Winthrop University

Research Experience for Undergraduates

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An Introduction to Beamer

Introduction

Beamer is to LaTeX as Microsoft PowerPoint is to Word. Once you have learned to create documents in LaTeX, you can use a similar process to construct professional presentations using the document class Beamer.

Almost no one learns LaTeX or Beamer by studying them thoroughly prior to their use. They are best learned by modifying an already existing template, experimenting with particular changes, and a sometimes painful process of trial and error. As mathematicians are exceptionally well adapted to trial and error, we are already “ahead of the game” in this respect.

Experimentation

With this in mind, let’s begin the experimentation. Beamer’s author has made a wonderful user guide available at

<http://texdoc.net/texmf-dist/doc/latex/beamer/doc/beameruserguide.pdf>,

called “The beamer *class* User Guide for version 3.33.”

I recommend skimming the Introduction (Chapter 1, pp. 9-12), skipping the installation section (pp. 14-16), and spending this time experimenting with the step by step tutorial presented in Chapter Three (pp. 20 – 27). For this tutorial, you’ll need the file “conference-ornate-20min.en.tex” located at

<http://www.ctan.org/tex-archive/macros/latex/contrib/beamer/solutions>.

This file is also temporarily located near the bottom of my webpage at

<http://faculty.winthrop.edu/kullt/>.

Notes

Here are a few notes to help you through the tutorial, organized by section. Have fun!

***3.2 Solution Template . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 20***

*TeXworks and TeXnicCenter are two popular editors available for use. As our lab computers can be quite stubborn at times, we may have to use* [*https://www.sharelatex.com/*](https://www.sharelatex.com/)*.*

***3.3 Title Material . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 20***

*Experiment with the formal title, the short title, and the subtitle, and see subsection 3.5 to check the results of any changes you make.*

Note that \textt merely invokes a specific font called teletypefont.

*By using \beamerdefaultoverlayspecification{<+->}, the presentation acts as though a \pause command has been inserted between every two bullets, without the actual need to write \pause after each item.*

***3.4 The Title Page Frame . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 21***

*Note that the \titlepage command visibly constructs the material just created above.*

***3.5 Creating the Presentation PDF File . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 21***

*Starting now, and continuing throughout this tutorial, consider changing one aspect of the document at a time, then typesetting to verify the changes just made. In this manner, errors (they will happen) will be much easier to correct. Changing too much at one time can hide errors and lead to a lengthy troubleshooting process.*

***3.6 The Table of Contents . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 21***

*If you find a particular command unnecessary, you can delete it permanently. Often more useful is to comment it by placing a % symbol just to the left of the text you wish to have no effect on typesetting. For example, trying adding this symbol to the line, as shown:*

*% \tableofcontents[pausesections].*

*Now typeset the document and see if you can identify the result, which may be subtle. Merely uncommenting the line will reinstate the original effect.*

***3.7 Sections and Subsections . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 21***

*Note that this tutorial shows you three basic ways to create “overlays”:*

1. *the \pause command*
2. *the overlay specification command: \item<3->*
3. *the \uncover command*

*Subsection 3.10 below (and experience) will help you determine an appropriate method for particular needs.*

***3.8 Creating a Simple Frame . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 22***

*Finally, some mathematics!*

*Just for additional LaTeX practice, construct a slide with the following mathematics. Title the slide “****s1****,* ***s2****, and* ***s3*** *are eigenvectors of M”.*2s3 are eigenvectors of Ms1s2s3 are eigenvectors of M

