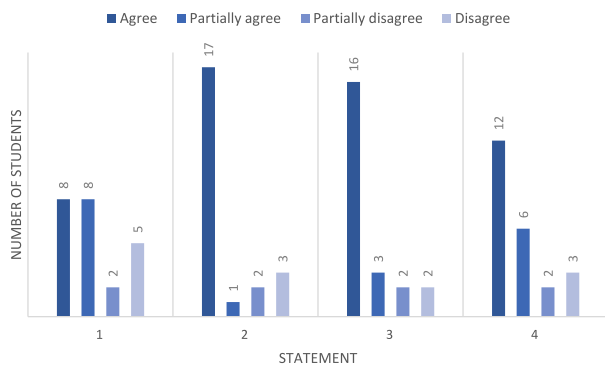
```
\hypersetup{pdfencoding=auto}
```

in addition to any other `hyperref` options.

## 6 Some statistics

The techniques and guidelines described in this article have been accumulated over the years to typeset the author’s own textbook *A Gentle Introduction to Functional Programming in English* [5], whose major language is English and minor one is Japanese.

Those students of the course who used that textbook (not all did) were asked how useful they think the supporting text (e.g., margin notes, section titles translations) written in the minor language is. An online survey was prepared in Japanese—the mother tongue of most students—which consisted of these four statements:



**Figure 4:** Students’ answers to the survey regarding the bilingual lecture textbook.

1. Supporting text in Japanese (table of contents, margin notes, index, etc.) is useful.
2. The number of margin notes given in Japanese should be increased.
3. More keywords should be translated in Japanese.
4. More Japanese short commentaries should be given.

The students rated each with “agree”, “partially agree”, “partially disagree” or “disagree”. Twenty-three students submitted the survey whose results are given in Figure 4. The results show the importance and the corresponding student expectations of the supporting text given in the minor language. Note that it is reasonable to assume that the students who disagree at the first question most likely mean “not useful because not enough: I would like more”. This is corroborated by the results of the subsequent questions.

## 7 Conclusions

Bilingual publishing has various important applications, for instance educational textbooks. With particular attention to the demanding English–Japanese scenario, we have reviewed herein general  $\text{\LaTeX}$  guidelines and techniques to produce a bilingual book. Considering a major (e.g. English) and a minor (e.g. Japanese) language for the book, issues of the type, page layout and customisation of page headers, chapter pages and special pages have been addressed. For electronic publishing, the adaptation of PDF features, particularly bookmarks, to support bilingual content has been discussed.

We have also obtained readers’ feedback: after using such a bilingual textbook (major language: English, minor language: Japanese) for an undergraduate lecture (functional programming), we have asked students to rate this bilingual feature. The results show that students expect a great deal from it, likely because the prevalent mother tongue of the class was the minor language of the book.

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