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L^AT_EX 2_ε guide for CPC authors

CAMBRIDGE T_EX-T-O-TYPE

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This guide is for authors who are preparing papers for *Combinatorics, Probability & Computing* using the L^AT_EX 2_ε document preparation system and the Cambridge University Press CPC class file. Please send your prepared manuscript to: **CPC@msci.memphis.edu**

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1. Introduction

The layout design for *Combinatorics, Probability & Computing* has been implemented as a L^AT_EX 2_ε class file. The CPC class is based on the ARTICLE class. Commands which differ from the standard L^AT_EX interface, or which are provided in addition to the standard interface, are explained in this guide.

1.1. The CPC Document Class and Style Issues

The use of document class allows a simple change of class to transform the appearance of your document. The CUP CPC class file preserves the standard L^AT_EX interface such that any document which can be produced using the standard L^AT_EX ARTICLE class, can also be produced with the CPC class. However, the measure (or width of text) differs from that of ARTICLE, therefore line breaks will change and long equations may need re-setting.

It is essential that you do not modify `cpc.cls`. When additional macros are required, place them in a separate file with the filename extension `.sty` (e.g. `smith_macros.sty`). Use your own name as filename. Treat this as a L^AT_EX package file:

```
\documentclass{cpc}
\usepackage{smith_macros}
```

In this way you will distinguish clearly between the main class file and your own macros, which can then be found easily by the journal editor. Do not forget to submit your own `.sty` file for publication along with your input file.

Note that the final printed version of papers will use the Monotype Times typeface rather than the Computer Modern available to authors. Also, the measure in CPC class is different from L^AT_EX 2_ε article class. For these reasons line lengths and page breaks will change and authors should not insert hard breaks in their text. Also avoid use of direct formatting unless really necessary. Papers will be edited as usual, and this process may be obstructed by the use of inserted line breaks, etc.

For general style issues, authors are referred to the ‘Preparation of manuscripts’ in the back cover of the journal. The language used in the journal is British English, and spelling should conform to this.

Use should be made of symbolic references (`\ref`) in order to protect against late changes of order, etc.

1.2. Extension packages

Many standard *extension packages*, such as `amssymb`, `amsmath`, or `epsfig`, are treated below.

The `cpc` class is compatible with many popular packages. The following have been used successfully in recent volumes of *Combinatorics, Probability & Computing*.

Special fonts and characters: `amssymb`, `amsfonts` and `latexsym`.

Equation formatting: `amsmath`.

Graphics: `psfig`, `epsf/epsfig`, `pictex`, `epic`, `graphics`, `graphicx`, `longtable`, `psfrag` and `subfigure`.

Other: `showkeys` (for drafting only), `ifthen` and `algorithmic`.

We particularly recommend the use of the `amsmath` package for equation formatting. We greatly prefer the appearance of its `align` environment to the standard `eqnarray` environment.

1.3. Document class options

In general, the standard document class options should *not* be used with the CPC class:

- `10pt`, `11pt`, `12pt` – unavailable.
- `draft`, `twoside` – `twoside` is the default.
- `fleqn`, `leqno`, `titlepage`, `twocolumn` – unavailable.

1.4. Submission of L^AT_EX articles

Authors who intend to submit a L^AT_EX article should obtain a copy of the CPC class file. This is available on Core at this link.

The `readme.txt` (which is in the same directory) tells you how to unzip the `cpc-cls.zip` file. There may also be an ‘unpacked’ directory containing all of the files separately, in

case of difficulty. If you cannot obtain the CPC files, use the standard `article` class, with the default ‘10pt’ option.

2. Additional facilities

In addition to all the standard L^AT_EX design elements, the CPC class includes the following features:

- Extended commands for specifying a short version of the title and author(s) for the running headlines.
- Full width and narrow figures and tables.
- Theorem-like and proof environments.
- Control of enumerated lists.

Once you have used these additional facilities in your document, do not process it with a standard L^AT_EX class file.

