

Minimum(ish) Working Example of Quarto with Arabic RTL text in an LTR document

The Authors

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This book is typeset with Xe_{La}TeX (via Quarto and pandoc) in the Charis, Vazirmatn, and Amiri typefaces.

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Preface

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Quarto is a document publishing software. With it, you can write your document in **Pandoc flavored markdown**. Quarto will use Pandoc under the hood, and do a bunch of other fancy stuff, to output your markdown document in formats of your choice, like HTML for websites, and PDF (via **Latex**).

So far so good. But many of my documents are in English with Arabic content interspersed. Arabic is written right-to-left (RTL) whereas English is written left-to-right (LTR). The support of bidirectional (BiDi) text is a notoriously tricky problem. The cursive property of the Arabic script (with joining letters) compounds the issue.

In this write-up, I will describe how to configure Quarto to achieve this.

The code for this book can be used as a template for RTL document projects. Along with BiDi, I'll also discuss other aspects like fonts, figures, etc. إِنَّ شَاءَ اللَّهُ.

The source code for this book can be found here: <https://github.com/adamiturabi/quarto-arabic-mwe>.

The rendered output is published here: <https://adamiturabi.github.io/quarto-arabic-mwe/>.

A PDF version of this document can be downloaded if you click on the PDF icon next to the title at the top left of this page.

1 Introduction

In order to create a Quarto book project (like this one), use this command:

```
quarto create project book mybook
```

It will create a bunch of files that will be needed for the book.

This procedure is described in detail here: <https://quarto.org/docs/books/>.

2 Arabic (العربية) support

There are two main ways to insert RTL Arabic text in an LTR document:

1. In-line Arabic within an LTR paragraph.
2. A block of Arabic text by itself

2.1 In-line Arabic: spans

For inline Arabic, we will use a Pandoc span. A span is written using this syntax:

```
[This is the span's content text]{.classname attributekey="attributeval"}
```

Within square brackets [] is the content of the span. This is what will be rendered in the output. Within the curly braces {} is a class name and some attributes that are needed by Quarto to properly process the span.

2.1.1 Arabic spans for HTML output

In order to render the Arabic content text correctly for HTML output, the span is input thus in the .qmd source file.

```
[نص عربي.]{.reg-ar-txt dir="rtl" lang="ar"}
```

(Note that the the Arabic text in code listings (like the one above) does not render correctly in the PDF output, exemplifying how tricky BiDi support is. We haven't attempted to find a workaround for this.)

The class name is arbitrary. We suggest using a descriptive name. We will be using it in the CSS for selecting the font later. The output HTML code will be something like:

```
<span class="reg-ar-txt" dir="rtl" lang="ar">هذا نص عربي.</span>
```

2.1.2 Arabic spans for PDF output

For PDF output, the `dir="rtl"` attribute is unneeded, and in fact, clashes with the Xelatex PDF engine that Quarto mandates we use for documents with RTL text. So the span will need to be input thus in the .qmd source file:

```
[|هذا نص عربي|.reg-ar-txt lang="ar"]
```

The output Latex code will be something like:

```
\foreignlanguage{arabic}{هذا نص عربي.}
```

Under the hood, `\foreignlanguage` is a command that is used by the Latex package `babel` that Pandoc specifies in its Latex template for handling multiple languages and their scripts.

2.1.3 Rendered output of Arabic span

Finally, this is an example of an English sentence with inline Arabic text within it. Locate this sentence in the source code file [here](#) to see how we wrote it.

2.2 Arabic block text: divs

In order to write a block (paragraph) of Arabic text within an LTR document we will use a Pandoc div. A div is written using this syntax:

```
:::{.classname attributekey="attributeval"}
This is the divs's *content text*.
:::
```

2.2.1 Arabic divs for HTML output

For HTML output, a div is input thus in the .qmd source:

```

:::{.reg-ar-txt dir="rtl" lang="ar"}
سطرين. النص يبلغ حتى أكتب أن أريد طويلاً. عربي كلام هذا
الخارجي. الملف لإنتاج قوارطو برنامج أستعمل
قبل. من أستعمله كنت الذي بكداؤن البرنامج خلف قد جيء برنامج هو
:::

