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 LaTeX to produce files that are suitable for submission to the IEEE. `quarto-ieee` can produce conference, journal, and technical note (correspondence) papers with a suitable choice of class options.**

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

I. Introduction

THIS file is intended to serve as a "sample article file" for IEEE journal papers produced under LaTeX using `IEEEtran.cls` version 1.8b and later. 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` templates are 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.

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).

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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IV. 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 IV-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 Markdown syntax. The `quarto-ieee` template relies mainly on the Markdown markup supported by Quarto[1], which is build based on Pandoc [2], [3]. Below are some basic examples of usage of Markdown markup.

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:

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

$$a = b + c \tag{2}$$

$$c = d + e \tag{3}$$

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

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[2] 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.

[1] See Quarto markdown basics at https://quarto.org/docs/authoring/markdown-basics.html.

[2] https://github.com/quarto-dev/quarto-cli/issues/2275

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 IV.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 IV.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. An example of solution environment.

3) Figures: It is recommended to use div block with `#fig-` label to embed your Figures.

Fig. 1: An example of figure.

(a) (b)

Fig. 2: An example with sub-figure.

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

Table II: A table

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

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

Remark. There is no markup for double-column floating figures. The only workaround is to change the environment of the `knitr` chunk option with `#| fig.env: figure*`.

4) Tables: For tables produced by executable code cells, include a label with a `#tbl-` prefix to make them cross-referenceable.
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[3], 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.

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

V. Conclusions

The conclusion goes here.

Acknowledgment

This should be a simple paragraph before the References to thank those individuals and institutions who have supported your work on this article.

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

[3] https://github.com/jgm/pandoc/issues/1023

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.

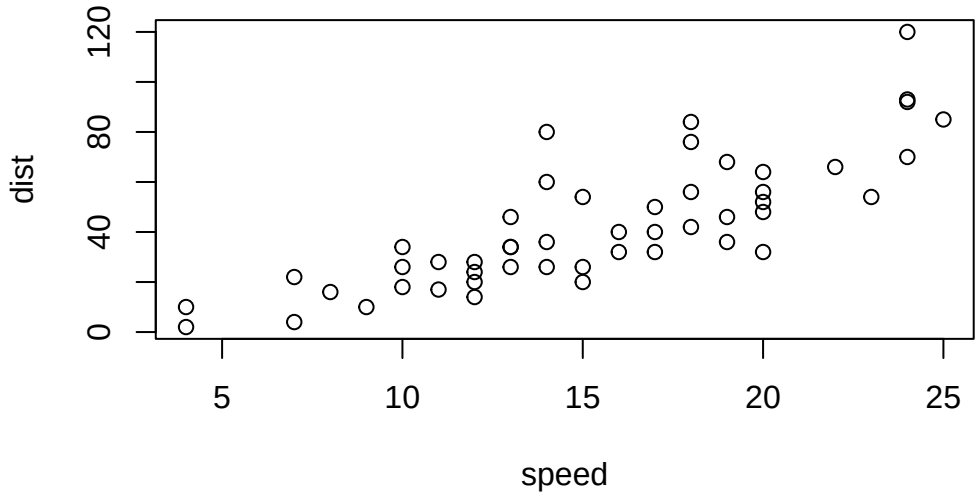

Fig. 3: Example of double column floating figures (in PDF).