OpTEX
Format Based on Plain TeX and OPmac

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http://petr.olsak.net/optex

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1 The OPmac package is a set of simple additional macros to Plain TeX. It enables users to take advantage of basic \LaTeX{} functionality but keeps Plain TeX simplicity. See http://petr.olsak.net/optex-e.html for more information about it. For OPmac users: the red triangle ▶ in the right margin means that there is a difference from standard OPmac features.
Introduction

OpTEX is LuaTEX format with Plain \TeX{} and OPmac. Only LuaTEX engine is supported. The main goal of OpTEX is:

- OpTEX keeps the simplicity (like in Plain \TeX{} and OPmac macros).
- There is no old obscurities concerning with various 8-bit encodings and various engines.
- OpTEX provides a powerful font selection system (for Unicode font families, of course).
- OpTEX supports hyphenations of all languages installed in your \TeX{} system.
- All features from OPmac macros are copied.
- Macros are documented in the same place where code is (macros for printing such documentation will come in the future).
- User name space of control sequences is separated from internal name space of OpTEX and primitives (\texttt{\_foo} versus \texttt{\_foo}).

OpTEX should be a modern Plain \TeX{} with power from OPmac (fonts selection system, colors, external graphics, references, hyperlinks, indexing, bibliography, ...) with preferred Unicode fonts.

If you need to customize your document or you need to use something very specific, then you can copy relevant parts of OpTEX macros into your macro file and do changes of these macros here. This is significant difference from \LaTeX{} or ConTeXt, which are an attempt to create a new user level with a plenty of non-primitive parameters and syntax hiding \TeX{} internals. The macros from OpTEX are simple and straightforward because they solve only what is explicitly needed, they does not create a new user level for controlling your document over \TeX{}. And you can use OpTEX macros, understand them an modify them.

OpTEX offers a markup language for authors of texts (like \LaTeX{}), i.e. the fixed set of tags to define the structure of the document. This markup is different from the \LaTeX{} markup. It may offer to write the source text of the document somewhat clearer and more attractive.

 DISCLAIMER: This software is under construction. It is possible that some features documented here will be changed in future.

This manual desribes OpTEX features only. We suppose that user knows \TeX{} basic principles. They are described in many books. You can see a short document \TeX{} in nutshell too.

1 Starting with OpTEX

OpTEX is compiled as a format for LuaTEX. Maybe there is a command \texttt{optex} in your \TeX{} distribution. Then you can write into command line

\texttt{optex document}

You can try to process \texttt{optex op-demo} or \texttt{optex optex-doc}.

If there is no \texttt{optex} command, see more information about installation OpTEX at \url{http://petr.olsak.net/optex}.

A minimal document should be

\begin{verbatim}
\fontfam[LMfonts]
Hello World! \bye
\end{verbatim}

The first line \texttt{\fontfam[LMfonts]} tells that Unicode Latin Modern fonts (derived from Computer Modern) are used. If you omit this line then preloaded Latin Modern fonts are used but preloaded fonts cannot be in Unicode\footnote{This is a technical limitation of LuaTEX for fonts downloaded in formats: only 8bit fonts can be preloaded.}. So the sentence \texttt{Hello World} will be OK without the first line, but you cannot print such sentence in another languages (for example \texttt{Ahoj světe!}) where Unicode fonts are needed because of the characters like \texttt{ě} are not mapped correctly in preloaded fonts.

A somewhat larger example with common settings should be:

\begin{verbatim}
\fontfam[Termes] \% selecting Unicode font family Termes (section 3.1)
\typosize[11/13] \% setting the basic font size and the baselineskip (sec. 3.2)
\margins/1 a4 (1,1,1,1)in \% setting lin margins for A4 paper (section 2.1)
\cslang \% Czech hyphenation patterns (section 7.1)
\end{verbatim}
2 Page layout

2.1 Setting the margins

\TeX\xspace declares paper formats a4, a4l (landscape a4), a5, a5l, b5, letter and user can declare another own format by \texttt{\textbackslash sdef}:

\begin{verbatim}
  \sdef{_pgs:b5l}{(250,176)mm}
  \sdef{_pgs:letterl}{(11,8.5)in}
\end{verbatim}

The \texttt{\textbackslash margins} command declares margins of the document. This command have the following parameters:

\begin{verbatim}
\margins/{\texttt{pg}} \{\texttt{fmt}\} \{(\texttt{left}), (\texttt{right}), (\texttt{top}), (\texttt{bot})\}\{\texttt{unit}\}
\end{verbatim}

\texttt{\margins/1 a4 (2.5,2.5,2,2)cm}

Parameters are:

- \texttt{\texttt{pg}} ... 1 or 2 specifies one-page or two-pages design.
- \texttt{\texttt{fmt}} ... paper format (a4, a4l, a5, letter, etc. or user defined).
- \texttt{\texttt{left}}, \texttt{\texttt{right}}, \texttt{\texttt{top}}, \texttt{\texttt{bot}} ... gives the amount of left, right, top and bottom margins.
- \texttt{\texttt{unit}} ... unit used for values \texttt{\texttt{left}}, \texttt{\texttt{right}}, \texttt{\texttt{top}}, \texttt{\texttt{bot}}.

Each of the parameters \texttt{\texttt{left}}, \texttt{\texttt{right}}, \texttt{\texttt{top}}, \texttt{\texttt{bot}} can be empty. If both \texttt{\texttt{left}} and \texttt{\texttt{right}} are nonempty then \texttt{\texttt{hsize}} is set. Else \texttt{\texttt{hsize}} is unchanged. If both \texttt{\texttt{left}} and \texttt{\texttt{right}} are empty then typesetting area is centered in the paper format. The analogical rule works when \texttt{\texttt{top}} or \texttt{\texttt{bot}} parameter is empty (\texttt{\texttt{vsize}} instead \texttt{\texttt{hsize}} is used). Examples:

\begin{verbatim}
\margins/1 a4 (,,,)mm % \texttt{\texttt{hsize}}, \texttt{\texttt{vsize}} untouched, \texttt{\texttt{vsize}} untouched, \texttt{\texttt{hsize}} untouched, \texttt{\texttt{vsize}} untouched, \texttt{\texttt{hsize}} untouched, \texttt{\texttt{vsize}} untouched, vertically centered
\margins/1 a4 (,2,,)cm % right margin set to 2cm % \texttt{\texttt{hsize}}, \texttt{\texttt{vsize}} untouched, vertically centered
\end{verbatim}

If \texttt{\texttt{pg}}=1 then all pages have the same margins. If \texttt{\texttt{pg}}=2 then the declared margins are true for odd pages. The margins at the even pages are automatically mirrored in such case, it means that \texttt{\texttt{left}} is replaced by \texttt{\texttt{right}} and vice versa.

The \texttt{\texttt{fmt}} can be also in the form \{(\texttt{width}), (\texttt{height})\}\{\texttt{unit}\} where \texttt{\texttt{unit}} is optional. If it is missing then \texttt{\texttt{unit}} after margins specification is used. For example:

\begin{verbatim}
\margins/1 a4 (100,200) (7,7,7,7)mm
\end{verbatim}

This declares the paper 100×200 mm with all four margins 7 mm. The spaces before and after \texttt{\texttt{fmt}} parameter are necessary.

The command \texttt{\textbackslash magscale[(\texttt{factor})]} scales the whole typesetting area. The fixed point of such scaling is the upper left corner of the paper sheet. Typesetting (breakpoints etc.) is unchanged. All units are relative after such scaling. Only paper formats dimensions stays unscaled. Example:

\begin{verbatim}
\margins/2 a4 (22,17,19,21)mm
\magscale[1414] \margins/1 a4 (,,,)mm
\end{verbatim}

The first line sets the \texttt{\texttt{hsize}} and \texttt{\texttt{vsize}} and margins for final printing at a4 format. The setting on the second line centers the scaled typesetting area to the true a4 paper while breaking points for paragraphs and pages are unchanged. It may be usable for review printing. After review is done, the second line can be commented out.
2.2 Concept of default page

OpTEX uses for page design very similar “output routine” like Plain TeX. There is \headline followed by “page body” followed by \footline. The \headline is empty by default and it can be used for running headers repeated on each page. The \footline prints centered page number by default. You can set the \footline to empty using \nopagenumbers macro.

The margins declared by \margins macro (documented in the previous section 2.1) is concerned to the page body, i.e. the \headline and \footline are placed to the top and bottom margins.

The distance between the \headline and the top of the page body is given by \headlinedist register. The distance between bottom of the page body and the \footline is given by \footlinedist. The default values are:

\headline = {}  
\footline = {\_hss\_rmfixed \_folio \_hss} % \folio expands to page number  
\headlinedist = 14pt % from baseline of \headline to top of page body  
\footlinedist = 24pt % from last line in pagebody to baseline of footline

The page body should be divided to top insertions (floating tables and figures) followed by a real text and followed by footnotes. Typically, only real text is here.

The \pgbackground tokens list is empty by default but it can be used for creating background of each page (colors, picture, watermark for example). The macro \draft uses this register and puts big text DRAFT as watermark to each page. You can try it.

More about the page layout is documented in files parameters.opm and output.opm.

