EPFL

EESD

My long, detailed, and flashy title

The Templator

École Polytechnique Fédérale de Lausanne (EPFL)

School of Architecture, Civil and Environmental Engineering (ENAC)

May 2019

Supervisor: Prof. Katrin Beyer

EPFL

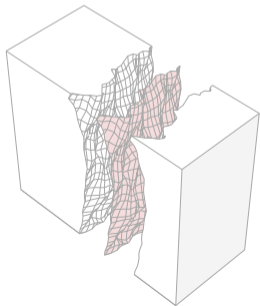# EESD

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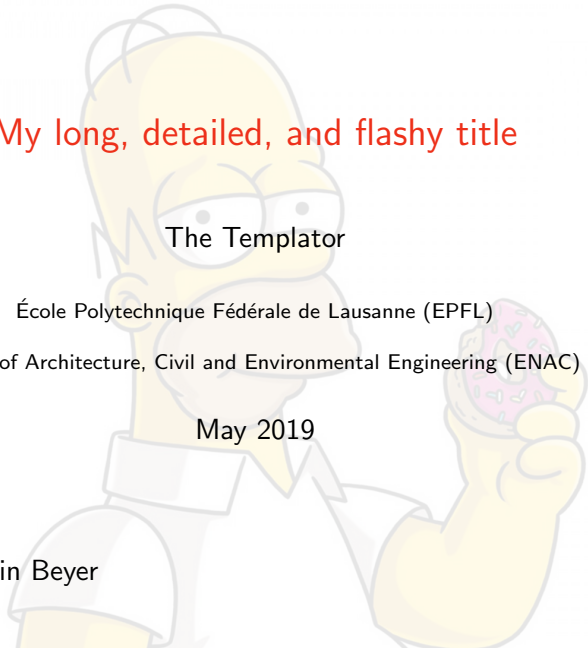
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Outlines

Introduction

Copyright

This file is a customized "beamer" template made for the EESD laboratory at EPFL (see https://www.epfl.ch/labs/eesd/). The author of this file is **Mahmoud S. Shaqfa**. This file is free: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version. This file is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details. To receive a copy of GNU License refer to: https://www.gnu.org/licenses/

Cover page

To define the cover page use the following code:

```
1    { % <-- Important to add those brackets; to affect only the background in
        this frame.
2    \usebackgroundtemplate{\includegraphics[]{}} % <-- Define the background
        here
3        \coverpage{
4            \titlepage % make the title here
5            {\newline Additional text like the supervisors, jury .. etc}
6        }
7        }
8    } % <-- end of the environment
```

Honest-to-god!

A dummy note: to define a very #swaggy background you can create a PDF file of the slide size and place it with any graphical effect by using Inkscape[1]or Adobe Illustrator.

> ### Inkscape advice
>
> Make all your drawings/charts vectorized. In this way, they will look important and professional. And use Inkscape it is free, open-source, easy to use, and again FREE! Unfortunately, LaTeX doesn't deal directly with *.SVG, *.EPS, or *.EMF drawings; convert them to *.PDF. *.PDF files come with price! They're bigger in size.

My secret weapon for perfect drawings:

1. Blender[2]
2. Inkscape

INKSCAPE

---

[1]Inkscape Project, *Inkscape*.

[2]Blender Online Community, *Blender - A 3D modelling and rendering package*.

TOC options

```
1           \tableofcontents % <-- Traditional TOC
```

```
1           \tableofcontents[sections={1-3}] % <-- Explicitly split TOC
```

```
1       \usepackage{multicol}
2       \begin{multicols}{2} % <-- Smart division (2, 3, ..etc any number of
            columns)
3           \tableofcontents
4       \end{multicols}
```

And define the frame to automatically divide itself when the TOC is too long to fit in a single frame:

```
1       % \begin{frame}[allowframebreaks]{Table of contents}
2       % \end{frame}
```

A new visual identity

It has been derived from the new EPFL logo. It reflects the same simplicity and consistency.

The logo

How we do it?

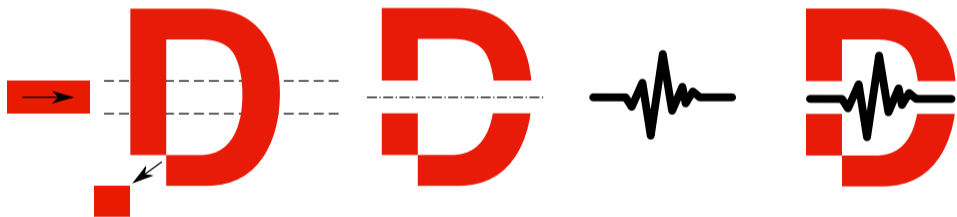

Swiss Red: HEX: E81B00

RGB:<232, 27, 0>

How we do it?

Font: "Helvetica"

How to dee?

How to use?

How to use blocks?

Basically, the blocks style have been modified in "beamer" in this customized version. Programmatic samples can be found in the next three slides.

```
1          \begin{block}{The block title}
2              The block body .. add meaningful stuff
3          \end{block}
```

It can be used for definitions, equations, theories, examples, alerts, and important stuff to highlight.