2.1. Titles and author’s names

In the CPC class, the title of the article and the author’s name (or authors’ names) are used both at the beginning of the article for the main title and throughout the article as running headlines at the top of every page. The title is used on odd-numbered pages (rectos) and the author’s name appears on even-numbered pages (versos). Although the main heading can run to several lines of text, the running head line must be a single line. Moreover, the main heading can also incorporate new line commands (e.g. `\`) but these are not acceptable in a running headline. To enable you to specify an alternative short title and author’s name, the standard `\title` and `\author` commands have been extended to take an optional argument to be used as the running headline:

```
\title[A short title]{The full title which can be as long
                        as necessary}
\author[Author’s name]{A\ls U\ls T\ls H\ls O\ls R’S\ns
                       F\ls U\ls L\ls L\ns N\ls A\ls M\ls E\ns
                       I\ls N\ns C\ls A\ls P\ls S}}
\affil{Full Affiliation\}
(e-mail: \texttt{email address})}
```

The following example, taken from [2], shows how this is done with more than one author, with different affiliations and a grant acknowledgement.

```
\title[On the Diameter of Random Cayley Graphs]{On the Diameter of
Random Cayley Graphs of the Symmetric Group}
\author[L. Babai and G. L. Hetyei]{L.\ns B\ls A\ls B\ls A\ls I{^1$}%
\thanks{Research partially supported by OTKA Grant No 2581.}
and\ns G.\ns L.\ns H\ls E\ls T\ls Y\ls E\ls I{^2$}}
\affil{^1$^1$} Department of Computer Science, University of
Chicago, 1100 E 58th St, Chicago IL 60637--1504 \}
and E\{o}tv\{o} University, Budapest, Hungary \}
(email: \texttt{babai@cambridge.org})\}[6pt]
```

```
{ $\^2$ } Department of Mathematics, M.I.T.,
Cambridge MA 02139, USA\
(email: \texttt{hetyei@cambridge.org})}
```

Note the use of `to` to letterspace the authors' names and insert an appropriate space between the names.

Once you have used these extended versions of `\author` and `\title`, do not use them with a standard L^AT_EX class file.

2.2. Figures and Tables

The `figure` and `table` environments are implemented as described in the L^AT_EX Manual to provide consecutively numbered floating inserts for illustrations and tables respectively. The standard inserts and their captions are formatted unjustified over the full text width. Line breaks in captions can be inserted as required using `\newline`.

2.3. Theorems and remarks

The `\newtheorem` command has been used in the CPC class file to define the following environments.

- `theorem`
- `corollary`
- `lemma`
- `proposition`

Each of the new environments listed above has a `*`-form in CPC class (`theorem*`, `corollary*`, *etc*) which will give you an unnumbered theorem (*corollary*, *etc*).

The following shows an example of these environments in use.

```
\begin{proposition}
  For every set  $X$  of  $n$  points in the plane and for every
   $\epsilon > 0$ , there is a weak  $\epsilon$ -net of size
   $O(\epsilon^{-\log_{4/3} 4})$ . Such a net can be found in time
   $O(n \log(1/\epsilon))$ .
\end{proposition}
\begin{remark}
  Without finding the fine structure (the clusters) of the set  $X$ ,
  one cannot obtain a smaller  $\epsilon$ -net than
   $\Omega(1/\epsilon^2)$ .
\end{remark}
```

This produces the following:

Proposition 2.1. *For every set X of n points in the plane and for every $\epsilon > 0$, there is a weak ϵ -net of size $O(\epsilon^{-\log_{4/3} 4})$. Such a net can be found in time $O(n \log(1/\epsilon))$.*

Remark. Without finding the fine structure (the clusters) of the set X , one cannot obtain a smaller ϵ -net than $\Omega(1/\epsilon^2)$.