2.3 Footnotes and marginal notes

The Plain TeX’s macro \footnote can be used as usual. But a new macro \fnote{⟨text⟩} is defined. The footnotemark is added automatically and it is numbered on each chapter from one\(^3\). The ⟨text⟩ is scaled to 80 %. User can redefine footnotemark or scaling, as shown in the file fnotes.opm.

The \fnote macro is fully applicable only in “normal outer” paragraph. It doesn’t work inside boxes (tables for example). If you are solving such case you can use \fnotemark{numeric-label} inside the box: only the footnotemark is generated here. When the box is finished you can use \fnotetext{⟨text⟩}. This macro puts the ⟨text⟩ to the footnote. The ⟨numeric-label⟩ have to be 1 if only one such command is in the box. Second \fnotemark inside the same box have to have the parameter 2 etc. The same number of \fnotetexts have to be written after the box as the number of \fnotemarks inserted inside the box. Example:

Text in a paragraph\footnote{First notice}… % a "normal" footnote  
\table{…}\{…\fnotemark1…\fnotemark2…\} % two footnotes in a box  
\fnotetext{Second notice}  
\fnotetext{Third notice}  
…  
\table{…}\{…\fnotemark1…\} % one footnote in a box  
\fnotetext{Fourth notice}

The marginal note can be printed by the \mnote{⟨text⟩} macro. The ⟨text⟩ is placed to the right margin on the odd pages and it is placed to the left margin on the even pages. This is done after second TeX run because the relevant information is stored in an external file and read from it again. If you need to place the notes only to the fixed margin write \fixmnotes\right or \fixmnotes\left.

The ⟨text⟩ is formatted as a little paragraph with the maximal width \mnotesize ragged left on the left margins or ragged right on the right margins. The first line of this little paragraph has its vertical position given by the position of \mnote in the text. The exceptions are possible by setting the \mnoteskip register. You can implement such exceptions to each \mnote manually in final printing in order to margin notes do not overlap. The positive value of \mnoteskip shifts the note up and negative value shifts it down. For example \mnoteskip=2\baselineskip \mnote{⟨text⟩} shifts this (and only this) note two lines up.

\(^3\) You can declare \fnotenumglobal if you want footnotes numbered in whole document from one or \fnotenumpages if you want footnotes numbered at each page from one. Default setting is \fnotenumchapters
3 Fonts

3.1 Font families

You can select the font family by \fontfam\[\langle Family-name\rangle\]. The argument \langle Family-name\rangle\ is case insensitive and spaces are ignored. So, \fontfam[LM Fonts] is equal to \fontfam[LMfonts] and it is equal to \fontfam[lmfonts]. Several aliases are prepared, thus \fontfam[Latin Modern] can be used for loading Latin Modern family too.

If you write \fontfam[?] then all font families registered in Op\TeX\ are listed on the terminal and in the log file. If you write \fontfam[catalog] then a catalog of all fonts registered in Op\TeX\ and available in your \TeX\ system is printed. The instructions how to register your own font family is appended in such catalog.

If the family is loaded then font modifiers applicable in such font family are listed on the terminal: (\caps, \cond for example). And there are four basic variant selectors (\rm, \bf, \it, \bi). The usage of variant selectors is the same as in Plain \TeX: {\it italics text}, {\bf bold text} etc.

The font modifiers (\caps, \cond for example) can be used before a basic variant selector and they can be (independently) combined: \caps\it or \cond\caps\bf. The modifiers keeps their internal setting until group ends or until another modifier which negates the previous feature is used. So \caps \rm text \it text uses normal and italics in Caps and SmallCaps.

There is one special variant selector \currvar which does not change the selected variant but reloads the font due to the (maybe newly specified) font modifier(s).

The context between variants \rm–\it and \bf–\bi is kept by the \em macro (emphasize text). It switches from current \rm to \it, from current \it to \rm, from current \bf to \bi and from current \bi to \bf. The italics correction \slash is inserted automatically. Example:

\begin{verbatim}
This is {\em important} text. % = This is {\it important}\slash text.
\it This is {\em important} text. % = This is/ {\rm important}\slash text.
\bf This is {\em important} text. % = This is \it \it {\bi important}\slash text.
\bi This is {\em important} text. % = This is/ \bf \bf \bf\bf text.
\end{verbatim}

More about the Op\TeX\ font selection system is written the file fonts-select.opm. You can mix more font families in your document, you can declare your own variant selectors or modifiers etc.

3.2 Font sizes

The command \typosize[(\fontsize)/\baselineskip\)] sets the font size of text and math fonts and baselineskip. If one of these two parameters is empty, the corresponding feature stays unchanged. Don’t write the unit of these parameters. The unit is internally set to \ptunit = 1pt by default. You can change the unit by the command \ptunit=\langle something-else\rangle, for instance \ptunit=1mm enlarges all font sizes declared by \typosize. Examples:

\begin{verbatim}
\typosize[10/12] % default of Plain TeX
\typosize[11/12.5] % font 11pt, baseline 12.5pt
\typosize[8/] % font 8pt, baseline unchanged
\end{verbatim}

The commands for font size setting described in this section have local validity. If you put them into a group, the settings are lost when the group is finished. If you set something relevant with paragraph shape (baselineskip given by \typosize for example) then you must first finalize the paragraph and second to close the group: {\typosize[12/14] \ldots\langle text of paragraph\rangle\ldots \par}.

The command \typoscale[(\font-factor)/\baselineskip-factor\)] sets the text and math fonts size and baselineskip as a multiple of the current fonts size and baselineskip. The factor is written in “scaled”-like way, it means that 1000 means factor one. The empty parameter is equal to the parameter 1000, i.e. the value stays unchanged. Examples:

\begin{verbatim}
\typoscale[800/800] % fonts and baselineskip re-size to 80 %
\typoscale[magstep2/1] % fonts bigger 1,44times (\magstep2 expands to 1440)
\end{verbatim}

First usage of \typosize or \typoscale macro in your document sets so called main values, i.e. main font size and main baselineskip. They are internally saved in registers \mainfontsize and \mainbaselineskip.
The \texttt{\textbackslash t Incorrect scaling} command does scaling in respect to current values by default. If you want to do it in respect to main values, type \texttt{\textbackslash scalemain} immediately before \texttt{\textbackslash t Incorrect scaling} command.

\texttt{\textbackslash typosize[12/14.4] \% first usage in document, sets main values internally}  
\texttt{\textbackslash typosize[15/18] \% bigger font}  
\texttt{\textbackslash scalemain \textbackslash typoscale[800/800] \% reduces from main values, no from current.}

The size of the current font can be changed by the command \texttt{\textbackslash thefontsizem{(font-size)}} or can be rescaled by \texttt{\textbackslash thefontscale{\textbackslash (factor)}}. These macros don’t change math fonts sizes nor baselineskip.

There is “low level” \texttt{\textbackslash setfontsize{\{size-spec\}}} command which behaves like a font modifier and sets given font size used by next variant selectors. For example \texttt{\textbackslash setfontsize{at15pt}\currvar} sets current variant to 15pt.

If you are using a font family with “optical sizes feature” (i.e. there are more recommended sizes of the same font which are not scaled linearly; good example is Computer Modern aka Latin Modern fonts) then the recommended size is selected by all mentioned commands automatically.

More information about resizing of fonts is documented in \texttt{fonts-resize.opm} file.

### 3.3 Typesetting math

\LaTeX{} preloads a collection of 7bit Computer Modern math fonts and AMS fonts in its format. You can use them in any size and in the \texttt{\textbackslash boldmath} variant. Most declared text font families (see \texttt{\textbackslash fontfam} in the section 3.1) are configured with recommended Unicode math font. This font is automatically loaded unless you specify \texttt{\textbackslash noloadmath} before first \texttt{\textbackslash fontfam} command. See log file for more information about loading text font family and Unicode math fonts. If you prefer another Unicode math font, specify it by \texttt{\textbackslash loadmath{\{\textbackslash (font-file)\}}} or \texttt{\textbackslash loadmath{\textbackslash font-name}} before first \texttt{\textbackslash loadfam} command.

Hundreds math symbols and operators like in AMSTeX are accessible. For example \texttt{\textbackslash alpha, \textbackslash geq \geq, \textbackslash sum \sum, \textbackslash sphericalangle \sphericalangle <, \textbackslash bumpeq \bumpeq, \approx}. See AMSTeX manual for complete list of symbols.

The following math alphabets are available:

\begin{verbatim}
\mit % mathematical variables abc–xyz, ABC–XYZ
\it % text italics abc–xyz, ABC–XYZ
\rm % text roman abc–xyz, ABC–XYZ
\cal % normal calligraphics ABC–XYZ
\script % script \textbackslash A \textbackslash B \textbackslash C – X \textbackslash Y \textbackslash Z
\frak % fracture \textbackslash a \textbackslash m \textbackslash j, \textbackslash A \textbackslash B \textbackslash C – X \textbackslash Y \textbackslash Z
\bbchar % double stroked letters \textbackslash A \textbackslash C – X \textbackslash Y \textbackslash Z
\bf % sans serif bold abc–xyz, ABC–XYZ
\bi % sans serif bold slanted abc–xyz, ABC–XYZ
\end{verbatim}

The last two selectors \texttt{\bf} and \texttt{\bi} select the sans serif fonts in math regardless the current text font family. This is common notation for vectors and matrices. You can re-declare it, see the file \texttt{unimath-codes.opm} where math variants of \texttt{\bf} and \texttt{\bi} selectors are defined.

