Session 2

General Hints
Automatically

Typesetting Big Documents

Graphics

Figures and

Figures & Images

Options for Includin

TikZ

CSV

ISGS LATEX Beginner's Workshop Session 3 – Figures

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December 09, 2016

Typesetting Documents

Graphics

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1. Recap of Session 2

- Exercise Sheet -

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Questions from last session

Changing numbering style of captions

```
\renewcommand{\thefigure}
{\arabic{chapter}.\arabic{figure}}
```

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Time for a break.

- 10 Minutes -

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2. Recap and General Hints

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Automatically Generated Content

• **Header**: \maketitle

• Table of contents: \tableofcontents

Bibliography: \bibliography{<file>}

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Automatically Generated Content

- **Header**: \maketitle
- Table of contents: \tableofcontents
- Bibliography: \bibliography{<file>}
- List of figures: \listoffigures
- List of tables: \listoftables
- Index of keywords: \makeindex and \printindex

Index

You can define index entries using \index{...} commands in the text.

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Saving Compile Time

Compiling and Recompiling...

Compilation of bigger documents (e.g. a diploma thesis) becomes quite slow

Separate the document into multiple TEX-files:

- Introduction
- Basics
- Main Part
- Results
- Outlook

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Saving Compile Time

Compiling and Recompiling...

Compilation of bigger documents (e.g. a diploma thesis) becomes quite slow

Separate the document into multiple T_EX-files:

- Introduction
- Basics
- Main Part
- Results
- Outlook

Combination

- \input{...}
- \include{...} and \includeonly{...}



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Splitting the Document

Example

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Splitting the Document

Example

- Main file contains the outer structure
- Chapters contain only pure Lagrange Code, no \documentclass etc.
- Only 2 chapters will be compiled in this example



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Input and Include I

Input

\input{<filename>}

- includes the file at current position
- can be nested¹

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Input and Include I

Input

\input{<filename>}

- includes the file at current position
- can be nested¹

Include

\include{<filename>}

- performs \clearpage, then includes the file
- can be controlled using \includeonly

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Input and Include II

Problems

- You cannot compile a chapter, you have to switch to the main file and compile it (editors like Kile or TeXnic Center take care of this)
- When "commenting out" a chapter, its labels are lost (references break and TOC needs to be rewritten)

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Include and Includeonly

Example

```
\documentclass{article}
...
\includeonly{main_part, results}
\begin{document}
  \include{introduction}
  \include{basics}
  \include{main_part}
  \include{results}
  \include{outlook}
\end{document}
```

- Only 2 chapters will be compiled in this example
- The labels and contents of the excluded chapters are kept in the index



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Time for a break.

- 5 Minutes -

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3. Graphics

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Introduction to Floats

Problem

- LATEX is a system for typesetting of text and other elements
- Text can usually be split at many positions (paragraphs, lines, words, syllables)

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Introduction to Floats

Problem

- LATEX is a system for typesetting of text and other elements
- Text can usually be split at many positions (paragraphs, lines, words, syllables)
- Images and tables are bigger, inseparable elements
- Placing an image in your text can cause empty space on a page

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Introduction to Floats

Problem

- LATEX is a system for typesetting of text and other elements
- Text can usually be split at many positions (paragraphs, lines, words, syllables)
- Images and tables are bigger, inseparable elements
- Placing an image in your text can cause empty space on a page

Solution

Use *floating* elements:

- You define the content and some positioning parameters
- LATEX takes care of the exact position



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Most used Types of Floats

Figures

```
\begin{figure}
  \includegraphics{...}
  ...
\end{figure}
```

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Most used Types of Floats

Figures

```
\begin{figure}
  \includegraphics{...}
  ...
\end{figure}
```

Tables

```
\begin{table}
  \begin{tabular}{...}
    ...
  \end{tabular}
\end{table}
```

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Float Positioning Suggestions

Example

```
\begin{figure}[<positioning suggestions>]
    ...
\end{figure}
```

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Float Positioning Suggestions

Example

```
\begin{figure}[<positioning suggestions>]
...
\end{figure}
```

Parameters

Combination of

- h: here
- t: top of page
- b: bottom of page
- p: on special page containing only floats

Note:

Order of suggestions specifies the priority, e.g. [hbt] (here, bottom, top) or [tb].