2.4. Proofs

The `proof` environment has been added to the standard L^AT_EX constructs to provide a consistent format for proofs. For example,

```
\begin{lemma}
  If  $\{\mathbf{PP}\}_0 \vdash a \text{ colon } A$ , then there exists a closed
   $\lambda$ -term  $a'$  s.t.
  \[ $\{\mathbf{PN}\}_0 \vdash a' \text{ colon } A$ .]
  Conversely, if  $\{\mathbf{PN}\}_0 \vdash a \text{ colon } A$ , then there exists
  a closed SK-term  $a^\circ$  s.t.
  \[ $\{\mathbf{PP}\}_0 \vdash a^\circ \text{ colon } A$ .]
\end{lemma}
\begin{proof}
  Use  $K_\lambda$  and  $S_\lambda$  to translate combinators
  into  $\lambda$ -terms. For the converse, translate
   $\lambda x \dots$  by  $[x] \dots$  and use induction
  and the lemma.
\end{proof}
```

produces the following text:

Lemma 2.2. *If $\mathbf{PP}_0 \vdash a : A$, then there exists a closed λ -term a' s.t.*

$$\mathbf{PN}_0 \vdash a' : A.$$

Conversely, if $\mathbf{PN}_0 \vdash a : A$, then there exists a closed SK-term a° s.t.

$$\mathbf{PP}_0 \vdash a^\circ : A.$$

Proof. Use K_λ and S_λ to translate combinators into λ -terms. For the converse, translate $\lambda x \dots$ by $[x] \dots$ and use induction and the lemma. \square

The final \square will not be included if the `proof*` environment is used. Note that the proof-box is drawn by a new macro `\proofbox` and can be placed in text by typing `\usebox{\proofbox}`.

The proof environment will also take an optional argument which allows you to produce ‘special’ proofs, e.g.

Proof of Theorem 27. Use K_λ and S_λ to translate combinators into λ -terms. For the converse, translate $\lambda x \dots$ by $[x] \dots$ and use induction and the lemma. \square

Which was produced like this:

```
\begin{proof}[Proof of Theorem~27.]
  Use  $K_\lambda$  and  $S_\lambda$  to translate combinators
  into  $\lambda$ -terms. For the converse, translate
   $\lambda x \dots$  by  $[x] \dots$  and use induction
  and the lemma.
\end{proof}
```

```
\end{proof}
```

Notice that once the optional argument is used, you have to type all of the text which is to appear as the heading (including the full-stop).

2.5. Lists

The CPC class provides the three standard list environments plus an additional unnumbered list:

- Numbered lists, created using the `enumerate` environment.
- Bulleted lists, created using the `itemize` environment.
- Labelled lists, created using the `description` environment.

The enumerated list numbers each list item with an arabic numeral; alternative styles can be achieved by inserting a redefinition of the number labelling command after the `\begin{enumerate}`. For example, a list numbered with roman numerals inside parentheses can be produced by the following commands:

```
\begin{enumerate}
  \renewcommand{\theenumi}{(\roman{enumi})}
  \item first item
  :
\end{enumerate}
```

This produces the following list:

- (i) first item
- (ii) second item
- (iii) etc...

In the last example, the label for item 3 (iii) is pushed out into the margin because the standard list indentation is designed to be sufficient for arabic numerals rather than the wider roman numerals. In order to enable different labels to be used more easily, the `enumerate` environment in the CPC class can be given an optional argument which (like a standard `bibliography` environment) specifies the *widest label*. For example,

- (i) first item
- (ii) second item
- (iii) etc...

was produced by the following input:

```
\begin{enumerate}[(iii)]
  \renewcommand{\theenumi}{(\roman{enumi})}
  \item first item
  :
\end{enumerate}
```

Remember, once you have used the optional argument on the `enumerate` environment, do not process your document with a standard L^AT_EX class file.

3. Some guidelines for using standard facilities

The following notes may help you achieve the best effects with the CPC class file.

Figure 1. An example figure with space for artwork.

