The \texttt{aipproc} class v1.0 for \LaTeX\texttt{2\epsilon}

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\section*{Abstract}
This document describes the functionality and use of the \texttt{aipproc} class by explaining its extensions and restrictions compared to the \texttt{article} class of standard \LaTeX. It is not a manual to be used on its own but should be used together with an introductory manual on \LaTeX\texttt{2\epsilon} such as (4).

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\section*{GENERAL OVERVIEW}

The \texttt{aipproc} class is a \LaTeX\texttt{2\epsilon} document class for conference proceedings of the American Institute of Physics. It is intended to produce camera-ready copy for direct photo-offset use. The only modification done by the AIP is adding appropriate page numbers.

The class implements the layout as specified in \textit{Instructions for Preparation of Camera Ready Manuscripts} (1). It provides essentially the same markup as implemented by \LaTeX\texttt{2\epsilon}'s standard \texttt{article} class. In addition to this it implements the following:

\begin{itemize}
\item extended set of front matter commands,
\item automatic placement of floats into column or page areas including turning of table floats by 90\textdegree if necessary,
\item allows mixing column and page-wide floats without getting the numbering out of sync,
\item footnotes will appear below bottom floats,
\item support for table notes,
\item support for textual page references like “on the next page”.
\end{itemize}

\section*{CLASS DETAILS}

\subsection*{Supported options}

As the class is based on the \texttt{article} class of standard \LaTeX all reasonable\textsuperscript{1} options of this class are supported automatically. In addition there are a number of options unique to the \texttt{aipproc} class.

Four options control the selection of fonts in the document; use at most one of them.

\texttt{mathptm} Directs the class to use PostScript Times and Symbol fonts (a few missing glyphs are taken from Computer Modern) for math by loading the \texttt{mathptm} package.

This option is the default.

\textsuperscript{1} Reasonable means not conflicting with fixed requirements for the AIP class, e.g., as this class requires 10pt body size option 11pt and 12pt are ignored and produce a warning.
mathtime  Directs the class to use MathTime fonts for math by loading the mathtime package. These fonts are commercial so that this option will not work if you don’t own them.

nomathfonts  Directs the class not to set up math fonts (which means using the installation default which is usually Computer Modern). This option is intended in case a special math font setup is loaded in the document preamble.

cmfonts  Directs the class to use standard Computer Modern fonts for math and text. This does not conform to the specification for this class and is intended for draft preparation in environments where the required fonts are unavailable.

The next options enable textual references; if this is desired select one of them:

varioref  Loads the varioref package (see (2, p.41ff)) allowing to produce textual page references. See section on Cross-references on the following page for details.

nonvarioref  Disables the \reftextvario command so that the strings produced by varioref commands will not depend on the number of references seen so far. Implies the varioref option.

Notes to tables can be influenced as follows:

tnotealph  Produce raised lower case alphabetic marks to indicate table notes.

tnotesymbol  Use footnote symbols to indicate table notes (default).

Finally there is one standard article class option which has its functionality extended:

draft  Allows \tableofcontents and similar commands to work without error message (during development of article). Shows overfull boxes, disables including of graphics for faster printing. It also provides page numbers in the printout.

Multiple authors

No special provision is made in the markup for supporting multiple authors. List all authors within an \author declaration separated by appropriate punctuation and/or the word “and”. If necessary use \ to produce line breaks in the right places.

affiliation{affiliation text}  This affiliation command is unique to the aipproc class and is intended to carry the author’s address.

date(date)  The article class also provides the \date command which is not used by aipproc class. If supplied it will be ignored unless the draft option is specified in which case it will show up in a footer line together with the title and the page number to ease document development.

maketitle  This command inserts the actual front matter data. It has to follow the above declarations.

begin{abstract}  The abstract environment can appear before or after the \maketitle command.

Front matter

The class supports the standard article class front matter commands with the following exceptions and additions:

\title{title text}  This \title command is unique to the aipproc class.

\author{author name}  The author name should not contain the address.

\affiliation{affiliation text}  This \affiliation command is unique to the aipproc class and is intended to carry the author’s address.

\affiliationmark{letter/symbol}  The \affiliationmark command will print the letter in a small typeface and raise it appropriately to the position of a footnote symbol. It is the responsibility of the author to select appropriate letters.

The \affiliationmark command as defined in the article class to separate multiple authors is not supported.
**Other front matter commands**

The \texttt{tableofcontents}, \texttt{listoffigures}, and \texttt{listoftables} commands are provided but produce an error message unless the draft option was selected. This is done since the \texttt{aipproc} class does not support page numbering and thus the above commands essentially produce incorrect data.

