
Practical Work 9: Creating Presentations with Beamer

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1. Introduction

The `beamer` class allows users to create professional presentations directly in $\text{\LaTeX}$. It is widely used in academic contexts for lectures, seminars, and conference talks.

A Beamer presentation is composed of **frames**, each corresponding to a slide. The structure is similar to a normal $\text{\LaTeX}$ document but uses the document class:

```
\documentclass{beamer}
```

2. Itemize with Alerts

Beamer allows the progressive display of list items using **overlay specifications**. The notation `<1->`, `<2->`, etc., determines when an element appears.

- `<1->`: appears from slide step 1 onward
- `<2->`: appears from slide step 2 onward
- `\alert`: highlights important elements

3. Example: Alerted Items

The following frame demonstrates how to highlight items progressively.

```
\begin{frame}
\begin{itemize}
\item<1-> Normal item
\item<2-> \alert<2>{Alerted item}
\item<3-> Another normal item
\end{itemize}
\end{frame}
```

4. Transparent Covered Items

Inactive items can be displayed with reduced opacity using:

```
\setbeamercovered{transparent=30}
```

Example:

```
\begin{frame}
\setbeamercovered{transparent=30}

\begin{itemize}[<+ -| alert@+>]
\item First item (alerted first)
\item Second item (alerted next)
\end{itemize}
\end{frame}
```

```

\item Third item (alerted last)
\end{itemize}

\end{frame}

```

5. Blocks and Alert Blocks

Beamer provides special environments to highlight content:

- `block` for standard statements
- `alertblock` for important results
- `exampleblock` for examples

Example:

```

\begin{frame}

\begin{block}{Definition}
This appears with red borders on Definition 1
\end{block}

\begin{alertblock}{Important Theorem 1}<2->
This appears with red borders on Theorem 1
\end{alertblock}

\begin{alertblock}{Important Theorem 2}<3->
This appears with red borders on Theorem 2
\end{alertblock}

\end{frame}

```

6. Mathematical Example

Beamer is especially useful for mathematical presentations. The following slide illustrates the progressive discussion of a theorem.

```

\begin{frame}{Sobolev Embedding Theorem}

\setbeamercovered{transparent=30}

\begin{theorem}<1->
 $W^{k,p}(\Omega) \hookrightarrow C^0(\overline{\Omega})$  when  $kp > n$ 
\end{theorem}

\begin{itemize}[<+| alert@+>]
\item Key idea: Morrey's inequality

```

```

\item Critical case:  $kp = n$ 
\item Counterexample when  $kp < n$ 
\end{itemize}

\begin{alertblock}{Application}<4->
Proving regularity for PDE solutions
\end{alertblock}

\end{frame}

```

7. Exercises

Exercise 1. Create a simple Beamer presentation containing:

- A title page using `\title`, `\author` and `\date`.
- One slide introducing the topic of your presentation.
- One slide containing a short itemized list.

Exercise 2. Create a slide with a progressive list using overlay specifications:

- Each item should appear one after another using `<1->`, `<2->`, and `<3->`.
- Highlight one of the items using the command `\alert`.

Exercise 3. Produce a slide containing mathematical content. For example, present the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Use a `block` or `alertblock` to emphasize the formula.

Exercise 4. Create a slide explaining the **Sobolev Embedding Theorem**. Your slide should contain:

- A theorem environment displaying the embedding

$$W^{k,p}(\Omega) \hookrightarrow C^0(\overline{\Omega}) \quad \text{when } kp > n.$$

- A progressive list explaining the main ideas behind the theorem.
- An `alertblock` highlighting an application to partial differential equations.

Exercise 5. Create a small presentation of three slides about a mathematical topic of your choice (for example Fourier transform, Hilbert spaces, or linear algebra). Your presentation should contain:

- A title slide.
- A slide with progressive itemization.
- A slide containing a theorem or important formula highlighted using a `block`.