



Metropolis

A modern beamer theme

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Center for modern beamer themes

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Introduction

The metropolis theme is a Beamer theme with minimal visual noise inspired by the hsrn Beamer Theme by Benjamin Weiss.

Enable the theme by loading

```
\documentclass{beamer}  
\usetheme{metropolis}
```

Note, that you have to have Mozilla's Fira Sans font and XeTeX installed to enjoy this wonderful typography.

Sections group slides of the same topic

```
\section{Elements}
```

for which metropolis provides a nice progress indicator ...

Taylor-series Method

we are given:

$$r_{i,1}^2 = cd_{i,1} = r_i - r_1$$

Linearize above equation by Taylor-series expansion and then solve iteratively:

- Compute position deviation
- Add position deviation to initial guess
- Solve again until deviation is considerably small

Convergence is not guaranteed

Taylor-series Method

The position deviation is computed by:

$$\begin{bmatrix} \Delta x \\ \Delta y \end{bmatrix} = (G_t^T Q^{-1} G_t)^{-1} G_t^T Q^{-1} h_t$$

where h_t and G_t are given as follows

$$h_t = \begin{bmatrix} r_{2,1} - (r_2 - r_1) \\ r_{3,1} - (r_3 - r_1) \\ r_{M,1} - (r_M - r_1) \end{bmatrix} \quad (1)$$

$$G_t = \begin{bmatrix} (x_1 - x)/r_1 - (x_2 - x)/r_2 & (y_1 - y)/r_1 - (y_2 - y)/r_2 \\ (x_1 - x)/r_1 - (x_2 - x)/r_3 & (y_1 - y)/r_1 - (y_3 - y)/r_3 \\ (x_1 - x)/r_1 - (x_M - x)/r_M & (y_1 - y)/r_1 - (y_M - y)/r_M \end{bmatrix} \quad (2)$$

Spherical Interpolation Method

The Equation-Error Formulation

We first map the spatial origin to an arbitrary sensor j , this gives:

$$\underline{x}_j \triangleq \underline{0} \implies \begin{cases} R_j &= 0 \\ D_j &= R_s \end{cases}$$

From the Pythagorean theorem, we have:

$$(R_s + d_{ij})^2 = R_i^2 - 2\underline{x}_i^T \underline{x}_s + R_s^2$$

which is also:

$$0 = R_i^2 - d_{ij}^2 - 2R_s d_{ij} - 2\underline{x}_i^T \underline{x}_s$$

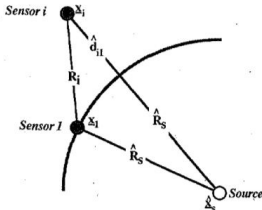


Fig. 4. Geometric representation of the relationship given in (5).

The Equation-Error Formulation

If we take the first sensor as origin, i.e. $j = 1$

As the delays are typically not measured precisely, we introduce "equation error"

$$\epsilon_i = R_i^2 - d_{ij}^2 - 2R_s d_{ij} - 2\underline{x}_i^T \underline{x}_s \quad (i = 2, 3, \dots, N)$$

where ϵ_i is to be minimized. With $N-1$ measurements, this equation can be written in matrix notation:

$$\underline{\epsilon} = \underline{\sigma} - 2R_s \underline{d} - 2S \underline{x}_s$$

where

$$\underline{\sigma} \triangleq \begin{bmatrix} R_2^2 - d_{21}^2 \\ R_3^2 - d_{31}^2 \\ \vdots \\ R_N^2 - d_{N1}^2 \end{bmatrix} \quad \underline{d} \triangleq \begin{bmatrix} d_{21} \\ d_{31} \\ \vdots \\ d_{N1} \end{bmatrix} \quad S \triangleq \begin{bmatrix} x_2 & y_2 \\ x_3 & y_3 \\ \vdots & \vdots \\ x_N & y_N \end{bmatrix}$$

Font feature test

- Regular
- Italic
- Small Caps
- Bold
- Bold Italic
- Bold Small Caps
- Monospace
- Monospace Italic
- Monospace Bold
- Monospace Bold Italic

Items

- Milk
- Eggs
- Potatoes

Enumerations

1. First,
2. Second and
3. Last.

Descriptions

PowerPoint Meeh.
Beamer Yeeeha.