Blocky block

Just a Block

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Blocky block

Example Block

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Blocky block

Alert Block

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

How to use frame-breakings?

In this template, and only this, I defined a "breakingframe" template frame that should not hold any useful information. The background of this frame is pinkish solid and it is not countable as a separate frame. You can use this as a transitioning page between different topics or for any funny funky stuff to release the tense of the poor audience during your presentation.

```
1       \breakingframe{
2           Put your contents here, such as images, text ..etc. Be as silly as
                possible .. or not!
3       }
```
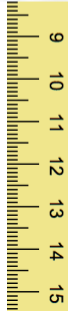
Look at the next slide, in code, as an example!

I'm just an example!
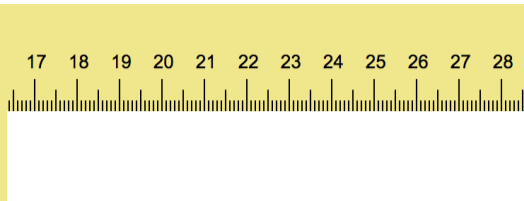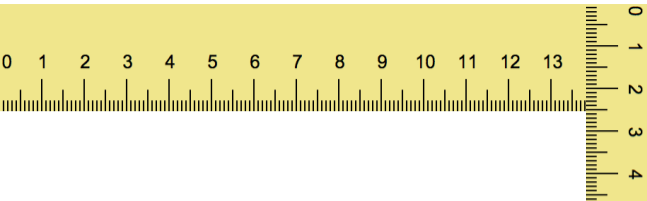
Slides 16:9 Size: Width 28.575 / Height 19.05 cm

Preamble

- Historical structures are part of the cultural heritage

- Stone masonry is one of the oldest construction materials

- Historical stone masonry structures are designed to handle gravity loads

- Stone masonry structure are vulnerable under seismic actions:
  - Low tensile strength
  - Poor interlocking
  - Large masses
  - Built with rules-of-thumb

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State-of-the-art

Zhang, "Micro-mechanical finite element modeling for in-plane behavior of historical masonry" (2018)

The research questions

Q1 What are the expected gains of using 3D micro-mechanical modeling of stone masonry walls?

Q2 What tools/methods will be used to relax the 3D FE models' complexity?

Q3 How to estimate the stone-mortar interface strength of a simplified surfaces?

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Q3 How to estimate the stone-mortar interface strength of a simplified surfaces?

Why we are shifting to 3D micro-mechanical modeling?

Motivation: Q1

1. Stone masonry walls are usually not homogeneous through the thickness

2. Leaf-separation effects on the strength capacity

3. In-plane and out-of-plane behaviours interaction

4. Internal cracking onsets and 3D crack paths (cannot be captured experimentally)

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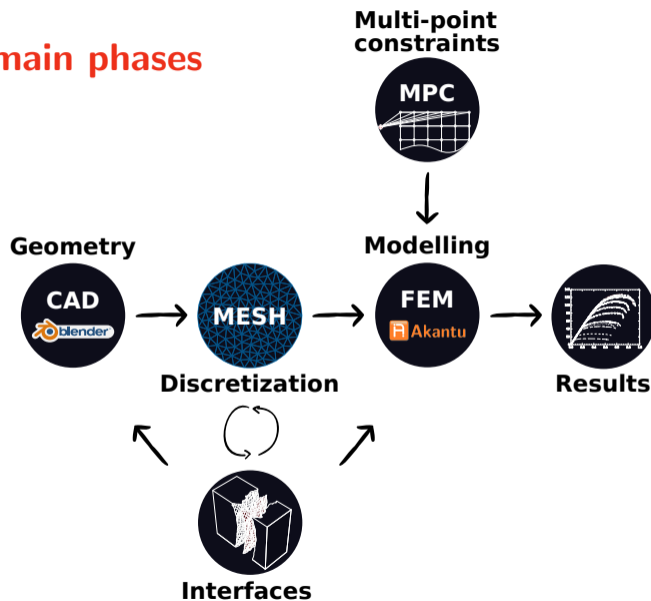4. Internal cracking onsets and 3D crack paths (cannot be captured experimentally)

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The study main phases

Multi-point constraints

MPC

↓

Geometry

CAD
blender

→

MESH

→

Modelling

FEM
Akantu

→

Results

Discretization

↺

Interfaces

How to arrange stones?

