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Make your first steps in the high-quality typesetting system \LaTeX

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Abstract. The article gives brief descriptions of the \LaTeX language and installation procedure on Windows operation System.

Keywords. TeX, LaTeX, pdfLaTeX, MiKTeX, AMS, computer typography.

1. INTRODUCTION

\LaTeX^2 is a high-quality typesetting system. It includes features for typesetting letters, articles, technical reports, books and slide presentations.

\LaTeX is not a word processor! Instead, \LaTeX encourages authors not to worry too much about the appearance of their documents but to concentrate on getting the right content. \LaTeX is based on the idea that is better to leave document design to document designers, and to let authors get on with writing documents.

2. A BRIEF HISTORY

In May 1977, the father of the computer typography, Donald Ervin Knuth [3] started working on the text-processing system “TeX and METAFONT”. \LaTeX was first developed in 1985 by Leslie Lamport [4] and is now been maintained and developed by the \LaTeX 3 Project [5]. Today \LaTeX is *de facto* standard for the communication and publication of scientific documents. \LaTeX is available as free software and is distributed under the LaTeX Project Public License (LPPL). The current version of \LaTeX is $\LaTeX 2_{\epsilon}$.

¹This article is distributed under the terms of the Creative Commons Attribution License which permits any use, distribution, and reproduction in any medium, provided the original author(s) and the source are credited.

² \LaTeX is pronounced as “lay-tech” or “lah-tech” as in the word “technique”

3. COMPATIBILITY AND SOFTWARE

\LaTeX documents (`name.tex`) can be opened with any text editor. The commands commonly start with backslash (`\`) and are grouped with curly braces. As a macro package, \LaTeX provides a set of macros for \TeX for interpret. When \TeX “compiles” a document, it follows the sequence: **Macros**->**TeX**->**Driver**->**Output**. Traditional \TeX will output a DVI (Devise Independent) file, which is usually converted to a PostScript file. More recently, Hàn Thê Thành and others have written a new implementation of \TeX called **pdfTeX**, which also outputs to PDF format. pdfTeX has several features not available in standard TeX: TrueType and Type 1 font embedding and direct access to PDF-specific features such as hyperlinks, tables of contents and document information.

4. IS \LaTeX HARD TO USE?

The most accurate answer to this question is given by Leslie Lamport: “It’s easy to use—if you’re one of the 2% of the population who thinks logically and can read an instruction manual. The other 98% of population would find it very hard or impossible to use.”

5. GETTING AND INSTALLING A \TeX SYSTEM ON WINDOWS OS

As a free software, \LaTeX is available on most operating systems including UNIX, Mac OS X, Linux, Microsoft Windows, DOS, etc. The Windows’ distribution is called MiKTeX. The first step [1] is to download all the software that you need. We list the appropriate links for you here.

- Install the Acrobat Reader XI from <https://get.adobe.com/reader>
- Install GSView and Ghostscript. GSView is a graphical interface for Ghostscript. Ghostscript is an interpreter for the PostScript page description language. Follow the link: pages.cs.wisc.edu/~ghost/gsview.
- Install MiKTeX from miktex.org. Follow the instructions on the MiKTeX Setup Page: miktex.org/2.9/setup. There are several options on this page. We recommend you to choose “MiKTeX 2.9.4503 Net Installer” to install the complete \TeX/\LaTeX system with Type 1 Cyrillic fonts. Don’t change any paths during the installation.
- MiKTeX now comes with a TeX editor called \TeX works. Browse to your MiKTeX installation. Inside the `miktex` folder there is another folder named `miktex`. In that folder is the folder named `bin`. There is an executable named `texworks.exe`. Right-click on it and create shortcut on your desktop.
- There are many editors (free or shareware) for easy writing tex-documents: tex.stackexchange.com/questions/399/latex-editors-ides

6. WRITE YOUR FIRST \LaTeX ARTICLE

Create a folder called `miktex-work` on your hard drive. Open `texworks`, create a new document and enter the following source code:

```
\documentclass{article}
\begin{document}
```

```

Hello, World!
\end{document}

```

Save the file as `first.tex` into `miktex-work`, select pdfLaTeX from the Typeset menu, and select again Typeset. As you've successfully compiled `first.tex`, a file named `first.pdf` will open in a new window.

7. SCIENTIFIC PAPERS IN L^AT_EX

Every well-written scientific paper contains a title, author, date, an abstract, sections and subsections, good references and a bibliography citing references.

7.1. The title page. The area between `\documentclass` and `\begin{document}` is called *preamble* of the document. You have to put your commands `\title`, `\author` and `\date` in the preamble. The `\maketitle` command makes the title page. If you want to make separate title page, you have to add `titlepage` option to the `\documentclass` command:

```

\documentclass[titlepage]{article}
\title{My first \LaTeX{} article}
\author{Ivan Ivanov}
\date{\today}
\begin{document}
  \maketitle
  This is my first \LaTeX\ article!
\end{document}

```

7.2. Languages. If you have to use another language (by default is English) you have to load packages `babel`, `inputenc` and `fontenc` by putting following commands `\usepackage` in the preamble of the document. For russian language:

```

\documentclass{article}
\usepackage[T1,T2A]{fontenc}
\usepackage[utf8]{inputenc}
\usepackage[english,russian]{babel}
\title{Моя первая \LaTeX\ статья}
\author{Иван Иванович}
\date{\today}
\begin{document}
  \maketitle
  Это моя первая \LaTeX{} статья!
\end{document}