**Headings**

The \texttt{aipproc} class officially supports three heading levels, i.e., \texttt{section}, \texttt{subsection}, and \texttt{subsubsection}.

It also supports the commands \texttt{paragraph} and \texttt{subparagraph} although the latter heading levels are not part of the \texttt{aipproc} class specification and are therefore discouraged.

**Cross-references**

Cross-references to page numbers are not possible with the \texttt{aipproc} class as the page numbers are determined after production. For this reason the \texttt{pageref} command of \LaTeX{} is disabled by default.

Since headings don’t carry numbers they can’t be referenced either.

References to tables, figures, and equations are possible using the \LaTeX{} commands \texttt{label} and \texttt{ref}.

However if the class option varioref or nonvarioref is used, references to page numbers are possible again as they will generate textual references of the form “on the following page” or “on an earlier page” etc. The produced strings are customizable as described in detail in the varioref package documentation or in (2, pp.41ff).

The class defaults are as follows and can be changed with \texttt{\renewcommand} in the document preamble. The varioref package normally distinguishes between reference to facing pages and references to pages that need turning over using different strings in these cases. However, since with \texttt{aipproc} class page numbers are not determined at the time of production no assumption can be made that page $x$ and $x+1$ actually fall onto the same double spread. For this reason the defaults used here do not produce strings containing the word “facing” or “opposite”.

\begin{verbatim}
\renewcommand\reftextfaceafter {on the \reftextvario{next}{following} page}
\renewcommand\reftextfacebefore {on the \reftextvario{previous}{page before}}
\renewcommand\reftextcurrent {on \reftextvario{this}{the current} page}
\end{verbatim}

Normally, text for references which are “far away” are produced using \texttt{\reftextfaraway} in varioref. However, to produce textual references without referring to actual page numbers even in this case, this command was hijacked in the \texttt{aipproc} class and redefined to determine whether or not this is a reference to some earlier or later page. So instead of changing this command the class provides the following two commands for customization:

\begin{verbatim}
\renewcommand\reftextearlier {\reftextvario{on an earlier page}{earlier on}}
\renewcommand\reftextlater {\reftextvario{later on}{further down}}
\end{verbatim}

To illustrate the result of this package all references in this document are made using \texttt{\vref} or \texttt{\vpageref}, e.g., references to Figure 2 further down and Figure 1 on the following page. These commands work best if used only for important references. Be careful when using them several times close to each other as the automatically generated texts then may sound strange (as they do in the example in this paragraph).

**Lists**

The \texttt{aipproc} class supports all standard list environments like \texttt{itemize}, \texttt{enumerate}, etc.

**Graphics support**

Support for including and manipulating graphics is provided as the standard \LaTeX{} \texttt{graphicx} package is automatically loaded by the \texttt{aipproc} class. For detailed descriptions of the commands made available by this package see (3) or the package documentation coming with the \LaTeX{} release. A sufficient introduction is also given by (4) although there only the \texttt{graphics} package (a subset of the \texttt{graphicx} package) is described.
A typical application is given in the following example where a picture is resized to span 70% of one column:

\begin{figure}[!b]
\resizebox{.7\columnwidth}{!}{\includegraphics{escher}}
\caption{An illustration taken from \cite{A-W:GMS94}}
\label{fig:a}
\end{figure}

resulting in figure 1.

**Floats**

Floats are objects which do not have to stay in sync with the running text but are allowed to move from their original place to some other position where they fit better for page breaking reasons. Such objects they are typically numbered so that they can be referenced from within the running text.

\LaTeX{} by default supports two float types: figures and tables. These float types are also supported by the \texttt{aipproc} class although their internal implementation is quite different resulting in a number of important differences in behaviour:\footnote{There exist packages that extend the number of float types. (This information is given as a footnote to show that footnotes in this class come out below a bottom float.)}

- The position of the float caption is determined automatically, independently of the placement of the \texttt{\caption} command within the float body.
- Depending on its width the float automatically spans two columns. In case of a table the whole object (including its caption) might even be rotated automatically if its exceeds \texttt{\textwidth}.
- The body of the float environments are processed in L-R mode and not in paragraph mode as in standard \LaTeX{}. This is necessary for measuring its width. Thus if paragraph mode is needed one has to put a \texttt{minipage} environment of the appropriate width (e.g., \texttt{\columnwidth}) into the body.
- Only one \texttt{\caption} command per float is allowed.

\begin{figure}[pos]
\resizebox{.8\textwidth}{!}{\includegraphics{outline}}
\caption{PostScript example taken from \cite{A-W:GMS94}}
\label{fig:b}
\end{figure}

The result is shown in Figure 2 on the following page.