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Float Positioning Algorithm

- as soon as possible
- not before the page of definition
- · keep the order
- follow general settings
- consider local suggestions
- don't overfill pages
- before \clearpage (with page break)
 or \FloatBarrier (placeins package, no
 pagebreak)

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Captions and References

Example

```
\begin{figure}[<positioning>]
...
  \caption{Some text here}
  \label{<label>}
\end{figure}
```

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Captions and References

Example

```
\begin{figure}[<positioning>]
...
  \caption{Some text here}
  \label{<label>}
\end{figure}
```

- Caption text is displayed below images,
 e. g. "Figure 5: Some text here"
- Reference using \ref{<label>}
- Every float type (figure, table, listing) has own counters

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A Hint for Figure Placement

```
Lorem ipsum dolor sit amet, consetetur sadipscing elitr. % <--- NO BREAK HERE \begin{figure}
```

\end{figure}\\ % <--- BREAK HERE

Figures and Paragraphs

A Hint for Figure Placement

```
Lorem ipsum dolor sit amet, consetetur
sadipscing elitr. % <--- NO BREAK HERE
\begin{figure}
\end{figure}\\ % <--- BREAK HERE
```

- Important: No blank lines between text and figure environment!
- The paragraph break command (\\) signals the affiliation between text and figure
- Nicer figure positioning and paragraph breaks

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Including Images into the Document

Figure

```
\begin{figure} [<positioning>]
  \centering
  \includegraphics[<options>] {<file>}
  \caption{...}
  \label{fig:...}
\end{figure}
```

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Including Images into the Document

Figure

```
\begin{figure}[<positioning>]
  \centering
  \includegraphics[<options>]{<file>}
  \caption{...}
  \label{fig:...}
\end{figure}
```



Figure: Example image

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001

Multiple Images in a Figure (1)

Subfloat

using subfig package²:

```
\begin{figure}
  \centering
  \subfloat[Subcaption~1] {
    \includegraphics{...}
    \label{fig:sub a}
  \subfloat[Subcaption~2] {
    \includegraphics{...}
    \label{fig:sub_b}
  \caption{Main Caption}
  \label{fig:main}
\end{figure}
```

²Attention! The command is not named like the package () > () < ()

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Multiple Images in a Figure (2)





(a) Subcaption 1

(b) Subcaption 2

Figure: Main Caption

You can reference the main figure 2 and the subfigures 2a and 2b using the $\ref{...}$ command.

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Options for includegraphics

Width, Height

```
\includegraphics[width=4cm]{...}
\includegraphics[height=1in]{...}
```

- usual units like mm, pt, in, em, ex, ...
- fractions of the current text width: 0.3\textwidth
- specifying both width and height can squash the image
- specifying only width or height keeps the aspect ratio

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Options for includegraphics

Width, Height

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\includegraphics[width=4cm]{...}
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- usual units like mm, pt, in, em, ex, ...
- fractions of the current text width: 0.3\textwidth
- · specifying both width and height can squash the image
- specifying only width or height keeps the aspect ratio

Angle

```
\includegraphics[angle=15]{...}
```



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Clipping Graphics

Viewport

\includegraphics[viewport=lx ly ux uy,clip]{}

- 1x = lower x coordinate, uy = upper y coordinate
- length units for raster images are pixels
- length units for documents with size information (e. g. pdf) are the usual units
- viewport only changes the virtual image border
- clip actually clips the image to its borders
- Order of options can change the outcome

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Clipping Graphics

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Figures that are not Images

Figures are versatile!

You don't have to use \includegraphics in the figure environment.

```
\begin{figure}
  \centering
  \textbf{Hello, I'm text in a figure}\\
  $\vec{c} = \vec{a} \times \vec{b}$
  \caption{Not an image}
\end{figure}
```

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Figures that are not Images

Figures are versatile!

You don't have to use \includegraphics in the figure environment.

```
\begin{figure}
  \centering
  \textbf{Hello, I'm text in a figure}\\
  $\vec{c} = \vec{a} \times \vec{b}$
  \caption{Not an image}
\end{figure}
```

Hello, I'm text in a figure

$$\vec{c} = \vec{a} \times \vec{b}$$

Figure: Not an image

You can even \input another file within figure!

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Graphics

Time for a break.

- 5 Minutes -

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4. Ti*k*Z

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What is TikZ?

- TikZ = "TikZ ist kein Zeichenprogramm"³ (TikZ is not a drawing program)
- "User-friendly syntax layer" for PGF (macros package for generating graphics)
- TikZ provides a special environment

```
\usepackage{tikz}
...
\begin{tikzpicture}[<options>]
...
\ond(tikzpicture)
```

\end{tikzpicture}

 TikZ provides also its own \usetikzpackage command



³Geeks love recursive acronyms

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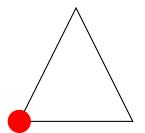
TikZ Example

```
\begin{tikzpicture}
  \draw[thick] (0,0)--(1.5,3)--(3,0)--cycle;
  \draw[fill,red] (0,0) circle (3mm);
\end{tikzpicture}
```

Tik7

TikZ Example

```
\begin{tikzpicture}
  \draw[thick] (0,0) -- (1.5,3) -- (3,0) -- cycle;
  \draw[fill, red] (0,0) circle (3mm);
\end{tikzpicture}
```



1 unit = 1 cm (unless defined otherwise)

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TikZ Example: Global Parameters

```
\begin{tikzpicture}[thick]
  \draw[blue, rounded corners=6mm]
    (0,0)--(1.5,3)--(3,0)--cycle;
  \draw[red] (0,0) circle (3mm);
\end{tikzpicture}
```

