

Лабораторная работа №5

Дисциплина: Computer Skills for Scientific Writing

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1 Цель работы

Изучить создание и оформление таблиц в системе LaTeX. Освоить пакеты *array*, *booktabs*, *tabularx*, *longtable*, *threeparttable*, *siunitx* и приёмы, позволяющие делать таблицы профессионального вида.

2 Задание

1. The array package.
2. Adding rules (lines).
3. Merging cells.
4. The other preamble contents.
5. Customizing booktabs rules.
6. Numeric alignment in columns.
7. Specifying the total table width.
8. Multi-page tables.
9. Table notes.
10. Typesetting in narrow columns.
11. Vertical tricks.
12. Line spacing in tables.

3 Выполнение лабораторной работы

3.0.1 The array package

В начале создаётся минимальная таблица из трёх колонок. Каждая ячейка отделяется знаком &, строка завершается \\.

```
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}

\begin{document}
\begin{tabular}{lll}
Animal & Food & Size \\
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
\end{tabular}
\end{document}
```

Figure 3.1: table.tex

Animal	Food	Size
dog	meat	medium
horse	hay	large
frog	flies	small

Figure 3.2: table.pdf

Для длинных колонок применяют тип колонки `p{}` с указанием ширины, что позволяет переносить текст внутри ячейки.

```
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}

\begin{document}
\begin{tabular}{cp{9cm}}
Animal & Description \\
dog & The dog is a member of the genus Canis, which forms part of the wolf-like canids,
cat & The cat is a domestic species of small carnivorous mammal. It is the only domestic
\end{tabular}
\end{document}
```

Figure 3.3: new table.tex

Animal	Description
dog	The dog is a member of the genus Canis, which forms part of the wolf-like canids, and is the most widely abundant terrestrial carnivore.
cat	The cat is a domestic species of small carnivorous mammal. It is the only domesticated species in the family Felidae and is often referred to as the domestic cat to distinguish it from the wild members of the family.

Figure 3.4: new table.pdf

3.0.2 Adding rules (lines)

Для профессионального оформления использован пакет *booktabs*. Он заменяет *hline* на типографские аккуратные линии.


```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}

\begin{document}
\begin{tabular}{lll}
\toprule
Animal & Food & Size \\
\midrule
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
\bottomrule
\end{tabular}
\end{document}

```

Figure 3.5: table2.tex

Animal	Food	Size
dog	meat	medium
horse	hay	large
frog	flies	small

Figure 3.6: table2.pdf

Линии *toprule*, *midrule* и *bottomrule* формируют верхнюю, среднюю и нижнюю границы таблицы. Команда *cmidrule* даёт возможность проводить линии только под некоторыми колонками, что удобно при группировке данных.

```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}{lll}
\toprule
Animal & Food & Size \\
\midrule
dog & meat & medium \\
\cmidrule{1-2}
horse & hay & large \\
\cmidrule{1-1}
\cmidrule{3-3}
frog & flies & small \\
\bottomrule
\end{tabular}
\end{document}

```

Figure 3.7: new table2.tex

Animal	Food	Size
dog	meat	medium
horse	hay	large
frog	flies	small

Figure 3.8: new table2.pdf

Чтобы улучшить читаемость таблицы используется *addlinespace*, добавляющая небольшой промежуток между строками.

```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}{cp{9cm}}
\toprule
Animal & Description \\
\midrule
dog & The dog is a member of the genus Canis, which forms part of the wolf-like canids,
\addlinespace
cat & The cat is a domestic species of small carnivorous mammal. It is the only domestic
\bottomrule
\end{tabular}
\end{document}

```

Figure 3.9: new new table2.tex

Animal	Description
dog	The dog is a member of the genus Canis, which forms part of the wolf-like canids, and is the most widely abundant terrestrial carnivore.
cat	The cat is a domestic species of small carnivorous mammal. It is the only domesticated species in the family Felidae and is often referred to as the domestic cat to distinguish it from the wild members of the family.