```

The class name `reg-ar-txt` is, again, arbitrary. The output HTML code will be:

```

<div class="reg-ar-text" lang="ar" dir="rtl">
طويلاً. عربي كلام هذا
سطرين. النص يبلغ حتى أكتب أن أريد
الخارجي. الملف لإنتاج قوارطو برنامج أستعمل
قبل. من أستعمله كنت الذي بكداؤن البرنامج خلف قد جيء برنامج هو
</div>

```

2.2.2 Arabic divs for PDF output

For PDF output, a div is input thus in the .qmd source:

```

:::{.otherlanguage data-latex="{arabic}" lang='ar'}
طويلاً. عربي كلام هذا
سطرين. النص يبلغ حتى أكتب أن أريد
الخارجي. الملف لإنتاج قوارطو برنامج أستعمل
قبل. من أستعمله كنت الذي بكداؤن البرنامج خلف قد جيء برنامج هو
:::

```

In this case, the class name `otherlanguage` is not arbitrary. Furthermore, another attribute `data-latex="{arabic}"` is also needed. And, as with spans, `lang="ar"` is needed but `dir="rtl"` should not be used. The output Latex code is:


```
\begin{otherlanguage}{arabic}
```

طويل. عربي كلام هذا
 سطرين. النص يبلغ حتى أكتب أن أريد
 الخارج. الملف لإنتاج قوارطو برنامج أستعمل
 قبل. من أستعمله كنت الذي بكداؤن البرنامج خلف قد جيد برنامج هو

```
\end{otherlanguage}
```

2.2.3 Rendered output of Arabic div

Finally, this is an example of an Arabic div. Locate it in the source code file [here](#) to see how we wrote it.

هذا كلام عربي طويل. أريد أن أكتب حتى يبلغ النص سطرين. أستعمل برنامج قوارطو لإنتاج الملف الخارجي. هو برنامج جيد قد خلف البرنامج بكداؤن الذي كنت أستعمله من قبل.

2.3 Pandoc Lua filters

As you can see, the process for typing Arabic text is both lengthy, and different for HTML and PDF outputs. In order to simplify it, we can use [Pandoc Lua filters](#).

We have created a Quarto filter extension (which is a grouping of Lua filters) to support Arabic divs and spans. The process for creating a Quarto filter extension is detailed here: <https://quarto.org/docs/extensions/filters.html>

This is the filter `inline-arabic-span.lua` that we wrote for handling Arabic spans:

```
-- Add attributes for Arabic text in a span
function Span (el)
  if el.classes:includes 'ar' or el.classes:includes 'aralt' then
    text = pandoc.utils.stringify(el)
    contents = {pandoc.Str(text)}
    if FORMAT:match 'latex' then
```

```

-- for handling alternate Arabic font
if el.classes:includes 'aralt' then
  -- can't seem to use string concatenate directly. Have to use RawInline
  table.insert(
    contents, 1,
    pandoc.RawInline('latex', '\\altfamily ')
  )
end
-- No dir needed for babel and throws error if it sees dir attribute.
-- It was previously needed for polyglossia
return pandoc.Span(contents, {lang='ar'})
elseif FORMAT:match 'html' then
  classval = 'reg-ar-text'
  if el.classes:includes 'aralt' then
    classval = 'alt-ar-text'
  end
  -- dir needed for html otherwise punctuation gets messed up
  return pandoc.Span(contents, {class=classval, lang='ar', dir='rtl'})
end
end
end

```

This is the filter `arabic-div.lua` that we wrote for handling Arabic divs:

```

-- Add attributes for Arabic text in a div
function Div (el)
  if el.classes:includes 'ar' or el.classes:includes 'aralt' then
    text = pandoc.utils.stringify(el)
    contents = {pandoc.Str(text)}
    if FORMAT:match 'latex' then
      -- for handling alternate Arabic font
      if el.classes:includes 'aralt' then
        -- can't seem to use string concatenate directly. Have to use RawInline
        table.insert(
          contents, 1,
          pandoc.RawInline('latex', '\\altfamily ')
        )
      end
    end
    -- No dir needed for babel and throws error if it sees dir attribute.
    -- It was previously needed for polyglossia
  end