**Figures**

Like with standard \LaTeX{} the optional \texttt{pos} argument can be used to specify into which float areas this float is allowed to migrate (default is \texttt{tbp}).

The environment \texttt{\texttt{figure}\*} is not supported as figures that need to span both columns are automatically recognized.

\begin{figure*}[pos]
\source{F. Mittelbach}
\caption{ \texttt{FIGURE 1}. An illustration taken from (2) }
\end{figure*}

**Tables**

Like with standard \LaTeX{} the optional \texttt{pos} argument can be used to specify into which float areas this float is allowed to migrate (default is \texttt{tbp}).

The environment \texttt{\texttt{table}\*} is not supported as tables that need to span both columns are automatically recognized.

Typically the body of the environment would consist of a \texttt{\texttt{tabular}} environment responsible for producing the actual table including the table and stub headers.

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To ease the production of tables the command `\tablehead` is provided which is essentially an abbreviation for a `\multicolumn` command that additionally boldens its text argument. I.e., `cols` specifies the number of columns the `heading text` should span and `h-pos` defines the horizontal positioning of the text of the column(s), e.g., `l`, `r`, `c`, or `p{...}`. In contrast to a simple `\multicolumn` command the `heading text` can be split vertically by using `\` to denote the line breaks. The `v-pos` argument should contain either `t`, `c`, or `b` denoting the vertical placement of the text in relation to other cells of that row. It is only relevant if the `heading text` consists of more than one line. See the example table below that demonstrates the use of this command.

Command to specify the origin of the data given in the table. The `text` will be printed in small italics below the table.

Command to produce a note to the table. It can only be used within a `table` environment and should be used only at the right end of a table cell. The command produces a raised footnote symbol at the place used which sticks into the right margin. As far as \LaTeX is concerned this symbol does not occupy any space. Thus is will not modify the alignment of table columns. The `text` will appear below the table.

In the current release notes to `\caption` or `\source` are not possible.

Like `\tablenote` but this time the raised footnote symbol will occupy space. This version is intended to be used in the middle of cells.

An example showing the use of all commands described above is shown in Table 1. It was produced by the following input:

```
\begin{table}
\begin{tabular}{lrrrr}
\hline
\&\tablehead{1}{r}{b}{Single\outlet} & \tablehead{1}{r}{b}{Small\tablenote\{2-9 retail outlets\}\multiple} & \tablehead{1}{r}{b}{Large\multiple} & \tablehead{1}{r}{b}{Total} \\
\hline
1982 & 98 & 129 & 620 & 847 \\
1987 & 138 & 176 & 1000 & 1314 \\
1991 & 173 & 248 & 1230 & 1651 \\
1998\tablenote{predicted} & 200 & 300 & 1500 & 2000 \\
\hline
\end{tabular}
\source{Central Statistical Office, UK}
\caption{Average turnover per shop: by type of retail organisation}
\label{tab:a}
\end{table}
```

<table>
<thead>
<tr>
<th></th>
<th>Single outlet</th>
<th>Small\textsuperscript{a} multiple</th>
<th>Large multiple</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>98</td>
<td>129</td>
<td>620</td>
<td>847</td>
</tr>
<tr>
<td>1987</td>
<td>138</td>
<td>176</td>
<td>1000</td>
<td>1314</td>
</tr>
<tr>
<td>1991</td>
<td>173</td>
<td>248</td>
<td>1230</td>
<td>1651</td>
</tr>
<tr>
<td>1998\textsuperscript{b}</td>
<td>200</td>
<td>300</td>
<td>1500</td>
<td>2000</td>
</tr>
</tbody>
</table>

\textsuperscript{a} 2-9 retail outlets
\textsuperscript{b} predicted

```
\begin{table}
\begin{tabular}{lrrrr}
\hline
\&\tablehead{1}{r}{b}{Single\outlet} & \tablehead{1}{r}{b}{Small\tablenote\{2-9 retail outlets\}\multiple} & \tablehead{1}{r}{b}{Large\multiple} & \tablehead{1}{r}{b}{Total} \\
\hline
1982 & 98 & 129 & 620 & 847\textbackslash \textbackslash
1987 & 138 & 176 & 1000 & 1314\textbackslash \textbackslash
1991 & 173 & 248 & 1230 & 1651\textbackslash \textbackslash
1998\tablenote{predicted}\& 200 & 300 & 1500 & 2000\textbackslash \textbackslash
\hline
\end{tabular}
\source{Central Statistical Office, UK}
\caption{Average turnover per shop: by type of retail organisation}
\label{tab:a}
\end{table}
```

Counters

The `\alph` and `\fnsymbol` commands to represent counter values have extended ranges. For example `\alph` will now count up to 52 (`zz`) and the `\fnsymbol` command will produce the following symbols `*`, `†`, `‡`, `$`, `¶`, `‖`, `‴`, `†′`, `‡′`, `‴′`, `§§`, `¶¶`, `§§§`, `¶¶¶`. This
will allow for up to 16 table notes per table. For documents that need a larger number of table notes select the option \texttt{tnotealph} to switch to lower case alphabetic letters to mark such notes.

