Hour 2

Fonts Selection

There are three modes for processing texts in LaTeX – *paragraph*-mode, *LR*-mode and *math*-mode[1]. The paragraph-mode is for producing normal texts with automatic word-splitting, and line and page breaking to fit the texts within the area specified by the width and height of a page. In contrast, the LR-mode processes texts from left-to-right without any word-splitting and line breaking, such as **\mbox{}** or **\fbox{}** command whose arguments may span even beyond the specified width of a page. On the other hand, the math-mode is for writing mathematical expressions, like equations. In this book, the paragraph-mode and LR-mode will occasionally be addressed by a single name, known as the *text*-mode.

2.1 Text-Mode Fonts

The default font type of a LaTeX document is medium series serif family in upright shape and 10 pt size. The sizes of fonts in different parts of a document, say in headings and in paragraphs, are calculated proportionately, which can be visualized in this book. The default font setting can be altered globally through various options to the **\documentclass[]{}** command, e.g., **\documentclass[12pt]{article}** for producing an article in 12 pt fonts. The type of fonts in a particular segment can also be set manually as discussed below.

Types of fonts in LaTeX are classified into four categories – *family*, *series*, *shape* and *size*. The detail of each category is given in Table 2.1 on the following page.

1. *Font family*: There are three standard font families, namely *serif* (default), *sans serif* and *typewriter* fonts, which are accessed by the **\textrm{}** (or **{\rm }**), **\textsf{}** (or **{\sf }**) and **\texttt{}** (or **{\tt }**) commands respectively. The same can also be accessed by the **\rmfamily**, **\sffamily** and **\ttfamily** declarations, respectively.

[1] LaTeX processes texts in three modes – paragraph-mode, LR-mode and math-mode.

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Table 2.1 Different types of text-mode fonts used in LaTeX

SN	Type	Variety	Command	Declaration
1	Family	Serif family (default)	\textrm{atext} or {\rm atext}	\rmfamily
		Sans serif family	\textsf{atext} or {\sf atext}	\sffamily
		Typewriter family	\texttt{atext} or {\tt atext}	\ttfamily
2	Series	Medium series (default)	\textmd{atext}	\mdseries
		Boldface series	\textbf{atext} or {\bf atext}	\bfseries
3	Shape	Upright shape (default)	\textup{atext}	\upshape
		Italic shape	\textit{atext} or {\it atext}	\itshape
		Slanted shape	\textsl{atext} or {\sl atext}	\slshape
		CAPS & SMALL CAPS SHAPE	\textsc{atext} or {\sc atext}	\scshape
		Emphasized shape	\emph{atext} or {\em atext}	—
4	Size	Tiny size	{\tiny atext}	\tiny
		Script size	{\scriptsize atext}	\scriptsize
		Foot note size	{\footnotesize atext}	\footnotesize
		Small size	{\small atext}	\small
		Normal size (default)	–	\normalsize
		Large size	{\large atext}	\large
		Larger size	{\Large atext}	\Large
		Largest size	{\LARGE atext}	\LARGE
		Huge size	{\huge atext}	\huge
		Hugest size	{\Huge atext}	\Huge

2. *Font series*: The two series of fonts, medium-valued width and height (default) and boldface, are accessed respectively by the \textmd{} and \textbf{} (or {\bf }) commands (or corresponding \mdseries and \bfseries declarations).
3. *Font shape*: Fonts of four different shapes, upright (default), italic, slanted, and caps and small caps, can be produced respectively through the \textup{}, \textit{} (or {\it }), \textsl{} (or {\sl }) and \textsc{} (or {\sc }) commands (or corresponding \upshape, \itshape, \slshape and \scshape declarations). Apart from these four shapes, fonts of emphasized shape can be produced using the \emph{} or {\em } command.
4. *Font size*: Fonts of ten different sizes can be produced using the {\tiny }, {\scriptsize }, {\footnotesize }, {\small }, {\normalsize }, {\large }, {\Large }, {\LARGE }, {\huge } and {\Huge } commands (or their corresponding declarations of \tiny, \scriptsize, \footnotesize, \small, \normalsize, \large, \Large, \LARGE, \huge and \Huge respectively). The sizes of these ten types of fonts are not rigid, but proportional to the setting made in the document class, e.g., \documentclass[12pt]{} for producing fonts of 12 pt in size.

