Chair of Structural Analysis
TUM Department of Civil, Geo and Environmental Engineering
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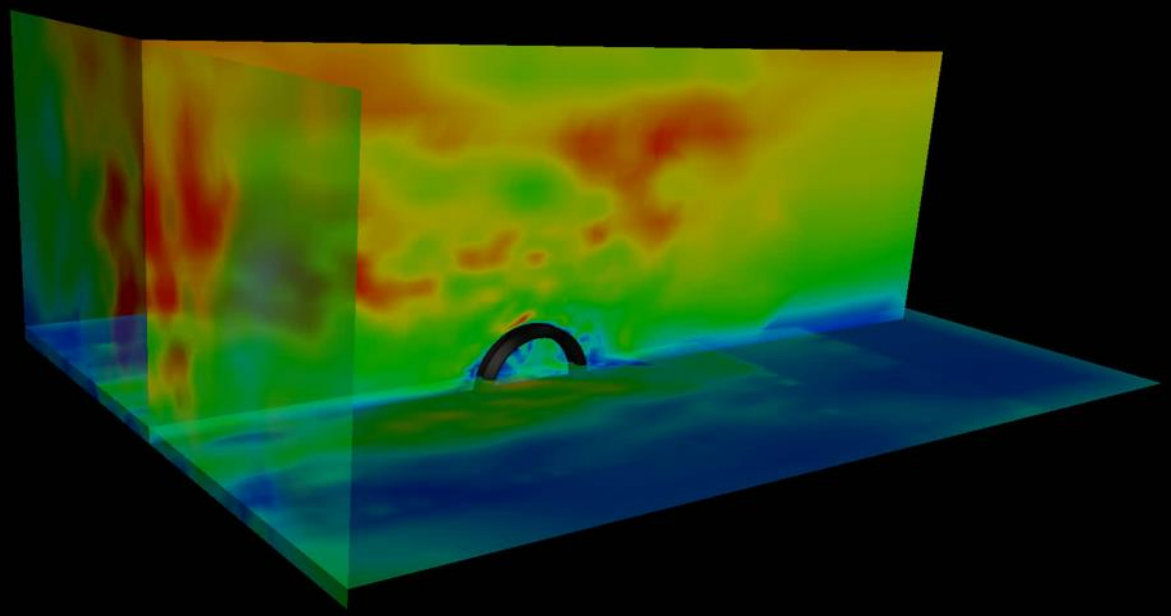

STRUCTURAL WIND ENGINEERING

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Kratos 2D Fluid Tutorial to an MDoF CSD System

In this tutorial we will investigate how to do a structural simulation using GID and Kratos. We will be using the geometry of structure from Tutorial 4.

Covered topics:

- Predefined example for structural simulation (aim of the current lecture, do not forget to do the necessary modifications in the setup parameters)

- **Or:** Preprocessing (out of scope for the current lecture)

  Geometry
  Input data and conditions

- Postprocessing of results

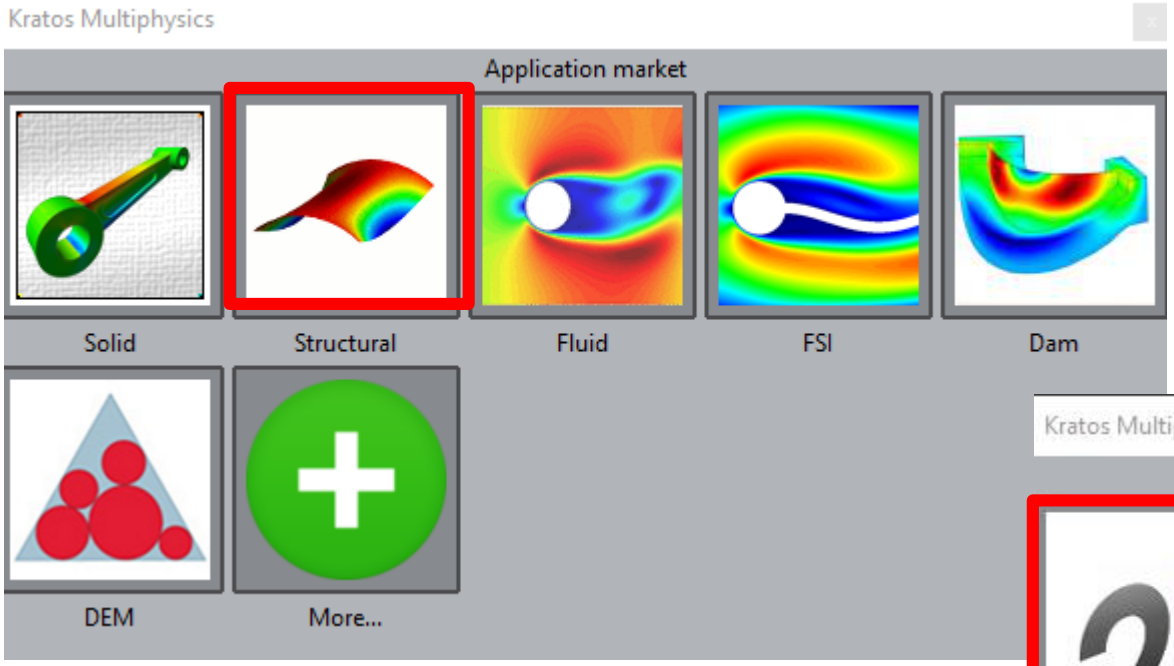
Disclaimer: This example serves the sole educational purpose of demonstrating how to setup a basic 2D CSD problem, run the simulation and do some postprocessing. For any real case in wind engineering a 3D setup should be adopted accompanied with detailed mesh and time step study.