The math fonts can be scaled by \texttt{\textbackslash typosize} and \texttt{\textbackslash typoscale} macros. Two math fonts collections are prepared: \texttt{\textbackslash normalmath} for normal weight and \texttt{\textbackslash boldmath} for bold. The first one is set by default.

You can use \texttt{\textbackslash mathbox{\textbackslash (text)}} inside math mode. It behaves as \texttt{\textbackslash hbox{\textbackslash (text)}} (i.e. the \texttt{\textbackslash (text)} is printed in horizontal non-math mode) but the size of the \texttt{\textbackslash (text)} is adapted to the context of math size (text or script or scriptscript).

### 4 Typical elements of document

#### 4.1 Chapters and sections

The document can be divided into chapters, sections and subsections and titled by \texttt{\textbackslash tit} command. The parameters are separated by the end of current line (no braces are used):

\begin{verbatim}
\tit Document title \{end of line\}
\chap Chapter title \{end of line\}
\sec Section title \{end of line\}
\secc Subsection title \{end of line\}
\end{verbatim}
If you want to write a title to more lines in your source file then you can use percent character before \textit{(end of line)}. Such \textit{(end of line)} is not scanned and reading of the title continues at next line.

The chapters are automatically numbered by one number, sections by two numbers (chapter.section) and subsections by three numbers. If there are no chapters then section have only one number and subsection two.

The implicit design of the titles of chapter etc. are implemented in the macros \verb|\_printchap|, \verb|\_printsec| and \verb|\_printsecc|. A designer can simply change these macros if he/she needs another behavior.

The first paragraph after the title of chapter, section and subsection is not indented but you can type \texttt{\let\_firstnoindent=\relax} if you need all paragraphs indented.

If a title is so long then it breaks to more lines. It is better to hint the breakpoints because \TeX{} does not interpret the meaning of the title. User can put the \texttt{\nl} (it means newline) macro to the breakpoints.

The chapter, section or subsection isn’t numbered if the \texttt{\nonum} precedes. And the chapter, section or subsection isn’t delivered to the table of contents if \texttt{\notoc} precedes.

### 4.2 Another numbered objects

Apart from chapters, sections and subsections, there are another automatically numbered objects: equations, captions for tables and figures. The user can declare more numbered object.

If the user writes the \texttt{\eqmark} as the last element of the display mode then this equation is numbered. The equation number is printed in brackets. This number resets in each section by default.

If the \texttt{\eqalignno} is used, then user can put \texttt{\eqmark} to the last column before \texttt{\cr}. For example:

\begin{verbatim}
eqalignno{ 
 a^2+b^2 &= c^2 \cr 
 c &= \sqrt{a^2+b^2} & \eqmark \cr }
\end{verbatim}

The next automatically numbered objects are captions which is tagged by \texttt{\caption/t} for tables and \texttt{\caption/f} for figures. The caption text follows. The \texttt{\cskip} can be used between \texttt{\caption text} and the real object (table or figure). You can use two orders: \texttt{(caption)\cskip \texttt{(object)}} or \texttt{(object)\cskip \texttt{(caption)}}. The \texttt{\cskip} creates appropriate vertical space between them. Example:

\begin{verbatim}
\caption/t The dependency of the computer-dependency on the age. \cskip
\noindent\hfil\table{rl}\
| age & value |
|------|--------|
| 0--1 & unmeasured |
| 1--6 & observable |
| 6--12 & significant |
| 12--20 & extremal |
| 20--40 & normal |
| 40--60 & various |
| 60--\infty & moderate |
\end{verbatim}

This example produces:

\begin{table}[h]
\centering
\begin{tabular}{ll}
\hline
\textbf{age} & \textbf{value} \\
\hline
0--1 & unmeasured \\
1--6 & observable \\
6--12 & significant \\
12--20 & extremal \\
20--40 & normal \\
40--60 & various \\
60--\infty & moderate \\
\hline
\end{tabular}
\caption{The dependency of the computer-dependency on the age.}
\end{table}

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You can see that the word “Table” followed by a number is added by the macro \caption/t. The caption text is centered. If it occupies more lines then the last line is centered.

The macro \caption/f behaves like \caption/t but it is intended for figure captions with independent numbering. The word (Table, Figure) depends on the actual selected language (see section 7.1 about languages).

If you wish to make the table or figure as floating object, you need to use Plain TeX macros \midinsert or \topinsert terminated by \endinsert. Example:

\topinsert % table and its caption is printed at the top of the current page
\caption and table
\endinsert

There are five prepared counters A, B, C, D and E. They are reset in each chapter and section. They can be used in context of \numberedpar ⟨letter⟩{⟨text⟩} macro. For example:

\def\theorem {\numberedpar A{Theorem}}
\def\corollary {\numberedpar A{Corollary}}
\def\definition {\numberedpar B{Definition}}
\def\example {\numberedpar C{Example}}

Three independent numbers are used in this example. One for Theorems and Corollaries second for Definitions and third for Examples. The user can write \theorem Let \$M$ be... and the new paragraph is started with the text: Theorem 2.3.1. Let $M$ be... You can add an optional parameter in brackets. For example, \theorem [(L’Hôpital’s rule)] Let $f, g$ be... is printed like Theorem 2.4.2 (L’Hôpital’s rule). Let $f, g$ be...

4.3 References

Each automatically numbered object documented in sections 4.1 and 4.2 can be referenced if optional parameter [(label)] is appended to \chap, \sec, \secc, \caption/t, \caption/f or \eqmark. The alternative syntax is to use \label[(label)] before mentioned commands (not necessarily directly before). The reference is realized by \ref[(label)] or \pgref[(label)]. Example:

\sec[beatle] About Beatles
\noindent\hfill\table{rl}{...} % the table
\cskip\caption/t [comp-depend] The dependency of the computer-dependency on the age.
\label[pythagoras]\\$ a^2 + b^2 = c^2 \eqmark \$

Now we can point to the section-\ref[beatle] on the page-\pgref[beatle] or write something about the equation-\ref[pythagoras]. Finally there is an interesting Table-\ref[comp-depend].

If there are forward referenced objects then user have to run TeX twice. During each pass, the working *.ref file (with references data) is created and this file is used (if it exists) at the beginning of the document.

You can use \label[(label)] before \theorem, \definition (macros defined by \numberedpar) if you want to reference these numbered objects. You can’t use \theorem[(label)] because the optional parameter is reserved to another purpose.

You can create a reference to whatever else by commands \label[(label)]\\wlabel{⟨text⟩}. The connection between ⟨label⟩ and ⟨text⟩ is established. The \ref[(label)] will print ⟨text⟩.

By default, labels are not printed, of course. But if you are preparing a draft version of document, you can declare \showlabels. The labels are printed at their destination places after such declaration.

\footnote{This feature can be changed, see the sections.om in the technical documentation.}
4.4 Hyperlinks, outlines

If the command \hyperlinks \{color-in\} \{color-out\} is used at the beginning of the document, then the following objects are hyperlinked in the PDF output:

- numbers generated by \ref or \pgref,
- numbers of chapters, sections and subsections in the table of contents,
- numbers or marks generated by \cite command (bibliography references),
- texts printed by \url or \ulink commands.

The last object is an external link and it is colored by \{color-out\}. Others links are internal and they are colored by \{color-in\}. Example:

\hyperlinks \Blue \Green % internal links blue, URLs green.

You can use another marking of active links: by frames which are visible in the PDF viewer but invisible when the document is printed. The way to do it is to define the macros \pgborder, \tocborder, \citeborder, \refborder and \urlborder as the triple of RGB components of the used color. Example:

\def\tocborder {1 0 0} % links in table of contents: red frame
\def\pgborder {0 1 0} % links to pages: green frame
\def\citeborder {0 0 1} % links to references: blue frame

By default these macros are not defined. It means that no frames are created.

The hyperlinked footnotes can be activated by \fnotelinks \{color-fnt\} \{color-fnf\} where footnote marks in text have \{color-fnt\} and the same footnote marks in footnotes have \{color-fnf\}. You can define relevant borders \fntborder and \fnfborder analogically as \pgborder (for example).

There are “low level” commands to create the links. You can specify the destination of the internal link by \dest\{⟨type⟩\}:\{label\}. The active text linked to the \dest can be created by \ilink\{⟨type⟩\}:\{label\}\{⟨text⟩\}. The ⟨type⟩ parameter is one of the toc, pg, cite, ref or another special for your purpose. These commands create internal links only when \hyperlinks is declared.

The \url macro prints its parameter in \tt font and creates a potential breakpoints in it (after slash or dot, for example). If \hyperlinks declaration is used then the parameter of \url is treated as an external URL link. An example: \url{http://www.olsak.net} creates http://www.olsak.net.