**Long tables**

Tables which are longer than one page cannot be placed into a \texttt{table} environment as floats cannot have a size larger than a page. Such tables are supported by the standard \texttt{longtable} package written by David Carlisle. However this package only works in single column mode. For this reason the following steps must be carried out to add such tables to the document:

1. Place an \texttt{\usepackage{longtable}} declaration into the preamble of the document.
2. At the end of the article before \texttt{\end{document}} add the command \texttt{\onecolumn} followed by an arbitrary number of \texttt{longtable} environments.

The package is supported by the class in the sense that captions within a \texttt{longtable} environment will be formatted using the appropriate style; however in contrast to the \texttt{table} environment it is the responsibility of the user to place the caption at the top of the table. The commands \texttt{\source} and \texttt{\tablenote} are not supported within this environment, but the \texttt{\tablehead} command can be used to produce column heads if desired.

Refer to the \texttt{longtable} package documentation or to (4, p.122ff) for a detailed description of the syntax of the \texttt{longtable} environment.

A possible alternative is the package \texttt{supertabular} written by Johannes Braams; however in this case no attempt has been made to ensure that a table produced with \texttt{supertabular} conforms to the layout specification for the \texttt{aipproc} class. Be aware that this package defines its own \texttt{\tablehead} command (with a completely different function).

Refer to the \texttt{supertabular} package documentation for the syntax description. A detailed comparison between \texttt{supertabular} and \texttt{longtable} can be found in Chapter 5 of (4).

**Building floats manually**

The original \texttt{\LaTeX} environments \texttt{figure} and \texttt{table} as well as their star forms are still available under the names \texttt{ltxfigure} and \texttt{ltxtable}. They should not be used in normal circumstances but are provided in case the automatism of the \texttt{aipproc} class needs overwriting.

Please note that if these environments are used the position of the \texttt{\caption} command determines the placement of the caption within the float body and that the special commands for figures and tables, e.g., \texttt{\tablenote}, etc. as provided by this class are not available within these environments.

**Bibliography**

Referring to other articles, books, etc. is done using the \texttt{\cite} command of standard \texttt{\LaTeX}. The list of references itself can either be produced using standard \texttt{\LaTeX} methods or using \texttt{\BibTeX}.

**Bibliography produced manually**

\begin{verbatim}
\begin{thebibliography}{widest-label}
\bibitem{label}
\end{thebibliography}
\end{verbatim}

Environment to hold the list of references.

\begin{verbatim}
\bibitem{label}
\end{verbatim}

Command to start a bibliographical entry having the label \texttt{label} for use in \texttt{\cite} commands. Refer to (1) for information on how to lay out individual entries.

**Bibliography produced using \texttt{\BibTeX}**

The \texttt{aipproc} class is accompanied by a \texttt{\BibTeX} style file which can be used to produce AIP compliant reference lists from \texttt{\BibTeX} database files. To use \texttt{\BibTeX} one first has to run the source file through \texttt{\LaTeX} the run \texttt{\BibTeX} and then rerun \texttt{\LaTeX} twice to get all references resolved. \texttt{\BibTeX} is described in more detail in appendix B of (4) and in chapter 13 of (2).

\begin{verbatim}
\bibliographystyle{aipproc}
\end{verbatim}

This declaration specifies to \texttt{\BibTeX} that the style \texttt{aipproc} should be used. It can be placed anywhere within the document but is usually positioned directly in front of the command described below.

\begin{verbatim}
\bibliography{bib-list}
\end{verbatim}

This command denotes the position where the reference list produced by \texttt{\BibTeX} will be included in the document. The \texttt{bib-list} is a comma separated list of \texttt{\BibTeX} database files.
Table 2. Files used by the aipproc class