- This is important

- This is important
- Now this

- This is important
- Now this
- And now this

- This is really important
- Now this
- And now this

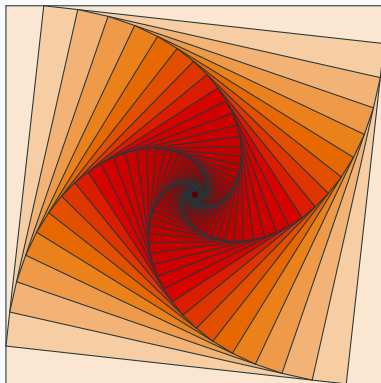


Figure 1: Rotated square from texample.net.

Table 1: Largest cities in the world (source: Wikipedia)

City	Population
Mexico City	20,116,842
Shanghai	19,210,000
Peking	15,796,450
Istanbul	14,160,467

Three different block environments are pre-defined and may be styled with an optional background color.

Default

Block content.

Default

Block content.

Alert

Block content.

Alert

Block content.

Example

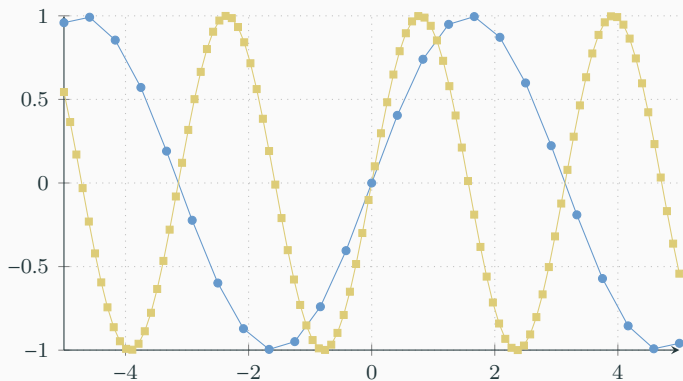
Block content.

Example

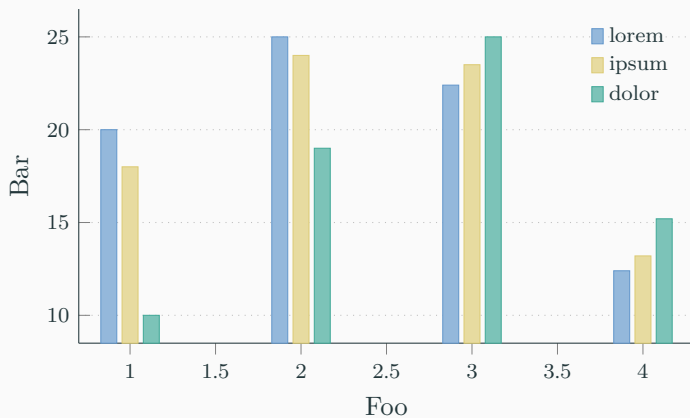
Block content.

$$e = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$$

Line plots



Bar charts



Veni, Vidi, Vici

metropolis defines a custom beamer template to add a text to the footer. It can be set via

```
\setbeamertemplate{frame footer}{My custom footer}
```

Some references to showcase `[allowframebreaks]` [?, ?, ?, ?, ?]

Conclusion

Get the source of this theme and the demo presentation from

github.com/matze/mtheme

The theme itself is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.



Questions?

Sometimes, it is useful to add slides at the end of your presentation to refer to during audience questions.

The best way to do this is to include the `appendixnumberbeamer` package in your preamble and call `\appendix` before your backup slides.

`metropolis` will automatically turn off slide numbering and progress bars for slides in the appendix.

References I