The characters %, \, #, \{ and \} have to be protected by backslash in the \url argument, the other special characters ~, ^, & can be written as single character\(^5\). You can insert the \| command in the \url argument as a potential breakpoint.

If the linked text have to be different than the URL, you can use \ulink\{⟨url⟩\}\{⟨text⟩\} macro. For example: \ulink[http://petr.olsak.net/optex]{\OpTeX/ page} creates \OpTeX page.

The PDF format provides outlines which are notes placed in the special frame of the PDF viewer. These notes can be managed as structured and hyperlinked table of contents of the document. The command \outlines{⟨level⟩} creates such outlines from data used for table of contents in the document. The ⟨level⟩ parameter gives the level of opened sub-outlines in the default view. The deeper levels can be open by mouse click on the triangle symbol after that.

If you are using a special macro in section titles then \outlines macro may crash. You must declare variant of the macro for outlines case which is expandable. Use \regmacro in such case. See the section 5.1 for more information about \regmacro.

The command \insertoutline\{⟨text⟩\} inserts next entry into PDF outlines at the main level 0. These entries can be placed before table of contents (created by \outlines) or after it. Theirs hyperlink destination is in the place where \insertoutline macro is used.

4.5 Lists

The list of items is surrounded by \begitems and \enditems commands. The asterisk (\*) is active within this environment and it starts one item. The item style can be chosen by \style parameter written after \begitems:

\(^5\) More exactly, there are the same rules as for \code command, see section 4.7.
\style o % small bullet
\style O % big bullet (default)
\style - % hyphen char
\style n % numbered items 1., 2., 3., ...
\style N % numbered items 1), 2), 3), ...
\style i % numbered items (i), (ii), (iii), ...
\style I % numbered items I, II, III, IV, ...
\style a % items of type a), b), c), ...
\style A % items of type A), B), C), ...
\style x % small rectangle
\style X % big rectangle

For example:

\begitems
  * First idea
  * Second idea in subitems:
    \begitems \style i
      * First sub-idea
      * Second sub-idea
      * Last sub-idea
    \enditems
  * Finito
\enditems

produces:

- First idea
- Second idea in subitems:
  (i) First sub-idea
  (ii) Second sub-idea
  (iii) Last sub-idea
- Finito

Another style can be defined by the command \sdef{_item:(style)}{(text)}. Default item can be set by \defaultitem=(text). The list environments can be nested. Each new level of item is indented by next multiple of \iindent which is set to \parindent by default. The \ilevel register says what level of items is currently processed. Each \begitems starts \everylist tokens register. You can set, for example:

\everylist={\ifcase\ilevel\or \style X \or \style x \else \style - \fi}

You can say \begitems \novspaces if you don’t want vertical spaces above and below the list. More information about design of lists of items should be found in the \texttt{lists.tex} file.

4.6 Tables

The macro \table{(declaration)}{(data)} provides similar \texttt{declaration} of tables as in \LaTeX{}: you can use letters \texttt{l}, \texttt{r}, \texttt{c}, each letter declares one column (aligned to left, right, center respectively). These letters can be combined by the \texttt{|} character (vertical line). Example

\table{||lc|r||}{
  Month & commodity & price \\
  January & notebook & \$ 700 \\
  February & skateboard & \$ 100 \\
  July & yacht & \$ 170
}

generates the following result:
### Table of Commodity Prices

<table>
<thead>
<tr>
<th>Month</th>
<th>Commodity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>notebook</td>
<td>$700</td>
</tr>
<tr>
<td>February</td>
<td>skateboard</td>
<td>$100</td>
</tr>
<tr>
<td>July</td>
<td>yacht</td>
<td>k$170</td>
</tr>
</tbody>
</table>

Apart from l, r, c declarators, you can use the \texttt{p\{size\}} declarator which declares the column of given width. More precisely, a long text in the table cell is printed as an paragraph with given width. To avoid problems with narrow left-right aligned paragraphs you can write \texttt{p\{size\}\textbackslash{raggedright}}, then the paragraph will be only left aligned.

You can use \texttt{(\textit{text})} in the \texttt{\langle declaration\rangle}. Then this text is applied in each line of the table. For example \texttt{r\{\textbackslash{kern10pt}\}l} adds more 10 pt space between r and l rows.

An arbitrary part of the \texttt{\langle declaration\rangle} can be repeated by a \texttt{\langle number\rangle} prefixed. For example \texttt{3c} means cccc or c 3\{c\} means c|c|c|c. Note that spaces in the \texttt{\langle declaration\rangle} are ignored and you can use them in order to more legibility.

The command \texttt{\cr} used in the \texttt{\langle data\rangle} part of the table is generally known. It marks end row of the table. Moreover \texttt{\LaTeX} defines following similar commands:

- \texttt{\cr\ldots} the end of the row with a horizontal line after it.
- \texttt{\crli\ldots} like \texttt{\cr} but the horizontal line doesn’t intersect the vertical double lines.
- \texttt{\crlp\{\langle list\rangle\}\ldots} like \texttt{\crli} but the lines are drawn only in the columns mentioned in comma separated \texttt{\langle list\rangle} of their numbers. The \texttt{\langle list\rangle} can include \texttt{\langle from\rangle}-\texttt{\langle to\rangle} declarators, for example \texttt{\crlp\{1-3,5\}} is equal to \texttt{\crlp\{1,2,3,5\}}.

The \texttt{\tskip\{dimen\}} command works like the \texttt{\noalign{\vskip\{dimen\}}} after \texttt{\cr\ldots} commands but it doesn’t interrupt the vertical lines.

You can use following parameters for the \texttt{\table} macro. Default values are listed too.

- \texttt{\everytable={}} % code used after settings in \texttt{\vbox} before table processing
- \texttt{\thisetable={}} % code used when \texttt{\vbox} starts, is is removed after using it
- \texttt{\tabiteml={\enspace}} % left material in each column
- \texttt{\tabitemr={\enspace}} % right material in each column
- \texttt{\tabstrut={\strut}} % strut which declares lines distance in the table
- \texttt{\tablinespace=2pt} % additional vertical space before/after horizontal lines
- \texttt{\vvkern=1pt} % space between lines in double vertical line
- \texttt{\hhkern=1pt} % space between lines in double horizontal line

Example: if you do \texttt{\tabiteml={\$\{\enspace}}}\texttt{\tabitemr={\enspace\$}} then the \texttt{\table} acts like \texttt{\LaTeX}'s array environment.

If there is an item which spans to more than one column in the table then \texttt{\multispan\{\langle number\rangle\}} macro from Plain \TeX can help you or, you can use \texttt{\mspan\{\langle number\rangle\}\{\langle declaration\rangle\}\{\langle text\rangle\}} which spans \texttt{\langle number\rangle} columns and formats the \texttt{\langle text\rangle} by the \texttt{\langle declaration\rangle}. The \texttt{\langle declaration\rangle} must include a declaration of only one column with the same syntax as common \texttt{\table \langle declaration\rangle}. If your table includes vertical rules and you want to create continuous vertical rules by \texttt{\mspan}, then use rule declarators | only after c, l or r letter in \texttt{\mspan \langle declaration\rangle}. The exception is only in the case when \texttt{\mspan} includes first column and the table have rules on the left side. The example of \texttt{\mspan} usage is below.

The \texttt{\frame\{\langle text\rangle\}} makes a frame around \texttt{\langle text\rangle}. You can put the whole \texttt{\table} into \texttt{\frame} if you need double-ruled border of the table. Example:

\begin{verbatim}
\frame\{\table\{|c|l||r|\}\{ \cr\l
\multispan3[\{c\}\{bf Title\}\cr] first & second & third \crlii
seven & eight & nine \crlii\cg
\}
\}
\end{verbatim}

creates the following result:
The \texttt{\begtt} and \texttt{\endtt} couple. The in-line verbatim have to be tagged (before and after) by a character which is declared by \texttt{\activettchar{char}}. For example \texttt{\activettchar{`}} declares the character ` for in-line verbatim markup. And you can use `\texttt{\relax}` for verbatim \relax (for example). Another alternative of printing in-line verbatim text is \texttt{\code{{⟨text⟩}}} (see below).

If the numerical register \texttt{\ttline} is set to the non-negative value then display verbatim will number the lines. The first line has the number \texttt{\ttline+1} and when the verbatim ends then the \texttt{\ttline} value is equal to the number of last line printed. Next \texttt{\begtt...\endtt} environment will follow the line numbering. \hTeX{} sets \texttt{\ttline=-1} by default.

The indentation of each line in display verbatim is controlled by \texttt{\ttindent} register. This register is set to the \texttt{\parindent} by default. User can change values of the \texttt{\parindent} and \texttt{\ttindent} independently.

The \texttt{\begtt} command starts internal group in which the catcodes are changed. Then the \texttt{\everytt} tokens register is run. It is empty by default and user can control fine behavior by it. For example the catcodes can be reseted here. If you need to define active character in the \texttt{\everytt}, use \texttt{\adef} as in the following example:

\begin{verbatim}
\everytt={\adef!{?}\adef?{!}}
\begtt
Each occurrence of the exclamation mark will be changed to the question mark and vice versa. Really? You can try it!
\endtt
\end{verbatim}

The \texttt{\adef} command sets its parameter as active after the value of \texttt{\everytt} is read. So you don’t have to worry about active categories.