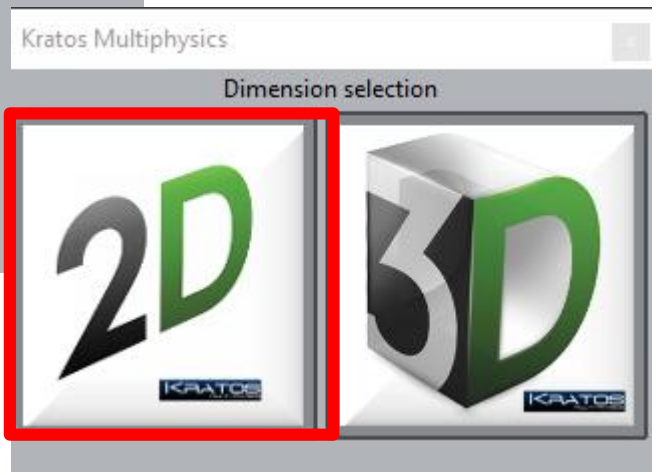
Technical note: Tested on 04.12.2019, works with GiD 14.1.7d and the pre-release of the Kratos problemtype (7.1) on Windows 10 and Ubuntu 18 64 bit.

Note: This set up will be used later for FSI simulation of a building.

Problem Type

- Load the Kratos problem type
  Data → Problem type → Kratos
- Select *Structural* in the first window (Application Type) and click the *Next* button
- Select *2D* in the second window (Analysis Type) and click the *Next* button

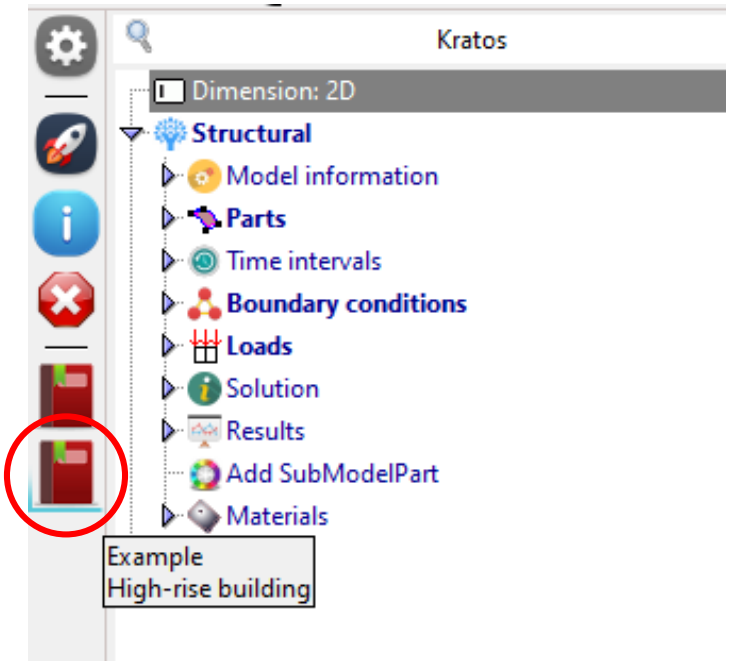




Use of the predefined example

Predefined example „High-rise building“

- Load the predefined example “High-rise building”



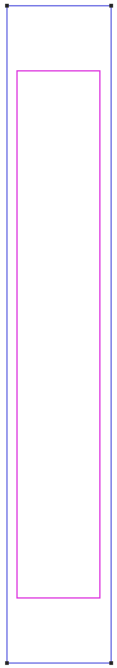
- Continue on page 12 -> Check the time and solver settings
- Generate the mesh
- Run the calculation