```

```

return pandoc.Div(
  contents,
  {class='otherlanguage', data_latex="{arabic}", lang='ar'}
)
elseif FORMAT:match 'html' then
  classval = 'reg-ar-text'
  if el.classes:includes 'aralt' then
    classval = 'alt-ar-text'
  end
  -- dir needed for html otherwise punctuation gets messed up
  return pandoc.Div(
    contents,
    {class=classval, lang='ar', dir='rtl'}
  )
end
end
end
end

```

With activating these filters, now you can use Arabic divs and spans using a simplified syntax.

Input for an Arabic span:

```
[{.ar}{عربي. نص هـذا}]
```

Input for an Arabic div:

```

:::{.ar}
طويل. عربي كلام هـذا
سـطـريـن. النص يـبلـغ حـتى أـكـتب أن أـرى
الـخـارجـي. الـمـلف لـإـنتـاج قـوارطـو بـرـنـامـج أسـتـعـمـل
قـبل. مـن أسـتـعـمـله كـنت الـذي بـكـداؤـن الـبـرـنـامـج خـلف قـد جـي بـرـنـامـج هـو
:::

```

The filters will process them correctly for HTML and PDF output. Note that the class name `reg-ar-text` is hardcoded in the filter. If you wish to modify it you can edit the Lua files directly.

2.4 Arabic fonts

You can use a specific font for the Arabic text which is different from the font used for the English text. This is usually desirable because the typeface design for the Latin font often does not optimize (or even sometimes support) an Arabic font.

For my project, I am using the [Vazirmatn](#) and [Amiri](#) fonts.

Both of these are well designed fonts. For me, a major consideration is good typesetting of diacritics and the hamza character (ء). (See here for what I'm talking about: <https://adamiturabi.github.io/hamza-rules/#typographical-limitations>)

To specify the Arabic fonts, the process is different for HTML vs PDF output. We'll describe both below:

2.4.1 Specify Arabic font for HTML

For HTML output, the Arabic font is specified in the CSS file. The class name that we selected previously `reg-ar-text` is now assigned a font:

```
.reg-ar-text {
  font-family: Vazirmatn, serif;
  /* scaled up slightly w.r.t. the Latin font for readability */
  font-size: 1.2em;
  /* line spacing not scaled for visual congruence at the expense of clashes */
  line-height: 100%;
}
```

You will also need to add the font files to your project. Quarto will copy them over to the output directory so that they can be served to the browsers of visitors viewing your site. Be aware of fonts licences before uploading and using fonts in this way. Instead of uploading font files, you can instead use a font delivery service like Google Fonts, although they often have outdated versions. See [our fonts directory](#).

The font names `Vazirmatn` and `AmiriWeb` are defined in the same CSS file. A relative path to the font files is needed in the CSS file. See [our CSS file](#) for details.

In our CSS file, we have specified the font Amiri is specified as an alternate font:

```
.alt-ar-text {
  font-family: AmiriWeb, serif;
  font-size: 1.2em;
}
```

It can be specified in the .qmd source with `{.aralt}` instead of `{.ar}`. You can also see how we handle it in the source code for the Lua filters above.

Here is an example of a div and a span in the alternate Arabic font. Span: هذا نص عربي.

Div:

هذا كلام عربي طويل. أريد أن أكتب حتى يبلغ النص سطرين. أستعمل برنامج قوارطو لإنتاج الملف الخارجي. هو برنامج جيد قد خلف البرنامج بكداؤن الذي كنت أستعمله من قبل.

By the way, I am not, by any means, an expert (or even proficient) in CSS, so if you see any problems with this method of specifying the font, feel free to let me know in the discussions or issues of the [Github page for this book](#).

