THE *COCV* DOCUMENTCLASS USERS GUIDE VERSION 1.1 [*, **]

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Abstract. This paper describes the use of the `cocv` LaTeX document class and is prepared as a sample to illustrate the use of this class written for the *ESAIM: Control, Optimisation and Calculus of Variations* Journal.

Résumé. Cette courte note décrit la classe de LaTeX `cocv` et illustre son usage en se présentant sous la forme d'un article du journal *ESAIM: Control, Optimisation and Calculus of Variations* pour lequel elle a été écrite.

AMS Subject Classification. 35L05, 35L70.

The dates will be set by the publisher.

CONTENTS

Introduction

This short note describes the `cocv` LATEX class for authors preparing a compuscript for the *ESAIM: Control, Optimisation and Calculus of Variations* journal. In itself it is an example of the use of the `cocv` class. It is assumed that authors have some experience with LATEX or $\mathcal{AMS}$-LATEX; if not, they are kindly referred to [2,4,7], and to [3,6] for plain TEX. Apart from its few high-level structuring commands, standard LATEX2$_\varepsilon$-commands will work normally (`\begin{...} ... \end{...}`, `\section{...}`, `\subsection{...}`, *etc*).

1. About the "head" of your paper

Your paper contains essentially two parts: the *preamble*, where you put your personal macros, which is between the `\documentclass` and the `\begin{document}` commands, and its *body*, which is where you put its contents. The body is in turn made of two parts: the *top matter* and the *text*. The top matter is where you give the initial data of your paper (the date, your name, the abstract, *etc*.). Your paper should begin with its preamble:

```
\documentclass{cocv}
⟨ your macros ⟩
```

This is followed by its body:

```
\begin{document}
\title{your title}\thanks{your thanks} ... \thanks{your thanks}
\author{name of the first author }\address{his/her address}
 ...
\author{name of the last author }\address{his/her address}
\date{dates will be set by the publisher}
\subjclass{the ams subject classification}
\keywords{your keywords}
\begin{abstract} your abstract \end{abstract}
\begin{resume} votre résumé \end{resume}
\maketitle
your text and your references
\end{document}
```

1.1. Your private macros (the preamble)

Your private definitions *must* be placed between the `\documentclass` and the `\begin{document}` commands (the *preamble*), and *at no other place*. Definitions using the commands `\newcommand`, `\renewcommand`, `\newenvironment` and `\renewenvironment` should be used with an extreme care.

Sensible, restricted usage of private definitions is thoroughly encouraged. Large macro packages should be avoided when they are not used but for very few macros that can be isolated. Pasting macros borrowed from everywhere without needing them must certainly be avoided. Do not change existing environments commands or any part of standard LATEX. Never use macros that are mere abbreviations (v.g. `\bt` to replace `\begin{theorem}`) but use the facilities of your editor to minimize keystrokes. Intelligible comments of your macros are appreciated and may be useful.

Beware that deviations from these simple and sensible rules may cause inaccuracies and delays in the publication, or may even result in your LATEX file being discarded altogether, which implies traditional typesetting, hence costs and delays.

1.2. **The top matter**

The *top matter* consists of the information obtained from the commands

```
\title, \thanks, \author, \address, \date, \subjclass, \keywords,
```

and also from the

```
\begin{abstract}...\end{abstract} and \begin{resume}...\end{resume}
```

environments. The following commands, when used, are also part of the top matter:

```
\runningtitle, \runningauthor, \sameaddress  \secondaddress;
```

these are described in section 2.3. All these commands *must* come *before* the `\maketitle` command, which indicates the end of the top matter.

1. Title and thanks. The title of your paper is given with the `\title` command.

The `\thanks` command is optional; their uses are summarized by

```
\title{Measuring ...}\thanks{The P.T. Smith Laboratory}\thanks{NRR grant S30-A3x}
```

Each `\thanks` produces superscripts (*), (**), *etc.* referring to a footnote. Note that it is used *outside* the `\title` command, not inside the `\title` command. There cannot be more than five thanks.

2. Authors and their addresses The full name of each author is given with the `\author` command. The `\address` command takes as its argument the address of one (or several) author(s) and is to be used optionally *outside* an `\author{...}` command to give the address of the author mentioned in the argument of `\author`. Their uses are summarized by the example:

```
\author{John Smith}\address{University of ...}
\author{Paul Dupont}\address{Laboratoire ...}
```

`\address` produces numeral superscripts [1], [2], *etc.* referring to footnotes. It sometimes happen that several authors have the same address, or that some authors have two addresses. These special cases are considered in section 2.3.