Defining the Geometry

Geometry

- Create the geometry in the XY-plane using the following points to describe it:

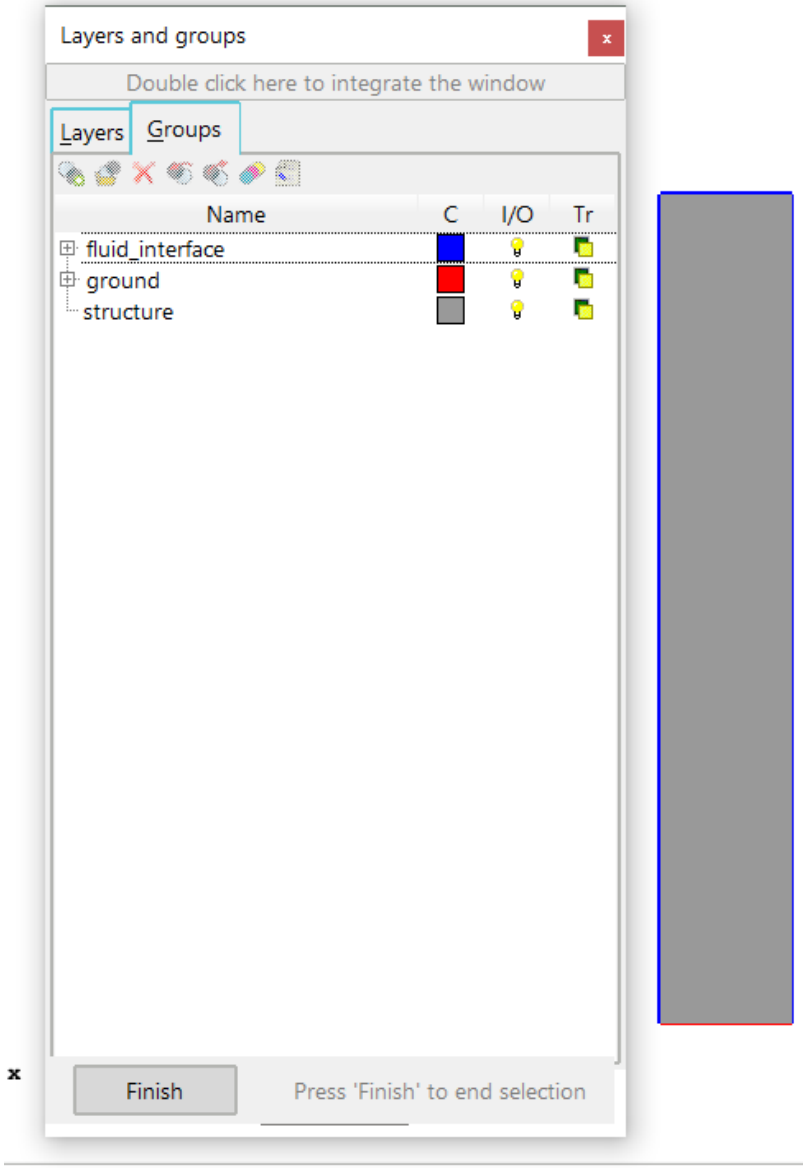
Structure X	Y	Z
15.0	0.0	0.0
15.0	190.0	0.0
-15.0	0.0	0.0
-15.0	190.0	0.0



- Create the points first, followed by the lines and the surface.

Define the entry groups

- *structure* group
  - Select surface
- *ground* group
  - Select bottom line
- *fluid_interface* group
  - Select the remaining lines