There is an alternative to \texttt{\everytt} named \texttt{\everyinttt} which is used for in-line verbatim surrounded by an \texttt{\activettchar} or processed by the \texttt{\code} command. The \texttt{\everytt} is applied to all \texttt{\begtt...\endtt} environments (if it is not declared in a group). There are tips for such global \texttt{\everytt} definitions here:

\begin{verbatim}
\everytt={\typedsize[9/11]} % setting font size for verbatim
\everytt={\ttline=0} % each listing will be numbered from one
\everytt={\adef{ }{\char9251}} % visualization of spaces (Unicode fonts)
\end{verbatim}

If you want to apply a special code only for one \texttt{\begtt...\endtt} environment then don’t set any \texttt{\everytt} but put desired material at the same line where \texttt{\begtt} is. For example:

\begin{verbatim}
\begtt \adef!{?}\adef?{!}
Each occurrence of ? will be changed to ! and vice versa.
\endtt
\end{verbatim}

The in-line verbatim surrounded by an \texttt{\activettchar} doesn’t work in parameter of macros and macro definitions, especially in titles declared by \texttt{\chap}, \texttt{\sec} etc. You can use more robust command \texttt{\code{{⟨text⟩}}} in such situations, but you must escape following characters in the \texttt{⟨text⟩}: \texttt{	extbackslash, #, %, braces (if the braces are unmatched in the \texttt{⟨text⟩}), and space or ^ (if there are more than one subsequent spaces or ^ in the \texttt{⟨text⟩})}. Examples:
prints \text, \%#
\text {@\{..\}*~$\} ... prints @\{..\}*~$ without escaping, but you can 
escape these characters too, if you want.
\text{a \ b} ... two spaces between a b, the second one must be escaped
\text{xy\{z} ... xy{z ... unbalanced brace must be escaped
\text{"\~M} ... prints \text{"\~M}, the second \~ must be escaped

You can print verbatim listing from external files by \texttt{\verbinput} command. Examples:

\verbatiminput (12-42) program.c % listing from program.c, only lines 12-42
\verbatiminput (-60) program.c % print from begin to the line 60
\verbatiminput (61-) program.c % from line 61 to the end
\verbatiminput (-) program.c % whole file is printed
\verbatiminput (70+10) program.c % from line 70, only 10 lines printed
\verbatiminput (+10) program.c % from the last line read, print 10 lines
\verbatiminput (-5+7) program.c % from the last line read, skip 5, print 7
\verbatiminput (+) program.c % from the last line read to the end

The \verbatimline influences the line numbering by the same way as in \verbatimtt \verbatimendtt environment. If \verbatimline=-1 then real line numbers are printed (this is default). If \verbatimline<-1 then no line numbers are printed.

The \verbatiminput can be controlled by \verbatimeverytt, \verbatimttindent just like in \verbatimbegtt \verbatimendtt.

5 Autogenerated lists

5.1 Table of contents

The \texttt{\maketoc} command prints the table of contents of all \texttt{\chap}, \texttt{\sec} and \texttt{\secc} used in the document. These data are read from external *.ref file, so you have to run \texttt{\TeX} more than once (typically three times if the table of contents is at the beginning of the document).

The name of the section with table of contents is not printed. The direct usage of \texttt{\chap} or \texttt{\sec} isn’t recommended here because the table of contents is typically not referenced to itself. You can print the unnumbered and unreferenced title of the section by the code:

\verbatim{\nonum
\notoc
\sec Table of Contents}

If you are using a special macro in section titles or chapter titles and you need different behavior of such macro in other cases then use \texttt{\regmacro{(case-toc)}{(case-mark)}{(case-outline)}}. The parameters are applied locally in given cases. The \texttt{\regmacro} can be used repeatedly: the parameters are accumulated (for more macros). If a parameter is empty then original definition is used in given case. For example:

\verbatim{% default value of \mylogo macro used in text and in the titles:
\def\mylogo{\leavevmode\hbox{\Red{\it My}\Black{\setfontsize{mag1.5}{\rm Lo}Go}}
% another variants:
\regmacro {\def\mylogo{\leavevmode\hbox{\Red{\it My}\Black{LoGo}}}} % used in TOC
{\def\mylogo{\leavevmode\hbox{\it My}/LoGo}} % used in running heads
{\def\mylogo{MyLoGo}} % used in outlines

5.2 Making the index

The index can be included into document by \texttt{\makeindex} macro. No external program is needed, the alphabetical sorting are done inside \texttt{\TeX} at macro level.

The \texttt{\ii} command (insert to index) declares the word separated by the space as the index item. This declaration is represented as invisible atom on the page connected to the next visible word. The page number of the page where this atom occurs is listed in the index entry. So you can type:

The \verbatim\ii resistor resistor is a passive electrical component ...

You cannot double the word if you use the \verbatim\iid instead \verbatim\ii:
The \iid resistor is a passive electrical component ...

or:

Now we'll deal with the \iid resistor.

Note that the dot or comma have to be separated by space when \iid is used. This space (before dot or comma) is removed by the macro in the current text.

The multiple-words entries are commonly organized in the index by the format (for example):

linear dependency 11, 40–50
— independency 12, 42–53
— space 57, 76
— subspace 58

To do this you have to declare the parts of the index entries by the / separator. Example:

{\bf Definition.}

\ii linear/space,vector/space
{\em Linear space} (or {\em vector space}) is a nonempty set of...

The number of the parts of one index entry is unlimited. Note, that you can spare your typing by the comma in the \ii parameter. The previous example is equivalent to \ii linear/space \ii vector/space.

Maybe you need to propagate to the index the similar entry to the linear/space in the form space/linear. You can do this by the shorthand ,@ at the end of the \ii parameter. Example:

\ii linear/space,vector/space,@
is equivalent to:
\ii linear/space,vector/space \ii space/linear,space/vector

If you really need to insert the space into the index entry, write ~.

If the \ii or \iid command is preceded by \iiitypename ⟨letter⟩, then such reference (or more references generated by one \ii) has specified type. The page numbers of such references should be formatted specially in the index. \OptX implements only \iiitypename b, \iiitypename i and \iiitypename u. The page number in bold or in italics or underlined is printed in the index when these types are used. Default index type is empty, which prints page numbers in normal font. See \TeX{}book index as an example.

The \makeindex creates the list of alphabetically sorted index entries without the title of the section and without creating more columns. \OptX provides another macros for more columns:

\begmultitable{number of columns}
text
\endtable

The columns will be balanced. The Index can be printed by the following code:

\sec Index
\begmultitable{3}
text
\endtable

Only “pure words” can be propagated to the index by the \ii command. It means that there cannot be any macro, \TeX{} primitive, math selector etc. But there is another possibility to create such complex index entry. Use “pure equivalent” in the \ii parameter and map this equivalent to the real word which is printed in the index by \iis command. Example:

The \ii chiquadrat \$\chi$-quadrat method is ...

If the \ii relax \`relax` command is used then \TeX/ is relaxing.

\iis chiquadrat \$\chi$-quadrat
\iis relax \{\code{\relax}}

The \iis ⟨equivalent⟩ \{⟨text⟩\} creates one entry in the “dictionary of the exceptions”. The sorting is done by the ⟨equivalent⟩ but the ⟨text⟩ is printed in the index entry list.

The sorting rules when \makeindex runs depends on the current language. See section 7.1 about languages selection.
5.3 BibTExing

The command $\cite[[label]]$ (or its variants of the type $\cite[[label-1],[label-2],\ldots,[label-n]]$) creates the citation in the form [42] (or [15, 19, 26]). If \shortcitations is declared at the beginning of the document then continuous sequences of numbers are re-printed like this: [3–5, 7, 9–11]. If \sortcitations is declared then numbers generated by one \cite command are sorted upward.

If \nonumcitations is declared then the marks instead numbers are generated depending on the used bib-style. For example the citations look like [Now08] or [Nowak, 2008]. The \rcite[labels] creates the same list as \cite[labels] but without the outer brackets. Example: $[\rcite[tbn], pg.~13]$ creates [4, pg.13].

The \ecite[label]{text} prints the ⟨text⟩ only, but the entry labeled ⟨label⟩ is decided as to be cited. If \hyperlinks is used then ⟨text⟩ is linked to the references list.

You can define alternative formatting of \cite command. Example:

\def\cite[#1]{(\rcite[#1])} % \cite[⟨label⟩] creates (27)
\def\cite[#1]{$^{\rcite[#1]}$} % \cite[⟨label⟩] creates^{27}

The numbers printed by \cite correspond to the same numbers generated in the list of references.

There are two possibilities to generate this references list:
• Manually using \bib[⟨label⟩] commands.
• By \usebib/(⟨type⟩ (⟨style⟩) ⟨bib-base⟩) command which reads *.bib files directly.

Note that another two possibilities documented in OPmac (using external BibTEx program) isn’t supported because BibTEx is old program which does not support Unicode. And Biber seems to be not compliant with Plain \TeX.