3. Dates Chronological data like *Received march 1998, revised ... , etc.* will be added by the publisher. You may specify a date using the `\date` command, but if you do not, `cocv` automatically typeset "*The dates will be set by the publisher*".

4. Subject classes, keywords, abstract, résumé. Each of these items is mandatory; omitting any of them will result in an error message being typeset.

2. ABOUT THE "BODY" OF YOUR PAPER

2.1. **The environments**

All theorem-like environments are numbered continuously from 1 upwards in each section. The following are defined, and these definitions should not be modified:

```
\theoremstyle{plain}
\newtheorem{thrm}{Theorem}[section]
\newtheorem{lmm}[thrm]{Lemma}
\newtheorem{crllr}[thrm]{Corollary}
\newtheorem{prpstn}[thrm]{Proposition}
\newtheorem{crtrn}[thrm]{Criterion}
\newtheorem{lgrthm}[thrm]{Algorithm}
```

```
%
\theoremstyle{definition}
\newtheorem{dfntn}[thrm]{Definition}
\newtheorem{cnjctr}[thrm]{Conjecture}
\newtheorem{xmpl}[thrm]{Example}
\newtheorem{prblm}[thrm]{Problem}
\newtheorem{rmrk}[thrm]{Remark}
\newtheorem{nt}[thrm]{Note}
\newtheorem{clm}[thrm]{Claim}
\newtheorem{smmr}[thrm]{Summary}
\newtheorem{cs}[thrm]{Case}
\newtheorem{bsrvtn}[thrm]{Observation}
```

Each environment has a "LATEX-name" made of the consonants (lowercase) of the corresponding "natural name" (*v.g.* R̲ e m̲ a r̲ k̲ ↦rmrk). Notice the numbering sequence below, produced by

```
\begin{prpstn}\label{abc} ...  \end{prpstn}
\begin{thrm}[The rigidity of the category of sets] ...  \end{thrm}
\begin{cnjctr} ...  \end{cnjctr}
```

Proposition 2.1. *Full sub-categories of* **Set**$_{\mathrm{fin}}$*, the category of finite sets and maps, generated by two non empty and non isomorphic sets possess fixing-object endofunctors not isomorphic to the identity endofunctor.*

Theorem 2.2 (The rigidity of the category of finite sets)**.** *In contrast to what is stated in Proposition* 2.1*, endofunctors of* **Set**$_{\mathrm{fin}}$ *fixing all objects are isomorphic to the identity endofunctor.*

Conjecture 2.3 (The rigidity of the category of sets)**.** Endofunctors of **Set** fixing all objects are isomorphic to the identity endofunctor.

Note that in Theorem 2.2 the reference to Proposition 2.1 is in normal text (roman font); this is always so, and it can be achieved using `\Rref` instead of `\ref` (we used `\Rref{abc}` in the text of the theorem). In an analogous manner, there is `\Rpageref`.

Proofs should begin with `\begin{proof}` and end with `\end{proof}`, and not with personal macros.

Theorem 2.4 (Brouwer)**.** *There exist irrational numbers* h, k *such that* h^k *is rational.*

Proof. If $\sqrt{2}^{\sqrt{2}}$ is rational, there is nothing to prove. If $\sqrt{2}^{\sqrt{2}}$ is not rational, then consider $\left(\sqrt{2}^{\sqrt{2}}\right)^{\sqrt{2}} = \sqrt{2}^2$; again, there is nothing to prove! (Was there something to prove?) $\qquad\square$

The proof was typeset between `\begin{proof}` and `\end{proof}`.

2.2. **Specific macros**

Fixed mathematical "object", "operators", *etc.* are usually typeset in roman (*v.g.* `\cos`, `\sup`, *etc.*). This should be the general rule, and the `cocv` class provides macros in this spirit; for example `\xCzero` yields C^0. These macros are:

`\xCzero`	$\mapsto \mathrm{C}^0$	`\xCone`	$\mapsto \mathrm{C}^1$	`\xCtwo`	$\mapsto \mathrm{C}^2$
`\xCinfty`	$\mapsto \mathrm{C}^\infty$	`\xCn{p}`	$\mapsto \mathrm{C}^p$		
`\xHzero`	$\mapsto \mathrm{H}^0$	`\xHone`	$\mapsto \mathrm{H}^1$	`\xHtwo`	$\mapsto \mathrm{H}^2$
`\xHinfty`	$\mapsto \mathrm{H}^\infty$	`\xHn{p}`	$\mapsto \mathrm{H}^p$		