3.1. Sections

L^AT_EX provides five levels of section headings. Only three of these are defined in the CPC class file:

- Heading A – `\section`
- Heading B – `\subsection`
- Heading C – `\subsubsection`

Section numbers are generated for section, subsection and subsubsection headings. Note that you must add punctuation, often a full stop, to the end of the subsubsection headings where the following text runs on.

3.2. Running headlines

As described above, the title of the article and the author's name (or authors' names) are used as running headlines at the top of every page. The title is used on odd-numbered pages (rectos) and the author's name appears on even-numbered pages (versos).

The `\pagestyle` and `\thispagestyle` commands should *not* be used. Similarly, the commands `\markright` and `\markboth` should not be necessary.

3.3. Illustrations (or figures)

The CPC class will cope with most positioning of your illustrations and tables and you should not normally use the optional positional qualifiers on the `figure` environment which would override these decisions. Figure captions should be below the figure itself therefore the `\caption` command should appear after the figure or space left for an illustration. For example, Figure 1 is produced using the following commands:

```
\begin{figure}
  \vspace{3cm}
  \caption{An example figure with space for artwork.}
  \label{sample-figure}
\end{figure}
```

3.4. Tables

The CPC class will cope with most positioning of your illustrations and tables and you should not normally use the optional positional qualifiers on the `table` environment which would override these decisions. Table captions should be at the top therefore the `\caption` command should appear before the body of the table. For example, Table 1 is produced using the following commands:

Table 1. An example table

Figure	hA	hB	hC
2	$\exp(\pi i \frac{5}{8})$	$\exp(\pi i \frac{1}{8})$	0
3	-1	$\exp(\pi i \frac{3}{4})$	1
4	$-4 + 3i$	$-4 + 3i$	$\frac{7}{4}$
5	-2	-2	$\frac{5}{4}i$

```

\begin{table}
  \caption{An example table}
  \begin{tabular}{cccc}
    \hline \hline
    Figure & $hA$ & $hB$ & $hC$ \\
    \hline
    2 & $\exp\left(\pi i \frac{5}{8}\right)$ & $\exp\left(\pi i \frac{1}{8}\right)$ & $0$ \\
    3 & $-1$ & $\exp\left(\pi i \frac{3}{4}\right)$ & $1$ \\
    4 & $-4+3i$ & $-4+3i$ & $\frac{7}{4}$ \\
    5 & $-2$ & $-2$ & $\frac{5}{4}i$ \\
    \hline \hline
  \end{tabular}
  \label{sample-table}
\end{table}

```

The `tabular` environment should be used to produce ruled tables; it has been modified for the CPC class so that additional vertical space is inserted on either side of a rule (produced by `\hline`). Commands to redefine quantities such as `\arraystretch` should be omitted.

3.5. Appendices

Use the standard L^AT_EX `\appendix` command. (`\section*` within an appendix will generate an entry in the table of contents in this style.)

Appendices should normally be placed after the main sections and before an acknowledgement and the list of references. This ensures that the references can be found easily at the end of the article. Occasionally, appendices are so different from the main text, as in this document, that they should be placed at the end.

3.6. Bibliography

As with standard L^AT_EX, there are two ways of producing a bibliography; either by compiling a list of references by hand (using a `thebibliography` environment), or by using BibTeX with a suitable bibliographic database.

In standard L^AT_EX you make a citation such as [6] by typing `\cite{JR69}`. You may also type `\cite{AJ87,DK84,TDR87}` to produce the citation list [1, 5, 7]. The key JR69 establishes the cross-reference to the bibliography (see below). The `\bibitem`'s are num-

bered automatically and these numbers are typeset both as the in-text citation and as the label in the list of references.