References created manually using \bib[⟨label⟩] command.

\bib [tst] P. Olšák. {\it Typografický systém \TeX{}}.

If you are using \nonumcitations then you need to declare the ⟨marks⟩ used by \cite command. To do it you must use long form of the \bib command in the format \bib[⟨label⟩] = {⟨mark⟩}. The spaces around equal sign are mandatory. Example:

\bib [tbn] = {Olšák, 2001}

Direct reading of .bib files is possible by \usebib macro. This macro reads and uses macro package librarian.tex by Paul Isambert. The usage is:

\usebib/c (⟨style⟩) ⟨bib-base⟩ % sorted by \cite-order (c=cite),
\usebib/s (⟨style⟩) ⟨bib-base⟩ % sorted by style (s=style).
% example:
\usebib/s (simple) op-example

The ⟨bib-base⟩ is one or more *.bib database source files (separated by spaces and without extension) and the ⟨style⟩ is the part of the filename bib-⟨style⟩.opm where the formatting of the references list is defined. Op\TeX{} supports simple or iso690 styles. The behavior of \usebib is documented in usebib.opm and bib-iso690.opm files in detail.

Not all records are printed from ⟨bib-base⟩ files: the command \usebib selects only such bib-records which were used in \cite or \nocite commands in your document. The \nocite behaves as \cite but prints nothing. It only tells that mentioned bib-record should be printed in the reference list. If \notcite[*] is used then all records from ⟨bib-base⟩ are printed.

6 Graphics

6.1 Colors

Op\TeX{} provides a small number of color selectors: \Blue, \Red, \Brown, \Green, \Yellow, \Cyan, \Magenta, \White, \Grey, \LightGrey and \Black. User can define more such selectors by setting four CMYK components or three RGB components. For example

\begin{verbatim}
\usebib/c (simple) example
\end{verbatim}
\def \Orange {\setcmykcolor{0 0.5 1 0}}
\def \Purple {\setrgbcolor{1 0 1}}

The command \morecolors reads more definitions of color selectors from \LaTeX file \texttt{x11nam.def}.
There is about 300 color names like \texttt{DeepPink, Chocolate} etc. If there are numbered variants of the
same name, then you can append letters B, C, etc. to the name in Op\LaTeX. For example \texttt{Chocolate}
is Chocolate1, \texttt{ChocolateB} is Chocolate2 etc.

The color selectors work locally in groups by default but with limitations. See the file \texttt{colors.opm}
for more information.

The colors \texttt{Blue, Cyan} etc. are defined with CMYK components using \texttt{\setcmykcolor}. But
you can define a color with three RGB components too and \texttt{\morecolors} defines such RGB colors.
By default, the color model isn’t converted but only stored to PDF output for each used color by
default. Thus, there may be a mix of color models in the PDF output which is not good idea. You
can overcome this problem by declaration \texttt{\onlyrgb} or \texttt{\onlycmyk}. Then only selected color model is
used for PDF output and if an used color is declared by another color model then it is converted. The
\texttt{\onlyrgb} creates colors more bright (usable for computer presentations). On the other hand CMYK
makes colors more true\textsuperscript{6} for printing.

You can define your color by a linear combination of previously defined colors using \texttt{\colordef}.

For example:

\begin{verbatim}
\colordef \myCyan {0.3\Green + 0.5\Blue} \% 30 \% green, 50 \% blue, rest is white
\colordef \DarkBlue {\Blue + 0.4\Black} \% Blue mixed with 40 \% of black
\colordef \myGreen{\Cyan+\Yellow} \% exact the same as \Green
\colordef \MyColor {0.3\Orange+.5\Green+.2\Yellow}
\end{verbatim}

The linear combination is done in CMYK subtractive color space by default (RGB colors used in
\texttt{\colordef} argument are converted first). If the resulting component is greater than 1 then it is
truncated to 1. If a convex linear combination (as in the last example above) is used then it emulates
color behavior on a painter’s palette. You can use \texttt{\rgbcolordef} instead \texttt{\colordef} if you want to
mix colors in additive RGB color space.

More about colors, about CMYK versus RGB and about the \texttt{\colordef} command is written in
the \texttt{colors.opm} file.

The following example defines a macro which creates the \texttt{\textbf{colored text on the colored background}}.

Usage: \texttt{\coloron\langle background\rangle\langle foreground\rangle\{\langle text\rangle\}}

The \texttt{\coloron} can be defined as follows:

\begin{verbatim}
\def\coloron#1#2#3{%
  \setbox0=\hbox{#3}
  \leavevmode
  {\rlap{#1\strut \vrule width\wd0#2\box0}}%
}
\end{verbatim}

\texttt{\coloron\Yellow\Brown\{The brown text on the yellow background\}}

\section*{6.2 Images}

The \texttt{\inspic \langle filename\rangle.\langle extension\rangle} or \texttt{\inspic \langle filename\rangle.\langle extension\rangle\langle space\rangle} inserts the picture
stored in the graphics file with the name \texttt{\langle filename\rangle.\langle extension\rangle} to the document. You can set the
picture width by \texttt{\picw=\langle dimen\rangle} before \texttt{\inspic} command which declares the width of the picture.
The image files can be in the PNG, JPG, JBIG2 or PDF format.

The \texttt{\picwidth} is an equivalent register to \texttt{\picw}. Moreover there is an \texttt{\picheight} register
which denotes the height of the picture. If both registers are set then the picture will be (probably)
deformed.

The image files are searched in \texttt{\picdir}. This token list is empty by default, this means that
the image files are searched in the current directory. Example: \texttt{\picdir=\langle img/\rangle} supposes that image
files are in \texttt{\img} subdirectory. Note: the directory name must end by \texttt{/} in \texttt{\picdir} declaration.

\texttt{Inkscape\textsuperscript{7}} is able to save a picture to PDF and labels of the picture to another file\textsuperscript{8}. This second
file should be read by \TeX in order to print labels in the same font as document font. \LaTeX supports

\textsuperscript{6} Printed output is more equal to the monitor preview especialy if you are using ICC profile for your printer.
\textsuperscript{7} A powerfull and free wysiwyg editor for creating vector graphics.
\textsuperscript{8} Chose “Omit text in PDF and create LaTeX file” option.
this feature by \inkinspic \{filename\}.pdf command. It reads and displays both: PDF image and labels generated by Inkscape.

If you want to create a vector graphics (diagrams, schema, geometry skicing) then you can do it in Wysiwyg graphics editor (Inkscape, Geogebra for example), export the result to PDF and include it by \inspic. If you want to “program” such pictures then Tikz package is recommended. It works in Plain TeX.

6.3 PDF transformations

All typesetting elements are transformed by linear transformation given by the current transformation matrix. The \pdfsetmatrix \{(a) \ (b) \ (c) \ (d)\} command makes the internal multiplication with the current matrix so linear transformations can be composed. One linear transformation given by the \pdfsetmatrix above transforms the vector [0,1] to [(a), (b)] and [1,0] to [(c), (d)]. The stack-oriented commands \pdfsave and \pdfrestore gives a possibility of storing and restoring the current transformation matrix and the current point. The position of the current point have to be the same from \TeX’s point of view as from transformation point of view when \pdfrestore is processed. Due to this fact the \pdfsave\rlap{\langle transformed text \rangle}\pdfrestore or something similar is recommended. \TeX provides two special transformation macros:

\begin{verbatim}
\pdfscale{(horizontal-factor){(vertical-factor)}
\pdfrotate{angle-in-degrees)}
\end{verbatim}

These macros simply calls the properly \pdfsetmatrix command.

It is known that the composition of transformations is not commutative. It means that the order is important. You have to read the transformation matrices from right to left. Example:

First: \pdfsave \pdfrotate{30}\pdfscale{-2}{2}\rlap{text1}\pdfrestore
% text1 is scaled two times and it is reflected about vertical axis
% and next it is rotated by 30 degrees left.

second: \pdfsave \pdfscale{-2}{2}\pdfrotate{30}\rlap{text2}\pdfrestore
% text1 is rotated by 30 degrees left then it is scaled two times
% and reflected about vertical axis.

third: \pdfsave \pdfrotate{-15.3}\pdfsetmatrix{2 0 1.5 2}\rlap{text3}\%
% \pdfrestore % first slanted, then rotated by 15.3 degrees right

This gives the following result. First, second, third: text3
text1
text2

eLaTeX knows nothing about dimensions of transformed material, it treats it as with a zero dimension object. This problem is solved by the \transformbox{(transformation)}{(text)} macro which puts the transformed material to a box with relevant dimension. The \langle transformation \rangle parameter includes one or more transformation commands \pdfsetmatrix, \pdfscale, \pdfrotate with their parameters. The \langle text \rangle is transformed text.

Example: \frame{\transformbox{\pdfscale{1}{1.5} \pdfrotate{-10}}{moj}} creates \text{moj}.

The \rotbox{(deg)}{(text)} is a shortcut for \transformbox{\pdfrotate{(deg)}{(text)}}.

