A Sample Article Using `quarto-ieee` for IEEE Journal and Transactions

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Abstract—**This document describes the most common article elements and how to use the quarto-ieee class with Pandoc/Quarto-Markdown to produce files that are suitable for submission to IEEE journals. quarto-ieee can produce conference, journal, and technical note (correspondence) papers with a suitable choice of class options. It intends to generate PDF and HTML outputs that closely mimick what IEEE would generate.**

Index Terms—**IEEE, IEEEtran, journal, Quarto, Pandoc, template**

I. INTRODUCTION

THIS file is intended to serve as a "sample article file" for IEEE journal papers produced with (Pandoc/Quarto)-Markdown using `IEEEtran.cls` version 1.8b and later for the PDF output. It is based on `bare_jrnl_new_sample4.tex` provided by IEEE Publication Technology, Staff and available from https://template-selector.ieee.org/. The most common elements are covered in the simplified and updated instructions in `New_IEEEtran_how-to.pdf`. For less common elements you can refer back to the original `IEEEtran_HOWTO.pdf`. It is assumed that the reader has a basic working knowledge of LaTeX [1] and of (Pandoc/Quarto)-Markdown [2], [3] markup.

II. THE DESIGN, INTENT, AND LIMITATIONS OF THIS TEMPLATES

The `quarto-ieee` template is intended to **approximate the final look and page length of the articles/papers** either in PDF output or HTML output. **They are NOT intended to be the final produced work that is displayed in print or on IEEEXplore®**. They will help to give the authors an approximation of the number of pages and layout that will be in the final version.

A. Unsuported feature and limitations

Although most of the LaTeX and `IEEEtran.cls` commands and environment are supported, there are some limitations when trying to export to a format other than PDF (e.g. HTML output). For PDF output, the reader can use the LaTeX command directly. However, this may break other output formats.

It can be can reported the following limitations of the `quarto-ieee` template: - Several authors with same affiliation produce weird output. In such case, it is recommended to use `note` and `tex-author-no-affiliation: true`. - For `PDF` output - `quarto-ieee` use a hack to handle the `longtable` issue with 2-column LaTeX documents[1]. But, in some cases, a page overflow may occur (see also Section V-B4). - For `HTML` output - The default Quarto toc is used, so the table of contents (toc) display is not the same as on IEEEXplore®. - Footnote are put at the end of document, while on IEEEXplore® there are placed in the accordion. - Figures are not placed in the accordion. - IEEEXplore® specifics (e.g. citation metrics, etc.) - The `HTML` output is a Quarto citeable article [4], so a citation appendix is automatically added to the article end.

B. Contributing

If you want to improve the `quarto-ieee` template or need some specific features do not hesitate to submit Pull Request[2] (it is considered good practice to open an issue for discussion before working on a pull request for a new feature).

III. SOME RANDOM TEXT

For some of the remainder of this sample we will use dummy text to fill out paragraphs rather than use live text that may violate a copyright.

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[1][*"longtable not compatible with 2-column LaTeX documents"*],
[2]Go to the PR page: https://github.com/dfolio/quarto-ieee/pulls

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IV. FRONT MATTER

Most Quarto's authors and affiliations schemes [5] are supported in the YAML front matter to render authors as requested by IEEE journals in PDF and HTML outputs. When provided to an author, the `note` entry is rendered as a `\thanks{}` in PDF output (ignored in HTML output). Additionally, the reader may add to an author a `photo: path/to/photograph.png` with a `bio` metadata entries to generate a `IEEEbiography`, while a sole `bio` generates a `IEEEbiographynophoto` (these features is used both in PDF and HTML outputs).

The `funding` entry is also used in both PDF and HTML outputs [5]. At version v1.1.1, only the `funding.statement` is used. Similarly, `citation` entry is supported to make the HTML output a "*citeable article*" [4].

V. SOME COMMON ELEMENTS

A. Sections and Subsections

As stated in the `IEEEtran` template enumeration of section headings is desirable, but not required. When numbered, it should be consistent throughout the article, that is, all headings and all levels of section headings in the article should be enumerated. Primary headings are designated with Roman numerals, secondary with capital letters, tertiary with Arabic numbers; and quaternary with lowercase letters. References and Acknowledgment headings are unlike all other section headings in text. They are never enumerated. They are simply primary headings without labels, regardless of whether the other headings in the article are enumerated.

The following Section V-B shows some basic usage and capabilities of `quarto-ieee`.

B. Markdown basics

The reader can easily find many documentations on how to write using the (Pandoc/Quarto) Markdown syntax. The `quarto-ieee` template relies mainly on the Markdown markup supported by Quarto [6], which is build based on Pandoc [2], [3]. Below are some basic examples of usage of the Markdown markup (to save space, it is better to consult the original Quarto document `template.qmd`).

1) Display equations: To write equations use $ delimiters for inline formula or $$ for block one. To number the equations, it is recommended to use classic equation environments provided by LaTeX and to use `\eqref{}` (or `\ref{}`) for cross-referencing. For example:

$$\chi_a = \text{diag}\left(\frac{\chi}{1+n_a\chi}, \frac{\chi}{1+n_b\chi}, \frac{\chi}{1+n_b\chi}\right), \tag{1}$$

$$a = b + c \tag{2}$$
$$c = d + e \tag{3}$$

$$\begin{cases} 1 & = n_a + 2n_b \\ n_a & = \frac{1-\varepsilon^2}{2\varepsilon^3}\left(\log\left(\frac{1+\varepsilon}{1-\varepsilon}\right) - 2\varepsilon\right) \end{cases} \tag{4}$$

The above equation is cross-referenced as (1), (2), (3) and (4).