`\xLzero`	$\mapsto \mathrm{L}^0$	`\xLone`	$\mapsto \mathrm{L}^1$	`\xLtwo`	$\mapsto \mathrm{L}^2$
`\xLinfty`	$\mapsto \mathrm{L}^\infty$	`\xLn{p}`	$\mapsto \mathrm{L}^p$		
`\xWzero`	$\mapsto \mathrm{W}^0$	`\xWone`	$\mapsto \mathrm{W}^1$	`\xWtwo`	$\mapsto \mathrm{W}^2$
`\xWinfty`	$\mapsto \mathrm{W}^\infty$	`\xWn{p}`	$\mapsto \mathrm{W}^p$		
`\xGL`	$\mapsto \mathrm{GL}$	`\xSL`	$\mapsto \mathrm{SL}$	`\xPSL`	$\mapsto \mathrm{PSL}$
`\xSO`	$\mapsto \mathrm{SO}$	`\xSU`	$\mapsto \mathrm{SU}$		
`\xDif u`	$\mapsto \mathrm{D}u$	`\xdif u`	$\mapsto \mathrm{d}u$	`\xdrv xt`	$\mapsto \frac{\mathrm{d}x}{\mathrm{d}t}$
`\xDrv Fx`	$\mapsto \frac{\mathrm{d}}{\mathrm{d}x}F$				
`\xker u`	$\mapsto \ker u$	`\xcoker u`	$\mapsto \mathrm{coker}\ u$		
`\xim u`	$\mapsto \mathrm{im}\ u$	`\xcoim u`	$\mapsto \mathrm{coim}\ u$		
`\xtr A`	$\mapsto \mathrm{tr}\ A$	`\xdim V`	$\mapsto \dim V$	`\xcodim V`	$\mapsto \mathrm{codim}\ V$
`\xHom(X,Y)`	$\mapsto \mathrm{Hom}\,(X,Y)$				
`\xExt_{\Omega}(X,Y)`	$\mapsto \mathrm{Ext}_\Omega(X,Y)$				
`\xTor_{\varepsilon}^{\Lambda}(X,Y)`	$\mapsto \mathrm{Tor}_\varepsilon^\Lambda(X,Y)$				

Of course, they may be used in display style if necessary: `\displaystyle{\xdrv{x_1}{t_1}}`$\mapsto \dfrac{\mathrm{d}x_1}{\mathrm{d}t_1}$. Recall that `\dim`, `\ker` are already defined in LATEX, and may be used instead of `\xdim` and `\xker` (given here for uniformity). The macro `\xim` is for the image of a map, and LATEX provides `\Re` and `\Im` for the real and the imaginary parts of a complex number; `$\Re z$` and `$\Im z$` yield $\Re z$ and $\Im z$ respectively.

For the quaternions, the complex numbers, *etc.*, `\xQuaternion`, `\xC`, `\xR`, `\xQ`, `\xZ`, `\xN` yield respectively $\mathbb{H}$, $\mathbb{C}$, $\mathbb{R}$, $\mathbb{Q}$, $\mathbb{Z}$, $\mathbb{N}$. There is also `\xP` and `\xA` for $\mathbb{P}$ and $\mathbb{A}$ respectively. To use this font in some command, type (for example) `\newcommand{\F}{\mathbb{F}}`; then `$\F$`$\mapsto \mathbb{F}$. Vectors should be in boldface: `\mathbf{v}`$\mapsto \mathbf{v}$.

2.3. **Particular situations**

1. Several authors for one address. It frequently happens that two or more authors come from a same institution; their addresses are the same (except for their e-mail). In this case, use the `\sameaddress` command; its use is described in an example with the `\secondaddress` command below.

2. Two addresses for one author. Some authors have two academic addresses; in this case, they may use the `\secondaddress` command. The uses of `\sameaddress` and `\secondaddress` is better explained with an example (this paper itself!):

```
\author{Author One}
\address{Department of Theoretical Physics, University of ... ;
    \email{author.one@...\ \&\ author.three@...}}
\secondaddress{The Royal Academy of ... }
\author{Author Two}
\address{Institute for Fundamental ... ; \email{author.two@...}}
\author{Author Three}
\sameaddress{2}\secondaddress{The GLM Laboratories, ... }
```

Observe that: (1) `\address` and `\secondaddress` have an argument which is an address; like the `\address` command, `\secondaddress` produces numeral superscripts [1], [2], *etc.* referring to footnotes; (2) the argument of the `\sameaddress` command is an integer; it is the responsibility of the authors to give it its right value upon typesetting the document.
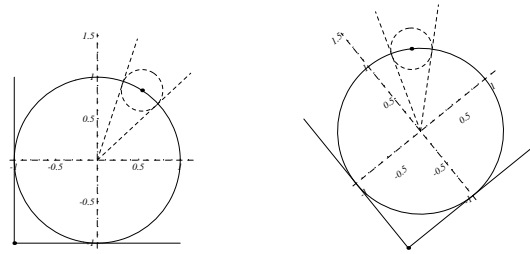
FIGURE 1. To illustrate the use of the graphicx package

3. Running title. The argument of the `\title` command automatically becomes the running title, unless you specify a running title using the `\runningtitle` command. The `\title` and `\runningtitle` commands work as follows: if the title is too long and you do not specify a running title, the running head of odd pages will be

YOUR TITLE IS TOO LONG TO BE A RUNNING TITLE; USE THE `\runningtitle` COMMAND.

