Indian TEX Users Group

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On-line Tutorial on LATEX

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2 Some Conventions

As a well developed programming language, TeX has certain conventions that might be worth understanding. It might appear cryptic to learn such nitty-gritty things just to typeset a document, but it will eventually become known to you that it is worth understanding. As in other mainstream programming languages, TeX has data types, booleans, input/output operations, etc. Apart from this TeX has a highly structured directory tree popularly called TeX Directory Structure (TDS), a font setup that is specific to TeX alone, a mechanism of reading and digesting characters that come across on its way and not found in other languages, etc. We shall examine one by one.

2.1. TeX Directory Structure

All implementation-dependent TeX system files (`.pool`, `.fmt`, `.base`, `.mem`) are stored by default directly in `texmf/web2c`. The configuration file `texmf.cnf` and various subsidiary `MakeTeX`... scripts used as subroutines are also stored there.

Non-TeX specific files are stored following the GNU coding standards. Given a root directory prefix (`/usr/local` by default), we have default locations as follows:

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```
⟨prefix⟩/              installation root (/usr/local by default)
  ├─bin/               executables
  ├─man/               man pages
  ├─info/              info files
  ├─lib/               libraries (libkpathsea.*)
  └─share/             architecture-independent files
       ├─texmf/        TDS root
       └─web2c/        implementation-dependent files
                       (.pool, .fmt, texmf.cnf, etc.)
```

See ftp://ftp.gnu.org/pub/gnu/standards.text for the rationale behind and descriptions of this arrangement. A site may of course override these defaults; for example, it may put everything under a single directory such as /usr/local/texmf.

2.1.1. A skeleton of a TDS

This is not to imply these are the only entries allowed. For example, local may occur at any level. Given below is the standard setup followed in web2c TeX implementations distributed along with GNU operating systems.

```
texmf                  Top level TeX directory
 ├─bibtex/             BibTeX input files
 │  ├─bib/             BibTeX databases
 │  │  ├─base/         base distribution (e.g., xampl.bib)
 │  │  └─misc/         single-file databases
 │  ├─⟨package⟩/       name of a package
 │  ├─bst/             BibTeX style files
```

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```
│  │  ├─ base/                    base distribution (e.g., plain.bst, acm.bst)
│  │  ├─ misc/                    single-file styles
│  ├─ ⟨package⟩/                  name of a package
├─ doc/                           Documentation
├─ etex/                          as with TeX, below
├─ fonts/                         font-related files
│  └─ ⟨type⟩/                     file type (e.g., pk)
│     └─ ⟨mode⟩/                  type of output device (for pk and gf only)
│        └─ ⟨supplier⟩/           name of a font supplier (e.g., public)
│           └─ ⟨typeface⟩/        name of a typeface (e.g., cm)
│              └─ dpi⟨nnn⟩/       font resolution (for pk and gf only)
├─ ⟨implementation⟩/              TeX implementations, by name (e.g., emTeX)
├─ local/                         files created or modified at the local site
├─ metafont/                      METAFONT (non-font) input files
│  ├─ base/                       base distribution (e.g., plain.mf)
│  ├─ misc/                       single-file packages (e.g., modes.mf)
│  └─ ⟨package⟩/                  name of a package (e.g., mfpic)
├─ metapost/                      MetaPost input and support files
│  ├─ base/                       base distribution (e.g., plain.mp)
│  ├─ misc/                       single-file packages
│  ├─ ⟨package⟩/                  name of a package
│  └─ support/                    support files for MetaPost-related utilities
├─ mft/                           MFT inputs (e.g., plain.mft)
├─ ⟨program⟩/                     TeX-related programs, by name (e.g., dvips)
├─ source/                        program source code by name (e.g., LaTeX, web2c)
├─ tex/                           TeX input files
```