2.4.2 Specify Arabic font for PDF

As we mentioned earlier, Latex uses the babel package to handle support for multiple languages. In order to specify Arabic font(s), we need to add the following lines in the intermediate .tex file produced by Quarto:

```
\babelfont[arabic]{rm}[Language=Default]{Vazirmatn-Light}
\babelfont[arabic]{sf}[Language=Default]{Vazirmatn-Light}
\babelfont[arabic]{alt}[Language=Default]{Amiri}
```

Quarto provides hooks for inserting such additional code using [includes](#) and [templates](#).

The above lines of code need to be inserted at a specific point after the `usepackage{babel}` line. We found that replacing the partial template for

`before-title.tex` worked in this case. Here is the addition in our `_quarto.yml` file:

```
format:
  pdf:
    template-partials:
      - srctex/before-title.tex
```

Again, see our source code in Github for more details.

By the way, the fonts will need to have been installed on your system in order to generate the PDF output.

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3 Transliteration of Arabic

3.1 Romanization scheme

In my documents, I frequently need to transliterate and transcribe Arabic text in Latin characters. There are various Romanization schemes in existence, using dots, macrons, etc. The Romanization scheme I am using for a few of my projects is tabulated below:

Arabic letter	Transliterated output	ASCII input
ء	'	E
ا	<i>ā</i>	A
ب	<i>b</i>	b
ت	<i>t</i>	t
ث	<i>th</i>	v
ج	<i>j</i>	j
ح	<i>h</i>	H
خ	<i>kh</i>	x
د	<i>d</i>	d
ذ	<i>d̄h</i>	p
ر	<i>r</i>	r
ز	<i>z</i>	z
س	<i>s</i>	s
ش	<i>sh</i>	c
ص	<i>ṣ</i>	S
ض	<i>ḍ</i>	D
ط	<i>ṭ</i>	T
ظ	<i>ḏh</i>	P
ع	<i>ε</i>	e
غ	<i>gh</i>	g
ف	<i>f</i>	f
ق	<i>q</i>	q

Arabic letter	Transliterated output	ASCII input
ك	<i>k</i>	k
ل	<i>l</i>	l
م	<i>m</i>	m
ن	<i>n</i>	n
ه	<i>h</i>	h
و (C/V)	<i>w/ū</i>	w
ي (C/V)	<i>y/ī</i>	y

As you can see, I use digraphs (\widehat{dh} , \widehat{gh} , etc.) for some letters. This is because, for my current projects, I prefer readability over precision.

It is possible to input these special characters directly by modifying your keyboard layout or mapping, either at a operating system, or editor level. Andreas Hallberg has described a technique for inputting them in the vim editor here: <https://andreamhallberg.github.io/ergonomic-arabic-transcription/>

For Quarto, I prefer to input the transliterated text as ASCII characters and write a Lua filter `transliteration-span.lua` to handle rendering them correctly. The ASCII to transliterated output mapping is shown in the table above. So if I type:

```
[pahabtu maphaban]{.trn}
```

It will be output as $\widehat{dh}ahabtu\ \widehat{ma}dh\cdot haban$.

Note the dot character `.` is automatically inserted by the filter between the digraph \widehat{dh} and the following *h* for helping in disambiguation.

With `{.trn}` the output is in italic (as above). But sometimes I need to have non-italic output, as in the case of names. For that I use `{.trn2}`. For example:

```
[#eAEicah]{.trn2} and [E#Adam]{.trn2} are studying  
the [#qurEAn]{.trn2} and [#HadIv]{.trn2}.
```

This is rendered as:

Ēā'ishah and 'Ādam are studying the Qur'ān and Ḥadīth.

Note how the hash character `#` is used to control capitalization.

3.2 Fonts

For the Latin font used in your main text, you will need to pick a font that supports the dots, macrons, breves, etc needed for transliteration. I am using the [Charis SIL](#) font.

Other fonts I have experimented with are:

- [New Computer Modern](#)
- [DejaVu Serif](#)
- [Junicode](#)
- [Brill](#)
- [Gentium Plus](#)
- [STIX Two Text](#)

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4 Summary

Dummy text to test references:

See Knuth (1984) for additional discussion of literate programming.

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References

Knuth, Donald E. 1984. “Literate Programming.” *Comput. J.* 27 (2): 97–111. <https://doi.org/10.1093/comjnl/27.2.97>.

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