Notice that italic, emphasized and slanted letters are leaned towards right, for which the gap between the last italic, emphasized, or slanted letter and the following upright letter gets reduced. In order to maintain a proper spacing, the arguments of the {\it }, {\em } and {\sl } commands may be followed by \/. For example, '{\it red} line'

will produce '*red* line', while '{\it red\/} line' will produce '*red* line'. The \textit{}, \emph{} and \textsl{} commands make such corrections automatically. Further, the \/ symbol is not required if the last italic, emphasized, or slanted letter is followed by a punctuation. The \/ can also be used between two letters for increasing inter-letter spacing, e.g., 'of\/f\/ice' will produce 'office', while 'office' produces 'office'.

Different combinations of font family, series, shape and size (i.e., the commands of Table 2.1) in a logical way are allowed for producing a wide variety of fonts[2], e.g., \emph{\textbf{emphasized boldface fonts}} for producing '***emphasized boldface fonts***', or {\large\sf large sans serif fonts} for producing 'large sans serif fonts'.

Type of fonts of an individual word or a short phrase can be changed by a font command having an argument, e.g., \textbf{atext} for printing atext in boldface fonts. While an equivalent declaration without any argument, e.g., \bfseries, may be used for changing the fonts of a large portion, say the remaining texts of an environment or a document. To return to the main document fonts, the declaration of any specific font type can be quit using the \normalfont declaration. If a particular font type is to be used in one or more consecutive paragraphs, the font type can be applied as an environment also, e.g., \begin{bfseries}aparas\end{bfseries} for printing aparas in boldface fonts.

2.2 Math-Mode Fonts

Like in text-mode, different types of fonts can be used in math-mode also as shown in Table 2.2 (math-mode is discussed in Hour 11 on page 101). In the case of these math-mode fonts, the following three points are to be noted:

Table 2.2 Different types of math-mode fonts used in LaTeX

Font type	Command	Package required	Output
Serif family	\mathrm{ABC abc}	—	ABCabc
Italic shape	\mathit{ABC abc}	—	*ABCabc*
Boldface series	\mathbf{ABC abc}	—	**ABCabc**
Sans serif family	\mathsf{ABC abc}	—	ABCabc
Typewriter family	\mathtt{ABC abc}	—	ABCabc
Mathematical boldface	\boldmath{ABC abc}	amssymb	***ABCabc***
Mathematical normal	\mathnormal{ABC abc}	—	*ABCabc*
Calligraphic	\mathcal{A B C}	—	$\mathcal{ABC}$
Open	\Bbb{A B C}	amsfonts/ amssymb	$\mathbb{ABC}$
Open	\mathbb{A B C}	amsfonts/ amssymb	$\mathbb{ABC}$
German/ Fraktur	\mathfrak{ABC abc}	eufrak/ amsfonts/ amssymb	$\mathfrak{ABCabc}$

[2]Different combinations of font family, series, shape and size (i.e., the commands of Table 2.1) in a logical way are allowed for producing a wide variety of fonts.

1. If used in text-mode, the commands of Table 2.2 (except \boldmath{}) are to be written within a pair of $ symbol, e.g., $\mathbf{abc}$ for printing **abc**. In the case of the \boldmath{} command, the argument is to be enclosed in a pair of $ symbol, e.g., \boldmath{abc} for printing ***abc***.
2. The \mathcal{}, \mathbb{} and \Bbb{} commands do not accept lower case letters.
3. Any blank space in the arguments of the commands of Table 2.2 is omitted. Commands, like \, or ~, may be used for maintaining some gap between two letters or words, e.g., $\mathbb{A\,B~C}$ will produce $\mathbb{A\,B~C}$ (creating blank spaces is discussed in §3.6 on page 21, while texts in math-mode in §12.1 on page 113). However, most of the commands of different family, series, and shape having the forms of \text. .{} (e.g., \textbf{} or \textit{}) and \emph{}, as shown in Table 2.1, can be used for writing normal texts in math-mode preserving the space provided between two letters in the input file.