The following listing shows examples of references prepared in the style of the journal and they are typeset below.

```
\begin{thebibliography}{9}
\bibitem{AJ87}
  Augustsson,~L. and Johnsson,~T. (1987) LML users' manual. PMG
  Report, Department of Computer Science, Chalmers University of
  Technology, Goteborg, Sweden.
\bibitem{BH92}
  Babai L. and Hetyei G.\,L. (1992) On the diameter of random Cayley
  graphs of the symmetric group. {\em Comb. Prob. Comp.}
  {\bf 1} 210--208.
\bibitem{JC87}
  Conklin,~J. (1987) Hypertext: an introduction and survey.
  {\em IEEE Computer} {\bf 20} 17--41.
\bibitem{ED76}
  Dijkstra,~E.\,W. (1976) {\em A Discipline of Programming}.
  Prentice-Hall.
\bibitem{DK84}
  Knuth,~D.\,E. (1984) Literate programming. {\em BCS Comput.\ J.}
  {\bf 27} 97--111 (May).
\bibitem{JR69}
  Reynolds,~J.\,C. (1969) Transformation systems and the
  algebraic structure of atomic formulas. In B. Meltzer and
  D. Michie (editors), {\em Machine Intelligence} {\bf 5} 135--151.
  Edinburgh University Press.
\bibitem{TDR87}
  Toyn,~I., Dix,~A. and Runciman,~C. (1987) Performance
  polymorphism. In {\em Functional Programming Languages and
  Computer Architecture, Lecture Notes in Computer Science} {\bf 274}
  325--346. Springer-Verlag.
\end{thebibliography}
```

References

- [1] Augustsson, L. and Johnsson, T. (1987) LML users' manual. PMG Report, Department of Computer Science, Chalmers University of Technology, Goteborg, Sweden.
- [2] Babai L. and Hetyei G. L. (1992) On the diameter of random Cayley graphs of the symmetric group. *Comb. Prob. Comp.* **1** 210–208.
- [3] Conklin, J. (1987) Hypertext: an introduction and survey. *IEEE Computer* **20** 17–41.
- [4] Dijkstra, E. W. (1976) *A Discipline of Programming*. Prentice-Hall.
- [5] Knuth, D. E. (1984) Literate programming. *BCS Comput. J.* **27** 97–111 (May).
- [6] Reynolds, J. C. (1969) Transformation systems and the algebraic structure of atomic formu-

- las. In *Machine Intelligence*, Vol. 5 (B. Meltzer and D. Michie, eds), Edinburgh University Press, pp. 135–151.
- [7] Toyn, I., Dix, A. and Runciman, C. (1987) Performance polymorphism. In *Functional Programming Languages and Computer Architecture*, Vol. 274 of *Lecture Notes in Computer Science*, Springer, pp. 325–346.

Appendix A. Special commands in `cpc.cls`

The following is a summary of the new commands, optional arguments and environments which have been added to the standard L^AT_EX user-interface in creating the CPC class file.

New commands

<code>\ls</code>	to letter space the author's names.
<code>\proofbox</code>	used with <code>\usebox</code> to place a proofbox in text.
<code>\removebrackets</code>	removes the '()' brackets from around the optional argument of environments created by the <code>\newtheorem</code> and <code>\newremark</code> commands. Should be placed just before the appropriate environment.

New optional arguments

<code>[<short title>]</code>	in the <code>\title</code> command: to define a right running headline that is different from the article title.
<code>[<short author>]</code>	in the <code>\author</code> command: to define a left running headline with text that is different from the authors' names as typeset at the article opening.
<code>[<widest label>]</code>	in <code>\begin{enumerate}</code> : to ensure the correct alignment of numbered lists.

New environments

<code>figure*</code>	this environment is redefined in <code>cpc.cls</code> to typeset a long figure legend to the full text-width.
<code>table*</code>	redefined in <code>cpc.cls</code> to typeset wide tables, so that the table caption and rules are the full text-width.
<code>theorem, corollary, lemma, proposition</code>	defined in <code>cpc.cls</code> using <code>\newtheorem</code> ; text default: italic, *-forms are unnumbered.
<code>remark, definition</code>	defined in <code>cpc.cls</code> using <code>\newremark</code> , text default: roman; unnumbered.
<code>proof</code>	to typeset mathematical proofs.
<code>proof*</code>	to typeset mathematical proofs without the terminating proofbox.