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```
│    ├─⟨format⟩/          name of a format (e.g., latex)
│    │    ├─base/         base distribution for format (e.g., latex.ltx)
│    │    ├─misc/         single-file packages (e.g., webmac.tex)
│    │    ├─local/        local additions to or local configuration files for format
│    │    └─⟨package⟩/    name of a package (e.g., graphics, mfnfss)
│    ├─generic/           format-independent packages
│    │    ├─hyphen/       hyphenation patterns (e.g., hyphen.tex)
│    │    ├─images/       image input files (e.g., Encapsulated PostScript)
│    │    └─misc/         single-file format-independent packages (e.g., null.tex).
```

Understanding this directory tree will help you to install third party fonts and other packages later on. The top level *⟨prefix⟩* can be specified as is the case with TEXLive CDROM. However, the TEX tree does not change. The latest TDS Working Group's draft release is available at: http://tug.org/tds/.

2.2. Fonts

Unlike other typesetting systems, TEX needs a font file format called, `*.tfm` (TEX Font Metric). This file keeps all the metrics of characters like height, depth, width, kern values, etc. (TEX keeps around 64 parameters for a character) of a particular font family. During compilation process, TEX reads this metrics information and based on these values, it horizontally packs boxes having values of bounding box of characters consecutively till the end of the line is encountered. During this compilation process, TEX is not at all bothered, whether a physical font file (like `*.pfb` or `*.ttf` etc.) is available in your system. It is during previewing or printing, the corresponding software needs these font files.

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It arises a problem, when one tries to access third party fonts supplied by various foundries, for instance, Adobe. Foundries do not supply TEX font metric file. However, this can easily be generated with `afm2tfm` program supplied with your TEX distribution and is a trivial process. We will learn about these in subsequent chapters.

2.3. Characters

Not all the characters of your document is seen by TEX in the same way as we see them. The following characters have special meaning, `\`, `#`, `$`, `%`, `ˆ`, `&`, `_`, `{`, `}`.

`\`	escape character, TEX functions or control sequences start with this character, e.g., `\alpha`, `\section`, `\bf`, etc.
`#`	parameter character used in TEX macros (we will learn this later on)
`$`	math shift character, i.e., `$` character starts math mode and the next `$` character stops it
`%`	comment character, TEX will ignore the characters after `%` till the end of that line
`ˆ`	superscript character in math, e.g., `$aˆ2$` ⇒ a^2
`_`	subscript character in math, e.g., `$a_2$` ⇒ a_2
`{`	group open character used to open a local group
`}`	group close character used to close a local group
`~`	unbreakable space

The obvious question arises, what will we do if we want the above characters got printed. The table below will show you how to accomplish it:

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Character	Math mode	Text mode
\	\backslash	\textslash
#	\#	\#
$	\$	\$
%	\%	\%
^	\^	\^
_	_	_
{	\{	\{
}	\}	\}
~	\tilde	\texttilde

2.3.1. Alphabets and numerals

Ordinary alphabets, numerals, punctuations, parentheses, square brackets, and characters other than what listed above are entered as in any other program or word processor and the result will exactly match what you have entered.

2.3.2. Mathematical symbols and notations

Greek letters, various math operators including negated operators, arrows, stretchy delimiters, etc., which are normally not available in a keyboard are entered to the computer with a set of special control sequences specifically designed for this purpose. There are around 2500 control sequences available, at least half of them are not in regular use. The numbers need not make you awe-struck, since you know most of them. Knuth designed all the control sequences in such a way that it is nothing but what you ordinarily pronounce in your classroom. For instance, if you want a Greek alpha character entered into your document, you need to give as `\alpha`, this during compilation will give you 'α'. Given below is an equation composed of such control sequences:

$$(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta \tag{2.1}$$

The following code generates the above equation which is not at all difficult for any academic to undertake.

```
\begin{equation}
  (\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta
\end{equation}
```

Similarly, a wide variety of symbols are accessed with names similar to what we ordinarily denote them. For instance, $\swarrow$, ψ, $\longrightarrow$, $\sum$, $\subseteq$, $\not\subseteq$ are generated with `\swarrow`, `\psi`, `\longrightarrow`, `\sum`, `\subseteq`, `\not\subseteq`. The point is that symbols in TEX is extremely logical to follow and not much extra effort is needed to understand and remember them. We will learn more about math symbols, formulae and their spatial arrangement and constructs during the second phase of our tutorial.

2.3.3. Accented characters

Languages other than English have a variety of accents and special symbols. LATEX provides commands to generate accents and symbols to put small pieces of non-English text in an English document. See this sentence:

El señor está bien, garçon, Él está aqüí

generated by the following code:

```
El se\~nor est\'a bien, gar\c{c}on, \'El est\'a aq\"u\'{\i}
```

List of commands for accents and special symbols

\`{o}	⟹	ò	\~{o}	⟹	õ
\'{o}	⟹	ó	\={o}	⟹	ō
\^{o}	⟹	ô	\.{o}	⟹	ȯ
\"{o}	⟹	ö	\u{o}	⟹	ŏ
\v{o}	⟹	ǒ	\c{o}	⟹	o̧
\H{o}	⟹	ő	\d{o}	⟹	ọ
\t{oo}	⟹	o͡o	\b{o}	⟹	o̱
\oe	⟹	œ	\aa	⟹	å
\OE	⟹	Œ	\AA	⟹	Å
\ae	⟹	æ	\AE	⟹	Æ
\o	⟹	ø	\O	⟹	Ø
\l	⟹	ł	\L	⟹	Ł
\ss	⟹	ß			
\dag	⟹	†	\ddag	⟹	‡
\S	⟹	§	\P	⟹	¶
\copyright	⟹	©	\pounds	⟹	£

2.4. Epilog

With this chapter, we conclude the preliminaries and introductory part of the tutorial. Next chapter onwards, we get into the real meat of the learning process. The chapters have been written not from a programmer's point of view, but rather a qualitative treatment of the language from a functional point of view is undertaken. In case, any one needs any theoretical explanation of any of the functions described or its underlying mechanism in a TeX run to accomplish it, you are gladly welcomed to querry that at appropriate time. The tutorial team is only happy to

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explain that in great detail. So we start the LaTeX document classes in the next chapter.