2.3 Emphasized Fonts

Important texts in a document are usually emphasized by writing them in **boldface**, *italic*, or in ***boldface italic***, which are done in LaTeX through the {\bf }, {\it } (or {\em }) and {\bf\em } commands respectively, or through their other forms of \textbf{}, \textit{} (or \emph{}) and \textbf{\emph{}} commands[3] respectively (refer §2.1 for detail).

Apart from the above forms, texts can also be emphasized by underlining them through the \underline{} command, e.g., \underline{important} will produce important. However, the \underline{} command does not permit any line break in between its argument, for which it cannot be used for printing a long statement as it may go beyond the margin of a line.

The above problem with the \underline{} command can be sorted out using the ulem package, which redefines the {\em } and \emph{} commands for printing their arguments by underlining with required line breaks. If some texts are to be underlined, as well as to be printed in *italic* fonts, either {\it{\em }} or \textit{\emph{}} command may be used. If the ulem package is loaded, the redefined effects of the {\em } and \emph{} commands can be turned on or off using the \ULforem or \normalem command in between the texts where from the effects are to be turned on or off respectively. Besides the {\em } and \emph{} commands, the ulem package provides the \uwave{}, \sout{} and \xout{} commands for printing an argument, respectively, by a wavy underline, a strike-out line and by crossing out each character of the argument[4].

[3] Both the \emph{} and {\em } commands produce emphasized fonts, but the \emph{} command produces better spacing than the {\em } command does.

[4] Struck out or overlapping texts can also be produced by creating a negative horizontal space between two pieces of texts using the \hspace{} command with a negative length as its argument, e.g., '~~striked out~~' can be produced by 'striked out\hspace{-1.8cm}----------'.

Some examples of various features of the **ulem** package are shown in Table 2.3, where different applications are numbered both in LaTeX input and out files for easily identifying the effect of each LaTeX syntax. A blank line is left in the input file before each application for printing it in a new line (creating new lines is discussed in §3.5.1 on page 19), while the texts in a line preceded by a **%** sign are simply commented. The underlining effects of the redefined **{\em }** and **\emph{}** commands are shown in applications 2–5, where the redefined effects are first switched on by putting the **\ULforem** command before application 2 and then they are switched off by putting the **\normalem** command after application 5. Note that the **\uwave{}**, **\sout{}** and **\xout{}** commands are not affected by the **\normalem** and **\ULforem** commands.

Table 2.3 Various forms of emphasized texts under the **ulem** package

LaTeX input	Output
\documentclass[11pt,a4paper]{article} **\usepackage{ulem}** **\begin{document}** 1. **{\em** Normal emphasized texts.**}** **\ULforem** **%** Redefining effects of {\em } and \emph{}. 2. **{\em** Underlined texts with line breaks.**}** 3. **\emph{**Yet underlined texts with line breaks.**}** 4. **{\it{\em** Underlined texts in italic fonts …**}}** 5. **\textit{\emph{**Yet underlined texts in …**}}** **\normalem** **%** For normal effects of {\em } and \emph{}. 6. **{\em** Returned to normal emphasized texts.**}** 7. The next phase is **\uwave{**wavy underlined.**}** 8. The next phase is **\sout{**striked out statement.**}** 9. The next phase is **\xout{**crossed out statement.**}** **\end{document}**	1. *Normal emphasized texts.* 2. Underlined texts with line breaks. 3. Yet underlined texts with line breaks. 4. *Underlined texts in italic fonts with necessary line breaks.* 5. *Yet underlined texts in italic fonts with necessary line breaks.* 6. *Returned to normal emphasized texts.* 7. The next phase is wavy underlined. 8. The next phase is ~~striked out statement.~~ 9. The next phase is ~~*crossed out statement.*~~