Objective function

$\begin{cases} \\ \\ \\ \end{cases}$

- S_i, S_{i-1}: locations of i and $i-1$ stones
- ξ_1: penalty multiplier
- ξ_2: penalty exponent
- P_A: penalties summation

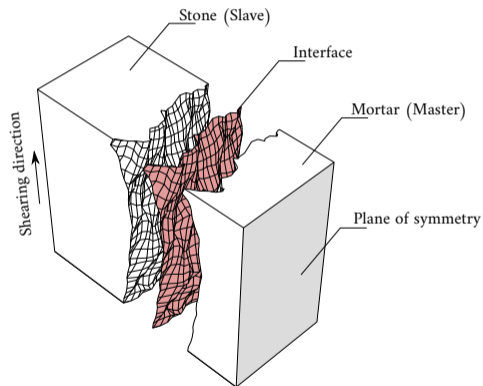### Packing objective

Minimize $F(\vec{X}_i)_i = \| \vec{S}_i - \vec{S}_{i-1} \|$

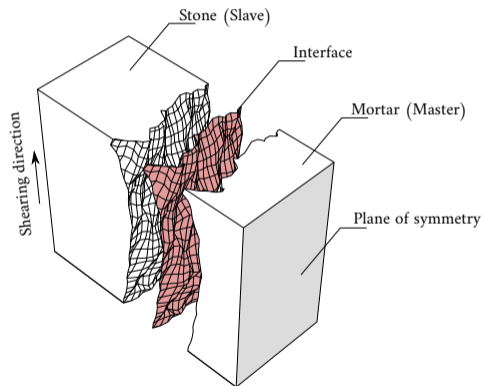$Fitness\left(F(\vec{X}_i) \right)_i = F(\vec{X}_i)_i (1 + \xi_1 P_A)^{\xi_2}$

Interface identification: Q3

Stone (Slave)

Interface

Mortar (Master)

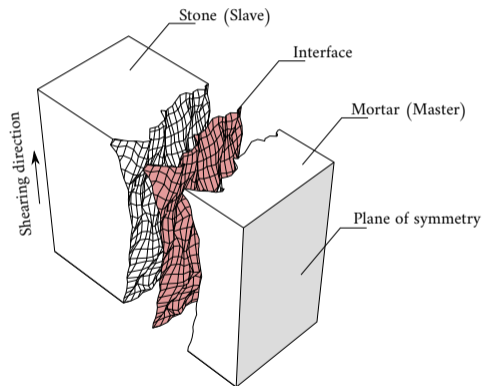Plane of symmetry

Shearing direction

1 Prepare real samples of stones and mortar

2 Scan the interface surface using the laser scanner

3 Test the samples (direct shear test)

4 Apply different smoothing cycles on the interfaces

5 Use the soft computing algorithms to identify the smoothed interfaces inputs (Benchmark)

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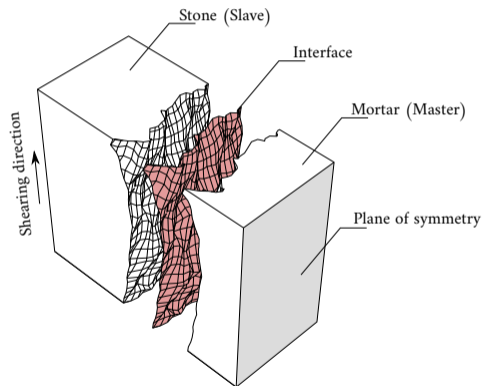
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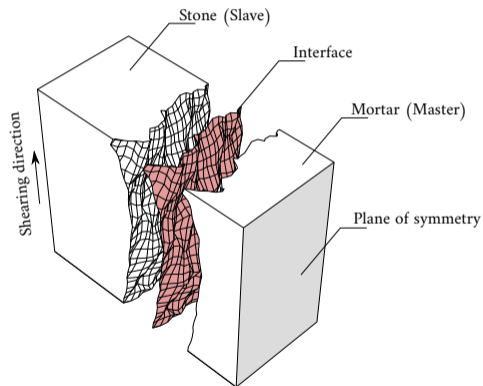
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Call another section

Fusce mauris. Vestibulum luctus nibh at lectus. Sed bibendum, nulla a faucibus semper, leo velit ultricies tellus, ac venenatis arcu wisi vel nisl. Vestibulum diam. Aliquam pellentesque, augue quis sagittis posuere, turpis lacus congue quam, in hendrerit risus eros eget felis. Maecenas eget erat in sapien mattis porttitor. Vestibulum porttitor. Nulla facilisi. Sed a turpis eu lacus commodo facilisis. Morbi fringilla, wisi in dignissim interdum, justo lectus sagittis dui, et vehicula libero dui cursus dui. Mauris tempor ligula sed lacus. Duis cursus enim ut augue. Cras ac magna. Cras nulla. Nulla egestas. Curabitur a leo. Quisque egestas wisi eget nunc. Nam feugiat lacus vel est. Curabitur consectetuer.

Merci de votre attention

References

Blender Online Community. *Blender - A 3D modelling and rendering package*. Blender Foundation. Blender Institute, Amsterdam, 2019. URL: http://www.blender.org.

Inkscape Project. *Inkscape*. Version 0.92.4. 2019. URL: https://inkscape.org.

Zhang, Shenghan. "Micro-mechanical finite element modeling for in-plane behavior of historical masonry". In: (2018), p. 154. DOI: 10.5075/epfl-thesis-8792. URL: http://infoscience.epfl.ch/record/256544.