In this case, you must use the `\runningtitle` command:

`\runningtitle{Measuring ...}`

4. Running authors. When the list of all authors is too long for the running head, use the `\runningauthors` command. The `\author` and `\runningauthors` command work as follows: if the list of all authors is too long, the running head of even pages will be

THE LIST OF AUTHORS IS TOO LONG TO BE IN THE RUNNING HEAD; USE THE `\runningauthors` COMMAND.

If so use the `\runningauthors` command with a shorter list of authors. The latin abbreviation *et al.* (`\etal`) may be used as in "J. SMITH *et al.*" (*v.g.* `\runningauthors{J. Smith \etal}`).

The command `\etal` is defined as well as `\cf`, `\ie`, `\etc`, `\apriori`, `\afortiori`, `\vg` and `\loccit`; note that the period after "*etc*" is *not* produced by `\etc` (to allow for "*etc*)." as at the end of the first paragraph of this document), and that *etc.* is never followed by " ... ". These latin abbreviation commands should not be changed; they must generally be followed by a pair of empty braces ({ }) when they are followed by a space.

2.4. **Including postscript files**

There are several packages used to include postscript files. For the journal, authors are kindly asked to use the `graphicx` package by D.P. Carlisle and S.P.Q. Rahtz (it is most likely already in your TeX distribution). For a full documentation on this package, see [5], and more generally, for including postscript files, see [1].

First, you preamble must contain the line `\usepackage{graphicx}`. Let us suppose that you have an `eps` file called `circl.eps`; the lines below produce figure 1.

```
\begin{figure}
  \centering \includegraphics[height=0.2\hsize]{circl.eps}
  \qquad
  \includegraphics[height=0.2\hsize,angle=39]{circl.eps}
  \caption{To illustrate the use of the graphicx package}
\end{figure}
```

2.5. **Acknowledgements**

There is an environment `\begin{acknowledgement} ... \end{acknowledgement}`; it may be used immediately before the bibliography to express your acknowledgements.

```
\begin{acknowledgement}
The first authors is thankfull ...
for ...  support.
\end{acknowledgement}
```

Thanks (`\thanks`) are generally reserved for thanking institutions, "acknowledgements" for thanking persons.

2.6. **Cross references and bibliography**

Authors should in all cases use the `\label`, `\ref`, `\pageref`, `\cite`, . . . commands and no "plain numbers". Every numbered part to which one wants to refer to should be labeled with a `\label{...}`, but unreferenced parts (sections, equations, figure, *etc.*) should not have a `\label{...}`. For multiple citations, do not use `\cite{A1}`, `\cite{A2}`, but `\cite{A1,A2}` instead.

There are two ways to produce literature references: either using the environment `\thebibliography` or using BIBTEX (see [2, 4]); in all cases, your references must appear as numbers: (*v.g.*: use `\bibitem{abc}` and not `\bibitem[xyz]{abc}`, *i.e.* do not give the optional argument to `\bibitem`). Do not use a "hand-made" bibliography.

References

[1] D.P. Carlisle, *Packages in the 'graphics' bundle*, available from CTAN as `grfguide.tex` and `grfguide.ps`.

[2] Michel Goossens, Frank Mittelbach, and Alexander Samarin, *The LATEX companion*, Addison-Wesley Co., Reading, MA, 1994.

[3] Donald E. Knuth, *The TEXbook*, Addison-Wesley, Reading, MA, 1984.

[4] Leslie Lamport, *LATEX: A document preparation system*, 2nd revised ed., Addison-Wesley, Reading, MA, 1994.

[5] Keith Reckdahl, *Using EPS Graphics in LATEX2$_\epsilon$ Documents*, available as `epslatex.ps` from the `ftp://ftp.tex.ac.uk/tex-archive/info/` directory (or other CTAN sites).

[6] Raymond Séroul, *Le petit livre de TEX*, Masson, Paris, 1996.

[7] M. D. Spivak, *The joy of TEX*, 2nd revised ed., Amer. Math. Soc., Providence, RI, 1990.