6.4 Ovals, circles

The \inoval{\langle text \rangle} creates a box like this: [text]. Multiline text can be put in an oval by the command \inoval{\vbox{\langle text \rangle}}. Local settings can be set by \inoval[\langle settings \rangle]{\langle text \rangle} or you can re-declare global settings by \ovalparams={\langle settings \rangle}. The default settings are:

\begin{verbatim}
\ovalparams={\roudness=2pt % diameter of circles in the corners
\fcolor=Yellow % color used for filling oval
\lcolor=Red % line color used in the border
\lwidth=0.5bp % line width in the border
\shadow=N % use a shadow effect
\overlapmargins=N % ignore margins by surrounding text
\hhkern=0pt \vvkern=0pt % left-right margin, top-bottom margin
\end{verbatim}

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The total distance from text to oval boundary is $\texttt{\text{\textbackslash hhkern}}+\texttt{\textbackslash roundness}$ at the left and right sides and $\texttt{\text{\textbackslash vvkern}}+\texttt{\textbackslash roundness}$ at the top and bottom sides of the text.

If you need a setting for the $\langle\text{text}\rangle$ (color, size, font etc.), use $\texttt{\text{\textbackslash oval\{\text{text settings}\}}\langle\text{text}\rangle}$.

The $\texttt{\text{\textbackslash incircle\{ratio=1.8\}}\langle\text{text}\rangle}$ creates a box like this $\langle\text{text}\rangle$. The $\texttt{\text{\textbackslash ratio}}$ is width/height.

The usage is analogous like for oval. The default settings of parameters are

\begin{verbatim}
\circleparams={\text{\textbackslash ratio=1 \texttt{\textbackslash fcolor=\textbf{\textbackslash Yellow}}} \texttt{\textbackslash \textcolor{\textbf{\textbackslash Red}}} \texttt{\textbackslash \textcolor{\textbf{\textbackslash width=0.5bp}}}} \texttt{\textbackslash shadow=N \textbackslash ignoremargins=N \textbackslash hhkern=2pt \textbackslash vvkern=2pt}
\end{verbatim}

The macros $\texttt{\text{\textbackslash clipinoval\{\text{\langle\text{x}\rangle \text{\langle\text{y}\rangle \text{\langle\text{width}\rangle \text{\langle\text{height}\rangle}}\{\langle\text{text}\rangle\}}\}}}$ and $\texttt{\text{\textbackslash clipincircle\{\text{\langle\text{ratio}\rangle \text{\langle\text{width}\rangle \text{\langle\text{height}\rangle}}\{\langle\text{text}\rangle\}}\}}$ print the $\langle\text{text}\rangle$ when a clipping path (oval or circle) with given $\langle\text{with}\rangle$ and $\langle\text{height}\rangle$ shifted its center by $\langle\text{x}\rangle$ to right and by $\langle\text{y}\rangle$ to up is used. The $\texttt{\text{\textbackslash roundness=5mm}}$ is default for $\texttt{\text{\textbackslash clipinoval}}$ and user can change it. Example:

\begin{verbatim}
\clipincircle 3cm 3.5cm 6cm 7cm \{\picw=6cm \inspic{myphoto.jpg}}
\end{verbatim}

### 6.5 Putting images and texts wherever

The $\texttt{\text{\textbackslash puttext\{\text{\langle\text{x}\rangle \text{\langle\text{y}\rangle \{\text{\langle\text{text}\rangle\}}\}}}}$ puts the $\langle\text{text}\rangle$ shifted by $\langle\text{x}\rangle$ right and by $\langle\text{y}\rangle$ up from current point of typesetting and does’nt change the position of the current point. Assume coordinate system with origin in the current point. Then $\texttt{\text{\textbackslash puttext\{\text{\langle\text{x}\rangle \text{\langle\text{y}\rangle \{\text{\langle\text{text}\rangle\}}\}}}}$ puts the text at the coordinates $\langle\text{x}\rangle$, $\langle\text{y}\rangle$. More exactly the left edge of its baseline is at that position.

The $\texttt{\text{\textbackslash putpic\{\text{\langle\text{x}\rangle \text{\langle\text{y}\rangle \text{\langle\text{width}\rangle \text{\langle\text{height}\rangle}}\{\langle\text{image}\rangle\}}\}}}$ puts the $\langle\text{image}\rangle$ of given $\langle\text{width}\rangle$ and $\langle\text{height}\rangle$ at given position (its left-bottom corner). You can write $\texttt{\text{\textbackslash nospec}}$ instead $\langle\text{width}\rangle$ or $\langle\text{height}\rangle$ if this parameter is not given.

### 7 Others

#### 7.1 Using more languages

Op\TeX\X prepares hyphenation patterns for all languages if such patterns are available in your \TeX\X system. Only US\English patterns (original from Plain \TeX\X) are preloaded. Hyphenation patterns of all other languages are loaded on demand when you first use the $\langle\text{\texttt{\textbackslash iso-code}}\texttt{\text{\textbackslash lang}}\rangle$ command in your document. For example $\texttt{\text{\textbackslash delang}}$ for German, $\texttt{\text{\textbackslash cslang}}$ for Czech, $\texttt{\text{\textbackslash pllang}}$ for Polish. The $\langle\text{\texttt{\textbackslash iso-code}}\rangle$ is a shortcut of the language (mostly from ISO 639-1). You can list all available languages by $\langle\text{\texttt{\textbackslash langlist}}\rangle$. This macro prints now:

en\text{(US\English)}\text{\textbackslash enus}\text{(US\English\\text{\textbackslash max})}\text{\textbackslash it}\text{(Italian)}\text{\textbackslash ia}\text{(Interlingua)}\text{\textbackslash id}\text{(Indonesian)}\text{\textbackslash cs}\text{(Czech)}\text{\textbackslash sk}\text{(Slovak)}\text{\textbackslash de}\text{(German)}\text{\textbackslash fr}\text{(French)}\text{\textbackslash pl}\text{(Polish)}\text{\textbackslash cy}\text{(Welsh)}\text{\textbackslash da}\text{(Danish)}\text{\textbackslash es}\text{(Spanish)}\text{\textbackslash sl}\text{(Slovenian)}\text{\textbackslash fi}\text{(Finnish)}\text{\textbackslash hu}\text{(Hungarian)}\text{\textbackslash tr}\text{(Turkish)}\text{\textbackslash et}\text{(Estonian)}\text{\textbackslash eu}\text{(Basque)}\text{\textbackslash gl}\text{(Galician)}\text{\textbackslash km}\text{(Kurmanji)}\text{\textbackslash tk}\text{(Turkmen)}\text{\textbackslash zh}\text{(Chinese)}\text{\textbackslash zh\text{-\textbackslash pinyin\text{\textbackslash is)}}\text{(Icelandic)}\text{\textbackslash hy}\text{(Armenian)}\text{\textbackslash ru}\text{(Russian)}\text{\textbackslash uk}\text{(Ukrainian)}\text{\textbackslash hy\\text{-\textbackslash Armenian\text{\textbackslash as)}}\text{(Assamese)}\text{\textbackslash hi}\text{(Hindi)}\text{\textbackslash kn}\text{(Kannada)}\text{\textbackslash lv}\text{(Latvian)}\text{\textbackslash lt}\text{(Lithuanian)}\text{\textbackslash ml}\text{(Malayalam)}\text{\textbackslash mr}\text{(Marathi)}\text{\textbackslash or}\text{(Oriya)}\text{\textbackslash pa}\text{(Panjabi)}\text{\textbackslash ta}\text{(Tamil)}\text{\textbackslash te}\text{(Telugu)}$

For compatibility with e-plain macros, there is the command $\langle\text{\texttt{\textbackslash use\textbackslash language\{\text{\langle\text{language}\rangle}\}}\rangle$. The parameter $\langle\text{language}\rangle$ is long form of language name, i.e. $\langle\text{\texttt{\textbackslash use\textbackslash language\{\text{\langle\text{Czech}\rangle}\}}\rangle$ works the same as $\langle\text{\texttt{\textbackslash cslang}}\rangle$. The $\langle\text{\texttt{\textbackslash use\textbackslash language}}\rangle$ parameter is case insensitive.

For compatibility with \texttt{\textbackslash plain}, there are macros $\langle\text{\texttt{\textbackslash chyph}}\rangle$, $\langle\text{\texttt{\textbackslash chyph}}\rangle$, $\langle\text{\texttt{\textbackslash shyph}}\rangle$ which are equivalent to $\langle\text{\texttt{\textbackslash enlang}}\rangle$, $\langle\text{\texttt{\textbackslash cslang}}\rangle$ and $\langle\text{\texttt{\textbackslash pllang}}\rangle$.

You can switch between language patterns by $\langle\text{\texttt{\textbackslash iso-code\textbackslash lang}}\rangle$ commands mentioned above. Default is $\langle\text{\texttt{\textbackslash enlang}}\rangle$.

\TeX\X generates three words used for captions and titles in technical articles or books: “Chapter”, “Table” and “Figure”. These words need to be known in used language and it depends on the previously used language selectors $\langle\text{\texttt{\textbackslash iso-code\textbackslash lang}}\rangle$. \TeX\X declares these words only for few languages: Czech, German, Spanish, French, Greek, Italian, Polish, Russian, Slovak and English, If you need to use these words in another languages or you want to auto-generate more words in your macros, then you can declare it by $\langle\text{\texttt{\textbackslash sdef}}\rangle$ or $\langle\text{\texttt{\textbackslash _langu\rangle}}$ commands as shown in the file languages.\text{\texttt{\textbackslash opm}}.