2.4 Colored Fonts

Like many word-processors, LaTeX also has the provision for producing colored fonts, supported by the **color** package. There are basically three types of color combinations – black and white (**gray**), additive primaries (**rgb**) and subtractive primaries

(**cmyk**)[5]. Using the **\definecolor{}{}{}** command, various colors can be defined by setting different values to **gray** and each of the letters of **rgb** and **cmyk** as follows:

\definecolor{cname**}{gray}{**w**}** ; $w \in [0, 1]$
\definecolor{cname**}{rgb}{**w, x, y**}** ; $w, x, y \in [0, 1]$
\definecolor{cname**}{cmyk}{**w, x, y, z**}** ; $w, x, y, z \in [0, 1]$

The definitions of the predefined colors, as well as some examples of defining new colors, are shown in Table 2.4, where `cname` is the name of the user-defined new color. The predefined colors (**black**, **white**, **red**, **green**, **blue**, **cyan**, **magenta** and **yellow**) need not to be redefined, while the user-defined colors (as shown through an example in Table 2.4 under each category of color combination) may be defined in the preamble for global effect or inside the **document** environment for local effect.

Table 2.4 Predefined as well as some user-defined colors for fonts

Type	Command	Color
Black and white	**\definecolor{black}{gray}{0}**	Predefined black
	\definecolor{white}{gray}{1}	Predefined white
	\definecolor{cname**}{gray}{0.75}**	User-defined
Additive primaries	**\definecolor{red}{rgb}{1,0,0}**	Predefined red
	\definecolor{green}{rgb}{0,1,0}	Predefined green
	\definecolor{blue}{rgb}{0,0,1}	Predefined blue
	\definecolor{black}{rgb}{0,0,0}	Predefined black
	\definecolor{white}{rgb}{1,1,1}	Predefined white
	\definecolor{cname**}{rgb}{0,0.7,0.3}**	User-defined
Subtractive primaries	**\definecolor{cyan}{cmyk}{1,0,0,0}**	Predefined cyan
	\definecolor{magenta}{cmyk}{0,1,0,0}	Predefined magenta
	\definecolor{yellow}{cmyk}{0,0,1,0}	Predefined yellow
	\definecolor{black}{cmyk}{1,1,1,1}	Predefined black
	\definecolor{white}{cmyk}{0,0,0,0}	Predefined white
	\definecolor{cname**}{cmyk}{0.2,1,0.7,0}**	User-defined

Once different colors are defined as above (if required), colored texts can be produced through the **\textcolor{**cname**}{**atext**}** command, where `atext` is the piece of texts to be colored by `cname` color. For example, **\textcolor{blue}{**`this is in blue`**}** will print '`this is in blue`', while **\textcolor{**`urgb`**}{**`this is in rgb = `**\{**`0,0.7,0.3`**\}}** will print '`this is in rgb = {0,0.7,0.3}`', where `urgb` is a new color defined as **\definecolor{**`urgb`**}{rgb}{**`0,0.7,0.3`**}** (recall that red color is adopted in this book for writing LaTeX commands and other LaTeX syntax).

The fonts discussed in §2.1–§2.3 can also be colored through the **\textcolor{}{}** command, e.g., **\textcolor{magenta}{\small\sf** `small Sans serif in magenta`**}** will produce 'small Sans serif in magenta', and **\textcolor{blue}{$\mathfrak{**`Colored~Fraktur~fonts`**}$}** will produce '$\mathfrak{Colored\ Fraktur\ fonts}$'.

[5]There are basically three types of color combinations – black and white (**gray**), additive primaries (**rgb**) and subtractive primaries (**cmyk**).

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