<table>
<thead>
<tr>
<th>File</th>
<th>Date</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>aipproc.cls</td>
<td>1998/08/21</td>
<td>v0.9a</td>
<td>AIP Proceedings (FMI)</td>
</tr>
<tr>
<td>calc.sty</td>
<td>1997/11/11</td>
<td>v4.0e</td>
<td>Infix arithmetic (KKT,FJ)</td>
</tr>
<tr>
<td>graphicx.sty</td>
<td>1997/06/09</td>
<td>v1.0d</td>
<td>Enhanced LaTeX Graphics (DPC,SPQR)</td>
</tr>
<tr>
<td>keyval.sty</td>
<td>1997/11/10</td>
<td>v1.10</td>
<td>key=value parser (DPC)</td>
</tr>
<tr>
<td>graphics.sty</td>
<td>1997/09/09</td>
<td>v1.0f</td>
<td>Standard LaTeX Graphics (DPC,SPQR)</td>
</tr>
<tr>
<td>trig.sty</td>
<td>1994/10/16</td>
<td>v1.08</td>
<td>sin cos tan (DPC)</td>
</tr>
<tr>
<td>dvips.def</td>
<td>1997/09/09</td>
<td>v3.0e</td>
<td>Driver-dependant file (DPC,SPQR)</td>
</tr>
<tr>
<td>article.cls</td>
<td>1998/05/05</td>
<td>v1.3y</td>
<td>Standard LaTeX document class</td>
</tr>
<tr>
<td>size10.clo</td>
<td>1998/05/05</td>
<td>v1.3y</td>
<td>Standard LaTeX file (size option)</td>
</tr>
<tr>
<td>mathptm.sty</td>
<td>1998/01/07</td>
<td>PSNFSS v.7</td>
<td>Times + math package from fontinst : S Rahtz</td>
</tr>
<tr>
<td>fontenc.sty</td>
<td>1998/06/12</td>
<td>v1.9p</td>
<td>Standard LaTeX package</td>
</tr>
<tr>
<td>t1enc.def</td>
<td>1998/06/12</td>
<td>v1.9p</td>
<td>Standard LaTeX file</td>
</tr>
<tr>
<td>times.sty</td>
<td>1998/01/07</td>
<td>PSNFSS v.7</td>
<td>Times font as default roman : S Rahtz</td>
</tr>
<tr>
<td>textcomp.sty</td>
<td>1998/06/12</td>
<td>v1.9p</td>
<td>Standard LaTeX package</td>
</tr>
<tr>
<td>ts1enc.def</td>
<td>1998/06/12</td>
<td>v3.0d</td>
<td>(jk/car/fm) Standard LaTeX file</td>
</tr>
<tr>
<td>varioref.sty</td>
<td>1997/12/06</td>
<td>v1.1d</td>
<td>package for extended references (FMI)</td>
</tr>
<tr>
<td>fix2col.sty</td>
<td>1998/08/17</td>
<td>v0.03</td>
<td>Output Routine fixes for two column mode (DPC,FMI)</td>
</tr>
<tr>
<td>shortvrb.sty</td>
<td>1998/05/19</td>
<td>v2.0b</td>
<td>Standard LaTeX documentation package (FMI)</td>
</tr>
<tr>
<td>ts1cmr.fd</td>
<td>1998/03/27</td>
<td>v2.5g</td>
<td>Standard LaTeX font definitions</td>
</tr>
<tr>
<td>t1ptm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for T1/ptm.</td>
</tr>
<tr>
<td>t1prcr.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for T1/prcr.</td>
</tr>
<tr>
<td>ot1ptmcm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for OT1/ptmcm.</td>
</tr>
<tr>
<td>omlptmcm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for OML/ptmcm.</td>
</tr>
<tr>
<td>omspzccm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for OMS/pzccm.</td>
</tr>
<tr>
<td>omxpsycm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for OMX/psycm.</td>
</tr>
<tr>
<td>ot1ptm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for OT1/ptm.</td>
</tr>
<tr>
<td>ts1ptm.fd</td>
<td>1997/09/30</td>
<td>Fontinst v1.6</td>
<td>font definitions for TS1/ptm.</td>
</tr>
</tbody>
</table>

Source: Output of \listfiles when processing aipguide.tex

GENERAL REQUIREMENTS AND RESTRICTIONS

This class was designed to work with \LaTeXe release 1997/12/01 or a later version. Earlier releases may work but have not been tested.

With the exception of the package fix2col it only requires files which are part of a standard \LaTeX distribution, i.e., it should work if your installation contains the following components: base, tools, graphics, and psnfss, see 2 for files used to produce this document.

The most recent \LaTeX distribution as well as fix2col can be obtained from CTAN sites (Comprehensive \TeX Archive Network).

Refer to http://www.tug.org for more information on CTAN and \TeX in general.

A ready to run \TeX system for various platforms which has everything required is available on CD-ROM, look into http://www.tug.org/texlive.html.

REFERENCES