Recalling $\left\vert \lambda\_{j} \right\vert \le 1$,

\begin{eqnarray\*}

\underset{n\rightarrow \infty }{\lim }\mathbf{d}\_{n} &= &\frac{1}{3}

\underset{n\rightarrow \infty }{\lim }\sum\_{i=0}^{n-1}M^{i}

\left( \mathbf{s}\_{2}+\mathbf{s}\_{3}+\mathbf{s}\_{4}\right) \\

&=&\frac{1}{3}\underset{n\rightarrow \infty }{\lim }\sum\_{i=0}^{n-1}\left(

\lambda \_{2}^{i}\mathbf{s}\_{2}+\lambda \_{3}^{i}\mathbf{s}\_{3}+\lambda

\_{4}^{i}\mathbf{s}\_{4}\right)\\

&=& \frac{1}{3}\left[

\left( \sum\_{i=0}^{\infty }\lambda \_{2}^{i}\right) \mathbf{s}\_{2}+\left(

\sum\_{i=0}^{\infty }\lambda \_{3}^{i}\right) \mathbf{s}\_{3}+\left(

\sum\_{i=0}^{\infty }\lambda \_{4}^{i}\right) \mathbf{s}\_{4}\right].

\end{eqnarray\*}

***3.9 Creating Simple Overlays . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 22***

*The align environment is used to vertically align sets of equations, for example.*

***3.10 Using Overlay Specifications . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 23***

*Copy and paste, as needed:*

\item<1->Suppose $p$ were the largest prime number.

\item<2->Let $q$ be the product of the first $p$ numbers.

\item<3->Then $q + 1$ is not divisibe by any of them.

\item<1->But $q +1$ is greater than $1$, thus divisible by some prime number not in the first $p$ numbers.

***3.11 Structuring a Frame . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 24***

*Note the differences between the environments created:*

1. *block*
2. *create a “theorem”*
3. *itemize*
4. *column*

***3.13 Verbatim Text . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 25***

*Copy and paste, as needed:*

int main (void)

{

std::vector<bool> is\_prime (100, true);

for (int i = 2; i < 100; i++)

if (is\_prime[i])

{

std::cout << i << " ";

for (int j = i; j < 100; is\_prime [j] = false, j+=i);

}

return 0;

}

*Copy and paste, as needed:*

\uncover<1->{\alert<0>{int main (void)}}

\uncover<1->{\alert<0>{\{}}

\uncover<1->{\alert<1>{ \alert<4>{std::}vector<bool> is\_prime (100, true);}}

\uncover<1->{\alert<1>{ for (int i = 2; i < 100; i++)}}

\uncover<2->{\alert<2>{ if (is\_prime[i])}}

\uncover<2->{\alert<0>{ \{}}

\uncover<3->{\alert<3>{ \alert<4>{std::}cout << i << " ";}}

\uncover<3->{\alert<3>{ for (int j = i; j < 100;}}

\uncover<3->{\alert<3>{ is\_prime [j] = false, j+=i);}}

\uncover<2->{\alert<0>{ \}}}

\uncover<1->{\alert<0>{ return 0;}}

\uncover<1->{\alert<0>{\}}}

*Return to the preamble and note the effect of commenting the* \setbeamercovered{transparent} *command. For details concerning transparency, see 17.6, pp. 189-190.*

***3.14 Changing the Way Things Look I: Theming . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 27***

*General tips on choosing appropriate themes, colors, and fonts are provided in 5.3, 5.4, and 5.5. Considerable technical details are provided in Part III: Changing the Way Things Look, beginning on p. 143.*

***3.15 Changing the Way Things Look II: Colors and Fonts . . . . . . . . . . . . . . . . . . . . . . . . . 27***

*Note that the “starred version” of \setbeamerfont is \setbeamerfont\*.*

Conclusion

Two additional basic templates are located at

<http://www.ctan.org/tex-archive/macros/latex/contrib/beamer/solutions>:

a speaker introduction template, “speaker-introduction-ornate-2min.en.tex,” and a generic talk template, “generic-ornate-15min-45min.en.tex.”

Of course, a Google search will unearth many more templates and answer nearly every question you may have concerning any aspect of using Beamer. The most difficult aspect of using LaTeX and Beamer is often the initial installation; once that is accomplished, you can focus on professionally presenting mathematics in many creative and effective ways.

Another wonderful, detailed tutorial is located at

<http://www.uncg.edu/cmp/reu/presentations/Charles%20Batts%20-%20Beamer%20Tutorial.pdf>,

covering many of the topics seen above in greater detail.

Happy Beamering!