```

7.3. Abstract. An abstract is one of the most important parts in your article. Readers use abstract to determine if they want to read further, so you have to hook them in with a good abstract.

```

\documentclass{article}
\title{My first \LaTeX{} article}
\author{Ivan Ivanov}
\date{\today}
\begin{document}

```

```

\maketitle
\begin{abstract}
  This is my very short abstract.
\end{abstract}
  This is my first \LaTeX\ article!
\end{document}

```

7.4. Sectioning and formulas. Use `\section` to get automatically numbered section heading. Subsections are entered by `\subsection` command. To get unnumbered sections use `\section*` or `\subsection*`. The `\tableofcontents` command is used to print automatically arranged table of contents. We can put them anywhere in the body of the document. The next example includes some mathematical formulas. The important is: Inline mathematical expressions are enclosed in `$. . . $`. You display mathematical expressions by putting them into `$$. . . $$`. The math writing is easy:

```

\documentclass{article}
\title{My first \LaTeX{} article}
\author{Ivan Ivanov}
\date{\today}
\begin{document}
  \maketitle
\begin{abstract}
  This is my very short abstract.
\end{abstract}
\section{In-line and displayed mathematics}
In-line mathematics appears right in the line of type, as in the
 $f(x) = a_1x^2 + a_2x + a_3$ . But displayed mathematics appears on
separate line, centered in the middle of the page, such as:

$$\log_{x-1} \sqrt{x} \cdot \log_3 (x+5) = 1$$

\subsection{Very important section}
\tableofcontents
\end{document}

```

7.5. Equations. You can easily typeset automatically numbered equations in \LaTeX . It is a good idea to label the equation by `\label` command. Then we have to use the same label as argument in `\ref` or `\eqref` command to reference the equation:

```

\documentclass{article}
\title{My first \LaTeX{} article}
\author{Ivan Ivanov}
\date{\today}
\begin{document}
\maketitle
...
\subsection{Very important section}
The solutions of the inequality \eqref{eq:1}
\begin{equation}\label{eq:1}
\sqrt{3}{x-1} + \sqrt{3}{x-2} > \sqrt{3}{2x-3}
\end{equation}

```

belong to the set $x \in \left(1, \frac{32}{\infty} \right) \cup (2, \infty)$.

Delimiters will automatically expand to the correct height in mathematical expressions if you precede them with the commands `\left` and `\right` by pair. If you want to get only one curly bracket, use `\left\{ \right.`.

The `equation` environment displays and automatically numbers an equation, while `\begin{equation*}... \end{equation*}` suppresses the numbering of the equation.

The array syntax is easy for typeset with a good editor such as WinEdt. In T_EXworks we have to separate row entries with ampersands (&), and end each row (except the last) with a new line (`\`):

```
\documentclass{article}
\begin{document}
Compile to see the result:
$$\left(\begin{array}{cc}
a_{11} & a_{12} \\
a_{21} & a_{22}
\end{array}\right)
\left(\begin{array}{c}
x_1 \\
x_2
\end{array}\right)
=\left(\begin{array}{c}
b_1 \\
b_2
\end{array}\right).$$
\end{document}
```

8. ON-LINE HELP

There are many books [6, 2] and manuals [8] to read when you learn L^AT_EX [9]. The main repository for packages and files is www.ctan.org. For beginners the most popular manual is “A short introduction to L^AT_EX 2_ε” by Tobias Oetiker [7]. The archive [7] holds versions in many languages: Bulgarian, English, German, Russian, etc.

REFERENCES

- [1] D. Arnold, *Writing Scientific Papers in LaTeX*, 2001, http://msemac.redwoods.edu/~darnold/math55/WritingScientificPapers/project_latex.pdf
- [2] M. Goossens and S. Rahtz, and F. Mittelbach, *The LaTeX Graphics Companion*, Addison-Wesley, Reading, 2nd Edition, 2007, Massachusetts, USA, ISBN: 978-0-321-50892-8.
- [3] D. Knuth, *The TeX Book*, Addison-Wesley Reading, 1984, Massachusetts, ISBN: 0-201-13447-0, https://en.wikipedia.org/wiki/Donald_Knuth
- [4] L. Lamport, *LaTeX. A Document Preparation System*, Addison-Wesley, Reading, 1994, Massachusetts, USA, ISBN:0-201-52983-1 <https://math.temple.edu/~gimenez/thesis/Addison-Wesley%20-%20Latex%20A%20Document%20Preparation%20System%202nd%20Ed.pdf>
- [5] LaTeX 3 Project page, <http://latex-project.org/latex3.html>

- [6] F. Mittelbach and M. Goossens, *The LaTeX Companion*, Addison-Wesley, Reading, 2nd Edition, 2004, Massachusetts, USA, ISBN: 0-201-36299-6.
- [7] T. Oetiker *A Short Introduction to LaTeX*, 2015, <https://www.ctan.org/tex-archive/info/lshort>
- [8] *The TeX Users Group Home Page*, <http://www.tug.org>
- [9] G. Williams, *The TeX Catalog Online*, 2011, <http://texcatalogue.ctan.org/>