Figure 3.10: new new table2.pdf

3.0.3 Merging cells

Команда *multicolumn* используется для объединения нескольких колонок в одной ячейке (например, для заголовков).

```
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}{lll}
\toprule
Animal & Food & Size \\
\midrule
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
fuath & \multicolumn{2}{c}{unknown} \\
\bottomrule
\end{tabular}
\end{document}
```

Figure 3.11: table3.tex

Animal	Food	Size
dog	meat	medium
horse	hay	large
frog	flies	small
fuath	unknown	

Figure 3.12: table3.pdf

Группировка данных в таблице. Первая колонка содержит названия групп. Пустые ячейки оставлены для визуального объединения строк внутри группы.

```
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}{lll}
\toprule
Group & Animal & Size \\
\midrule
herbivore & horse & large \\
& deer & medium \\
& rabbit & small \\
\addlinespace
carnivore & dog & medium \\
& cat & small \\
& lion & large \\
\addlinespace
omnivore & crow & small \\
& bear & large \\
& pig & medium \\
\bottomrule
\end{tabular}
\end{document}
```

Figure 3.13: new table3.tex

Group	Animal	Size
herbivore	horse	large
	deer	medium
	rabbit	small
carnivore	dog	medium
	cat	small
	lion	large
omnivore	crow	small
	bear	large
	pig	medium

Figure 3.14: new table3.pdf

3.0.4 The other preamble contents

С помощью `>{ }` и `<{ }` можно добавлять оформление отдельным колонкам.

```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}>{\itshape}l<{:} *{2}{l}}
\toprule
Animal & Food & Size \\
\midrule
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
\bottomrule
\end{tabular}
\end{document}

```

Figure 3.15: table4.tex

<i>Animal:</i>	Food	Size
<i>dog:</i>	meat	medium
<i>horse:</i>	hay	large
<i>frog:</i>	flies	small

Figure 3.16: table4.pdf

Межколоночные отступы и границы. Различные варианты показывают, как можно управлять расстоянием между колонками и вставлять дополнительные разделители внутри таблицы.


```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\begin{document}
\begin{tabular}{l@{ : }l@{\hspace{2cm}}l}
Animal & Food & Size \\
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
\end{tabular}

\begin{tabular}{l!{:}ll}
Animal & Food & Size \\
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
\end{tabular}

\begin{tabular}{l|ll}
Animal & Food & Size \\
dog & meat & medium \\
horse & hay & large \\
frog & flies & small \\
\end{tabular}
\end{document}

```

Figure 3.17: new table4.tex

Animal	:	Food	Size
dog	:	meat	medium
horse	:	hay	large
frog	:	flies	small
Animal	:	Food	Size
dog	:	meat	medium
horse	:	hay	large
frog	:	flies	small
Animal		Food	Size
dog		meat	medium
horse		hay	large
frog		flies	small

Figure 3.18: new table4.pdf

3.0.5 Customizing booktabs rules

Команды *toprule[2pt]*, *midrule[1pt]* и *cmidrule[0.5pt]* меняют толщину линий, что позволяет визуально разделять части таблицы.

```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}{@{} lll @{} } \toprule[2pt]
Animal & Food & Size \\ \midrule[1pt]
dog & meat & medium \\
\cmidrule[0.5pt](r{1pt}l{1cm}){1-2}
horse & hay & large \\
frog & flies & small \\ \bottomrule[2pt]
\end{tabular}
\end{document}

```

Figure 3.19: table5.tex

Animal	Food	Size
dog	meat	medium
horse	hay	large
frog	flies	small

Figure 3.20: table5.pdf

3.0.6 Numeric alignment in columns

Пакет *siunitx* автоматически выравнивает числа по десятичной точке, делая таблицу читабельной для сравнения значений.

```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{booktabs}
\usepackage{siunitx}
\begin{document}
\begin{tabular}{SS}
\toprule
{Values} & {More Values} \\
\midrule
1 & 2.3456 \\
1.2 & 34.2345 \\
-2.3 & 90.473 \\
40 & 5642.5 \\
5.3 & 1.2e3 \\
0.2 & 1e4 \\
\bottomrule
\end{tabular}
\end{document}

```

Figure 3.21: table6.tex

Values	More Values
1	2.3456
1.2	34.2345
−2.3	90.473
40	5642.5
5.3	1.2×10^3
0.2	1×10^4

Figure 3.22: table6.pdf

3.0.7 Specifying the total table width

*tabular** растягивает таблицу на заданную долю ширины страницы, а *tabularx* автоматически подбирает ширину последней колонки для равномерного заполнения пространства.


```

\documentclass{article}
\usepackage[paperheight=8cm,paperwidth=8cm]{geometry}
\usepackage{array}
\usepackage{longtable}
\begin{document}
\begin{longtable}{cc}
\multicolumn{2}{c}{A Long Table}\\
Left Side & Right Side\\
\hline
\endhead
\hline
\endfoot
aa & bb\\
Entry & b\\
a & b\\
a & b\\
a & b\\
a & b\\
a & bbb\\
a & b\\
a & b\\
a & b\\
a & b\\
a & b\\
a & b\\
a & b\\
a & b b b b b b\\
a & b b b b b b\\
a & b b\\
A Wider Entry & b\\
\end{longtable}
\end{document}