The $\langle\text{\texttt{\textbackslash makeindex}}\rangle$ command needs to know the sorting rules used in your language. \TeX\X defines only few language rules for sorting: Czech, Slovak and English. How to declare sorting rules for more languages are described in the file makeindex.\text{\texttt{\textbackslash opm}}.
If you declare \langle iso-code\rangle quotes, then the control sequences \" and \' should be used like this: \"⟨quoted text⟩\" or \'⟨quoted text⟩\'. (note that the terminating character is the same but it isn’t escaped). This prints language dependent normal or alternative quotes around ⟨quoted text⟩. The language is specified by ⟨iso-code⟩. \TeX declares quotes only for Czech, German, Spanish, French, Greek, Italian, Polish, Russian, Slovak and English ⟨csquotes, dequotes, . . . , enquotes⟩. You can simply define your own quotes as shown in languages.opm file. The \" is used for quotes visually more similar to the " character which can be primary quotes or secondary quotes depending on the language rules. May be you want to alternate meaning of these two types of quotes. Use \langle iso-code\rangle quotes\altquotes in such case.

7.2 Pre-defined styles

\TeX defines three style-declaration macros \report, \letter and \slides. You can use them at the beginning of your document if you are preparing these types of document and you don’t need to create your own macros.

The \report declaration is intended to create reports. It sets default font size to 11 pt and \parindent (paragraph indentation) to 1.2 em. The \tit macro uses smaller font because we assume that “chapter level” will be not used in reports. The first page has no page number, but next pages are numbered (from number 2). Footnotes are numbered from one in whole document. The macro \author ⟨authors⟩<end-line> can be used when \report is declared. It prints ⟨authors⟩ in italics at center of the line. You can separate authors by \nl to more lines.

The \letter declaration is intended to create letters. See an example in the file op-letter.tex. The \letter style sets default font size to 11 pt and \parindent to 0 pt. It sets half-line space between paragraphs. The page numbers are not printed. The \subject macro can be used, it prints the word “Subject:” or “Věc” (or something else depending on current language) in bold. Moreover, the \address macro can be used when \letter is declared. The usage of the \address macro looks like:

\address
⟨first line of address⟩
⟨second line of address⟩
⟨etc.⟩
⟨empty line⟩

It means that you need not to use any special mark at the end of lines: end of lines in the source file are the same as in printed output. The \address macro creates \vtop with address lines. The width of such \vtop is equal to the most wide line used in it. So, you can use \hfill \address . . . in order to put the address box to the right side of the document. Or you can use \langle prefixed text⟩ \address . . . to put \langle prefixed text⟩ before first line of the address.

The \slides style creates a simple presentation slides. See an example in the file op-slides.tex. Run optex op-slides.tex and see the usage of \slides style in the file op-slides.pdf.

Analogical declaration macros \book is not prepared. Each book needs an individual typographical care so you need to create specific macros for design.

7.3 Lorem ipsum dolor sit

A designer needs to concentrate to the design of the output and maybe he/she needs a material for testing macros. There is the possibility to generate a neutral text for such experiments. Use \lorem[⟨number⟩] or \lorem[⟨from⟩—⟨to⟩]. It prints a paragraph (or paragraphs) with neutral text. The numbers ⟨number⟩ or ⟨from⟩, ⟨to⟩ must be in the range 1 to 150 because there are 150 paragraphs with neutral text prepared for you. The \lipsum macro is equivalent to \lorem. Example \lipsum[1–150] prints all prepared paragraphs.

7.4 Logos

The control sequences for typical logos can be terminated by optional / which is ignored when printing.

This makes logos more legible in source file:

We are using \TeX/ because it is cool. \OpTeX/ is better than \LaTeX.
7.5 The last page

The number of the last page (it may be different from number of pages) is expanded by \texttt{lastpage} macro. It expands to \( ? \) in first \TeX{} run and to the last page in next \TeX{} runs.

There is an example for footlines in the format “current page / last page”:

\footline={\hss \fixedrm \folio/lastpage \hss}

The \texttt{lastpage} expands to the last \texttt{folio} which is a decimal number or roman numeral (when \texttt{pageno} is negative). If you need to know total pages used in the document, use \texttt{totalpages} macro. It expands to zero (in first \TeX{} run) or to the number of all pages in the document (in next \TeX{} runs).

7.6 Use Op\TeX{}

The command \texttt{useOptex} (or \texttt{useoptex}) does nothing in Op\TeX{} but it causes an error (undefined control sequence) when another format is used. You can put it as the first command in your document:

\texttt{\useOptex % we are using Optex format, no LaTeX :)}

8 Summary

\texttt{\tit Title (terminated by end of line)}
\texttt{\chap Chapter Title (terminated by end of line)}
\texttt{\sec Section Title (terminated by end of line)}
\texttt{\secc Subsection Title (terminated by end of line)}
\texttt{\maketoc % table of contents generation}
\texttt{\ii item1,item2 % insertion the items to the index}
\texttt{\makeindex % the index is generated}
\texttt{\label [labname] % link target location}
\texttt{\ref [labname] % link to the chapter, section, subsection, equation}
\texttt{\pgref [labname] % link to the page of the chapter, section, ...}
\texttt{\caption/t % a numbered table caption}
\texttt{\caption/f % a numbered caption for the picture}
\texttt{\eqmark % a numbered equation}
\texttt{\begitems % start list of the items}
\texttt{\enditems % end of list of the items}
\texttt{\begtt % start verbatim text}
\texttt{\endtt % end verbatim text}
\texttt{\activettchar X % initialization character X for in-text verbatim}
\texttt{\code % another alternative for in-text verbatim}
\texttt{\verbinput % verbatim extract from the external file}
\texttt{\begmulti num % start multicolumn text (num columns)}
\texttt{\endmulti % end multicolumn text}
\texttt{\cite [labnames] % refers to the item in the lits of references}
\texttt{\rcite [labnames] % similar to \cite but [] are not printed.}
\texttt{\sortcitations \shortcitations \nonumcitations % cite format}
\texttt{\bib [labname] % an item in the list of references}
\texttt{\usebib/? (style) bib-base % direct using of .bib file, ? in \{s,c\}}
\texttt{\fontfam [FamilyName] % selection of font family}
\texttt{\typsize [font-size/baselineskip] % size setting of typesetting}
\texttt{\typyscale [factor-font/factor-baselineskip] % size scaling}
\texttt{\thefontsize [size] \thefontscale [factor] % current font size}
\texttt{\inspic file.ext % insert a picture, extensions: jpg, png, pdf}
\texttt{\table {rule}{data} % simple macro for the tables like in LaTeX}
\footnote{text} % footnote (local numbering on each page)
\marginnote{text} % note in the margin (left or right by page number)

\hyperlinks{color-in}{color-out} % PDF links activate as clickable
\outlines{level} % PDF will have a table of contents in the left tab

\magscale{factor} % resize typesetting, line/page breaking unchanged
\margins{pg format (left, right, top, bottom)unit} % margins setting

\report \letter \slides % style declaration macros

\section{Compatibility with Plain \TeX}

All macros of Plain \TeX{} are re-written in Op\TeX{}. Common macros should work in the same sense as in original Plain \TeX{}. Internal control sequences like \texttt{\@p} or \texttt{\@f@t} are removed and mostly replaced by control sequences prefixed by \texttt{\_} (like \texttt{\_this}). All primitives and common macros have two control sequences with the same meaning: in prefixed and unprefixed form. For example \texttt{\hbox} is equal to \texttt{\_hbox}. Internal macros of Op\TeX{} have and use only prefixed form. User should use unprefixed forms, but prefixed forms are accessible too, because the \texttt{\_} is set as a letter category code globally (in macro files and in users document too). User should re-define unprefixed forms of control sequences with no worries that something internal will be broken (only the sequence \texttt{\par} cannot be re-defined without internal change of \TeX{} behavior because it is hard-coded in \TeX{}s tokenization processor).

The Latin Modern 8bit fonts instead Computer Modern 7bit fonts are preloaded in the format, but only few ones. The full family set is ready to use after the command \texttt{\fontfam[LMfonts]} which reads the fonts in OTF format.

The text accents macros like \texttt{\'}, \texttt{\v}, \texttt{\"} are undefined\footnote{The math accents macros like \texttt{\acute, \bar, \dot, \hat} still work.} in Op\TeX{}. Use real letters like á, ř, ž in your source document instead these old accents macros. If you really want to use them, you can initialize them by \texttt{\oldaccents} command. But we don’t recommend it.

The default paper size is not set as letter with 1 in margins but as A4 with 2.5 cm margins. You can change it, for example by \texttt{\margins/1 letter} (1,1,1,1)in. This example sets the classical Plain \TeX{} page layout.

The origin for typographical area is not at top left 1 in 1 in coordinates but at top left paper corner exactly. For example, \texttt{\hoffset} includes directly left margin.