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Paragraphs

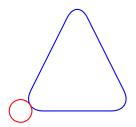
Options for Includin

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TikZ Example: Global Parameters

```
\begin{tikzpicture}[thick]
  \draw[blue, rounded corners=6mm]
    (0,0)--(1.5,3)--(3,0)--cycle;
  \draw[red] (0,0) circle (3mm);
\end{tikzpicture}
```



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TikZ Example: Nodes and Text

```
\begin{tikzpicture}[thick,blue]
  \draw[rounded corners=6mm]
     (0,0) node[left] {text left}
     -- (3,1) node[above] {hello world}
     -- (6,0) node[below] {text below};
  \draw[red] (1,-1) node {hello world};
\end{tikzpicture}
```

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TikZ Example: Nodes and Text

```
\begin{tikzpicture}[thick,blue]
  \draw[rounded corners=6mm]
    (0,0) node[left] {text left}
    -- (3,1) node[above] {hello world}
    -- (6,0) node[below] {text below};
  \draw[red] (1,-1) node {hello world};
\end{tikzpicture}
```



hello world

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TikZ Example: Grids and Arrows

```
\begin{tikzpicture}
  \draw[step=0.5,lightgray] (0,0) grid (8,3);
  \draw[thick,->] (1,1) -- (2,2);
  \draw[thick,<->] (3.5,0.5) -| (6.5,2.5);
  \draw[thick] (4,1) |- (6,2);
  \end{tikzpicture}
```

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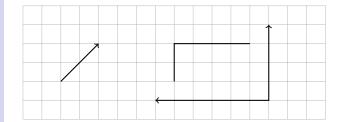
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TikZ Example: Grids and Arrows

```
\begin{tikzpicture}
  \draw[step=0.5,lightgray] (0,0) grid (8,3);
  \draw[thick,->] (1,1) -- (2,2);
  \draw[thick,<->] (3.5,0.5) -| (6.5,2.5);
  \draw[thick] (4,1) |- (6,2);
\end{tikzpicture}
```



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TikZ Example: Combined with LATEX

```
\begin{tikzpicture}
  \draw[step=0.5,lightgray] (0,0) grid (6,3);
  \draw (2.5,1.5) node
      {\includegraphics[...]{...}};
  \draw[latex-,thick] (2.6,1.6) --
      +(2,-0.6) node[right] {outdoor!};
  \end{tikzpicture}
```

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TikZ Example: Combined with LATEX



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TikZ Example: Plotting Functions

```
\begin{tikzpicture}[domain=-0.5:4]
  \draw[step=0.5,black!20](-1,-1) grid (6,2.5);
  \draw[thick,red] plot (\x, {1.5*sin(\x r)});
  \draw[thick,blue] plot (\x, {0.04*exp(\x)});
  \draw[thick,<->] (0,2)--(0,0)--(5.5,0);
  \end{tikzpicture}
```

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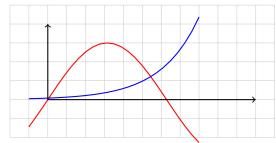
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TikZ Example: Plotting Functions

```
\begin{tikzpicture}[domain=-0.5:4]
  \draw[step=0.5,black!20](-1,-1) grid (6,2.5);
  \draw[thick,red] plot (\x, {1.5*sin(\x r)});
  \draw[thick,blue] plot (\x, {0.04*exp(\x)});
  \draw[thick,<->] (0,2)--(0,0)--(5.5,0);
  \end{tikzpicture}
```



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TikZ Example: Plotting Data

```
\begin{tikzpicture}
  \draw[step=0.5,black!20](-1,-1) grid (4,2.5);
  \draw[thick,blue,->] plot file{data.txt};
  \draw[thick,<->] (0,2) |- (3.5,0);
  \end{tikzpicture}
```

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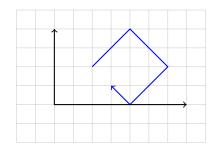
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TikZ Example: Plotting Data

```
\begin{tikzpicture}
  \draw[step=0.5,black!20](-1,-1) grid (4,2.5);
  \draw[thick,blue,->] plot file{data.txt};
  \draw[thick,<->] (0,2) |- (3.5,0);
  \end{tikzpicture}
```



data.txt:

1 1

2 2

3 1

2 0

1.5 0.5

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5. CSV

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CSV-Import

\usepackage{csvsimple}

\csvautotabular{data.csv}

Example

Χ	Υ
1	1
2	2
2 3 2	1
2	0
1.5	0.5

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Formatting of CSV Tables

CSV Reader

\csvreader[<options>] {<file name>}
{<assignment>} {<command list>}

\csvreader[head to column names]{data.csv}{}%
{\\ \csv_entry_1 & \csv_entry_2 & ...}%

Example

```
X Y
1 1
2 2
3 1
2 0
1.5 0.5
```

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Formatting of CSV Tables

CSV Style

```
\csvstyle{myStyle}
{tabular=c c, table head=X & Y \\}%
```

```
\csvreader{myStyle}{data.csv}{}{\X & \Y}
```

For more information see csvsimple documentation.

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Thank you for your attention!