```

Figure 3.25: table8.tex

A Long Table	
Left Side	Right Side
aa	bb
Entry	b
a	b
a	b
a	b
a	b
a	bbb
a	b
a	b
a	b
a	b

1

A Long Table	
Left Side	Right Side
a	b
a	b
a	b b b b b b
a	b b b b b
a	b b
A Wider Entry	b

Figure 3.26: table8.pdf

3.0.9 Table notes

Пакет *threeparttable* добавляет сноски к таблицам в виде пронумерованных замечаний под основным содержимым.

```
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{threeparttable}
\begin{document}
\begin{table}
\begin{threeparttable}
\caption{An Example}
\begin{tabular}{ll}
An entry & 42\tnote{1}\\
Another entry & 24\tnote{2}\\
\end{tabular}
\begin{tablenotes}
\item [1] the first note.
\item [2] the second note.
\end{tablenotes}
\end{threeparttable}
\end{table}
\end{document}
```

Figure 3.27: table9.tex

An entry 42¹
 Another entry 24²
¹ the first note.
² the second note.

Figure 3.28: table9.pdf

3.0.10 Typesetting in narrow columns

Показано сравнение разных способов выравнивания текста в узких колонках
(left, raggedright, RaggedRight)

```
% !TEX root = texdoc.tex
\documentclass[a4paper]{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{ragged2e}
\begin{document}
\begin{table}
\begin{tabular}[t]{lp{3cm}}
One & A long text set in a narrow paragraph, with some more example text.\\
Two & A different long text set in a narrow paragraph, with some more hard to hyphenate words.
\end{tabular}%
\begin{tabular}[t]{l>{\raggedright\arraybackslash}p{3cm}}
One & A long text set in a narrow paragraph, with some more example text.\\
Two & A different long text set in a narrow paragraph, with some more hard to hyphenate words.
\end{tabular}%
\begin{tabular}[t]{l>{\RaggedRight}p{3cm}}
One & A long text set in a narrow paragraph, with some more example text.\\
Two & A different long text set in a narrow paragraph, with some more hard to hyphenate words.
\end{tabular}
\footnotesize
\begin{tabular}[t]{lp{3cm}}
One & A long text set in a narrow paragraph, with some more example text.\\
Two & A different long text set in a narrow paragraph, with some more hard to hyphenate words.
\end{tabular}
\end{table}
\end{document}
```

Figure 3.29: table10.tex

One	A long text set in a narrow paragraph, with some more example text.	One	A long text set in a narrow paragraph, with some more example text.	One	A long text set in a narrow paragraph, with some more example text.
Two	A different long text set in a narrow paragraph, with some more hard to hyphenate words.	Two	A different long text set in a narrow paragraph, with some more hard to hyphenate words.	Two	A different long text set in a narrow paragraph, with some more hard to hyphenate words.
One	A long text set in a narrow paragraph, with some more example text.				
Two	A different long text set in a narrow paragraph, with some more hard to hyphenate words.				

Figure 3.30: table10.pdf

3.0.11 Vertical tricks

Комбинированные таблицы в ячейках (`@{}c@{}`) используются для вертикального совмещения текста и подписей.

```

\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\usepackage{booktabs}
\begin{document}
\begin{tabular}{lcc}
\toprule
Test & \begin{tabular}{@{}c@{}}A\end{tabular} & \begin{tabular}{@{}c@{}}B\end{tabular} \\
\midrule
Content & is & here \\
Content & is & here \\
Content & is & here \\
\bottomrule
\end{tabular}
\end{document}

```

Figure 3.31: table11.tex

Test	A	B
	a	b
Content	is	here
Content	is	here
Content	is	here

Figure 3.32: table11.pdf

3.0.12 Line spacing in tables

Команда *setlength* изменяет высоту строк, что повышает читабельность таблицы.

```

\documentclass[a4paper]{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\begin{document}
\begin{center}
\begin{tabular}{cc}
\hline
Square&  $x^2$ \\
\hline
Cube&  $x^3$ \\
\hline
\end{tabular}
\end{center}
\begin{center}
\setlength\extrarowheight{2pt}
\begin{tabular}{cc}
\hline
Square&  $x^2$ \\
\hline
Cube&  $x^3$ \\
\hline
\end{tabular}
\end{center}
\end{document}

```

Figure 3.33: table12.tex

Square	x^2
Cube	x^3

Square	x^2
Cube	x^3

Figure 3.34: table12.pdf

4 Выводы

Я изучил основные возможности LaTeX для создания и форматирования таблиц. Получены практические навыки использования пакетов *array*, *booktabs*, *tabularx*, *longtable*, *threeparttable* и *siunitx*.