For now, avoid using the Quarto cross-references that use of $$ $$ with #eq- label. It works properly only for PDF output, but there are some issues with HTML[3] output.

Remark. `quarto-ieee` template also supports the mhchem (for chemical equation) and physics (for flexible macros for typesetting equations) LaTeX packages and Mathjax extensions.

2) Theorems, Proofs and Remarks: To include a reference-able theorem, create a div with a #thm- label. A theorem name is specified via the first heading in the block. For example:

Theorem V.1 (Line). *The equation of any straight line, called a linear equation, can be written as:*

$$y = mx + b$$

The theorem is cross-referenced as Theorem V.1.

There are a number of theorem variations supported by Quarto, each with their own label prefix:

- #thm- for Theorem;
- #lem- for Lemma;
- #cor- for Corollary;
- #prp- for Proposition;
- #cnj- for Conjecture;
- #def- for Definition;
- #exm- for Example;
- #exr- for Exercise.

The `proof`, `remark` and `solution` environments generally receive similar typesetting as theorems. However they are not numbered (and therefore cannot be cross-referenced). To create these environments just use them as the class name of a div such as:

Solution (The solution). An example of solution environment.

3) Figures: An image with nonempty alt text will be rendered as a figure with a caption with Pandoc and Quarto. Quarto includes a different features to simplify the use of figures and subfigures. Here, it is recommended to use div block with #fig- label to embed your Figures.
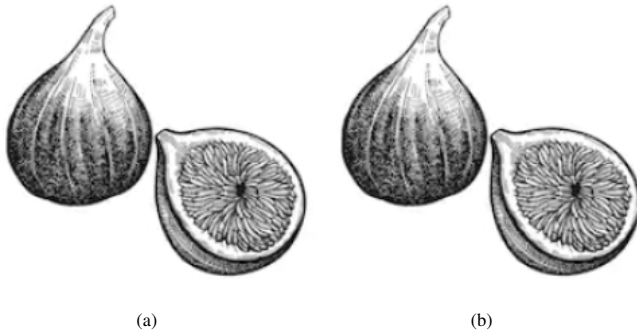
Fig. 1: An example of figure.

Fig. 2: An example with sub-figure.

(a) (b)

The figures is cross-referenced as Fig. 2 and even the sub-figures as Fig. 2b.

4) Tables: Similarly, many kind of tables may be used with Pandoc and Quarto. The latter also includes different features to simplify the table output. To make tables cross-referenceable use a label with a `#tbl-` prefix.

However, it is recommended to avoid using the commonly used single Markdown table known as a 'pipe table'. In fact, Pandoc Markdown uses the LATEX `longtable` package, which does not support the two-column mode, which is required for most `IEEEtran` journals. `quarto-ieee` uses a hack to temporarily switch to one-column mode. However, this hack may break the page layout. To overcome this issue, a basic way is to use code cells (as for Table II). Quarto is a multi-language and it uses `Knitr` to execute `R` code and can execute Python code blocks within Markdown.

Table I: Main Caption

(a) First Table

Col1	Col2	Col3
A	B	C
E	F	G
A	G	G

(b) Second Table

Col1	Col2	Col3
A	B	C
E	F	G
A	G	G

The Tables are cross-referenced as Table I for details, especially Table Ib. There is also Table II.

Table II: A table

Col1	Col2	Col3
A	D	G
B	E	H
C	F	I

C. Bibliography

IEEE journal should normally use IEEEtran[4] BIBTEX style. Nevertheless, Pandoc and Quarto do support BIBTEX with natbib or biblatex. However, neither is officially recommended for normal IEEE use. For this reason, `quarto-ieee` uses `citeproc` with the `ieee` CSL style sheet.

VI. CONCLUSIONS

The conclusion goes here.

ACKNOWLEDGMENT

APPENDIX
AN APPENDIX

Use `[]{.appendix options="An Appendix"}` markup if you have a single appendix. `IEEEtran` state that to do not use `\section{}` anymore after `\appendix`.

REFERENCES

[1] F. Mittelbach and U. Fischer, *The LaTeX companion*, 3rd ed. Addison Wesley Professional, 2023.

[2] J. MacFarlane, A. Krewinkel, and J. Rosenthal, "Pandoc." [Online]. Available: https://github.com/jgm/pandoc

[3] J. J. Allaire, C. Teague, C. Scheidegger, Y. Xie, and C. Dervieux, "Quarto." Jan-2022 [Online]. Available: https://github.com/quarto-dev/quarto-cli

[4] "Quarto - Creating Citeable Articles." [Online]. Available: https://quarto.org/docs/authoring/create-citeable-articles.html. [Accessed: 25-Oct-2023]

[5] "Quarto - Front Matter." [Online]. Available: https://quarto.org/docs/authoring/front-matter.html#funding. [Accessed: 25-Oct-2023]

[6] "Quarto - Markdown Basics." [Online]. Available: https://quarto.org/docs/authoring/markdown-basics. [Accessed: 25-Oct-2023]

David Folio Use `IEEEbiography` with figure as option and the author name as the argument followed by the biography text.

John Doe Use `IEEEbiographynophoto` and the author name as the argument followed by the biography text.

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[4]IEEEtran BibTeX style support page is: http://www.michaelshell.org/tex/ieeetran/bibtex/