

# **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 \\
\hline
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.
\end{tabular}
\end{document}
```

Figure 3.3: new table.tex

| Animal | Description   |
|--------|---|
| dog    | The dog is a member of the genus <i>Canis</i> , 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 <i>Felidae</i> 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 *cstrule* 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,\\
cat & The cat is a domestic species of small carnivorous mammal. It is the only domesticated\\
\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.

```
new table4.tex
\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 \\ \hline[2pt]
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
Animal & Food & Size \\ \midrule
dog & meat & medium \\
\cmidrule[0.5pt](r{1pt}l{1cm})[1-2]
horse & hay & large \\
frog & flies & small \\ \bottomrule
\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    | $1.2 \times 10^3$ |
| 0.2    | $1 \times 10^4$   |

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.

```

$ nano file.tex
\documentclass{article}
\usepackage[T1]{fontenc}
\usepackage{array}
\begin{document}
\begin{center}
\begin{tabular}{cc}
\hline
A & B\\
C & D\\
\hline
\end{tabular}
\end{center}
\begin{center}
\begin{tabular*}{.5\textwidth}{@{\extracolsep{\fill}}cc@{}}
\hline
A & B\\
C & D\\
\hline
\end{tabular*}
\end{center}
\begin{center}
\begin{tabular*}{\textwidth}{@{\extracolsep{\fill}}cc@{}}
\hline
A & B\\
C & D\\
\hline
\end{tabular*}
\end{center}
\end{document}

```

Figure 3.23: table7.tex

|   | A | B |
|---|---|---|
|   | C | D |
| A |   | B |
| C |   | D |

Figure 3.24: table7.pdf

### 3.0.8 Multi-page tables

Окружение *longtable* позволяет таблице автоматически переноситься на новую страницу, сохраняя заголовки.

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 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

# Table 1: An Example

|               |                 |
|---------------|-----------------|
| An entry      | 42 <sup>1</sup> |
| Another entry | 24 <sup>2</sup> |

<sup>1</sup> the first note.

<sup>2</sup> 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)

```
\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}%
\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\\a\end{tabular} & \begin{tabular} {@{}c@{}}B\\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*.