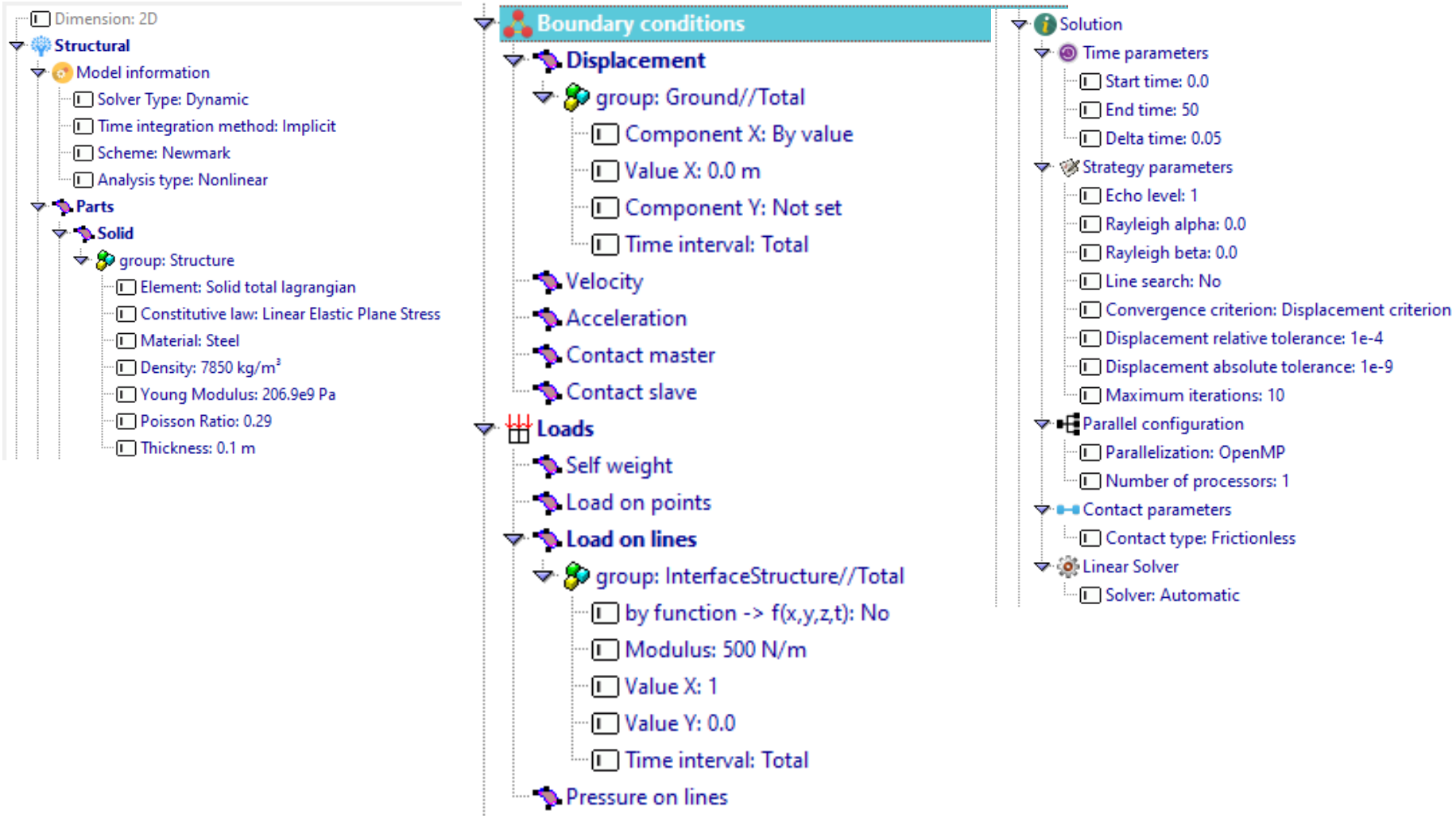


Problem Input

Model Properties and Boundary Conditions (1)

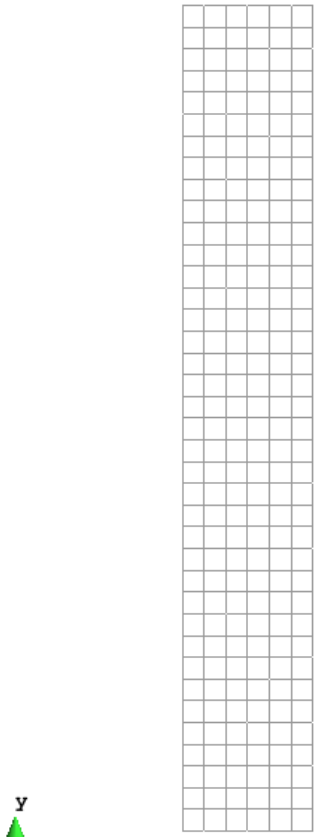
- Assign the group *structure* to the *Parts* and choose on *Surfaces*
- Specify the property of steel.
  - Density : 7850 kg/m^3
  - Young‘s Modulus : 206.9 e9 Pa
  - Poisson Ratio: 0.29
  - Thickness: 0.1 m
- Use the *Solid total lagrangian* element with *Linear elastic Plane stress*
- Apply fixed boundary condition at the bottom by setting the all displacement value to 0 and assign this boundary condition to *ground*.
- Appy load boundary condition at the *fluid_interface* by assigning it to *Load on lines* and set the modulus to 500 in direction x.
- Use the time and solver settings same as the figure.

Model Properties and Boundary Conditions (2)



Mesh the Domain

- We need to mesh the domain in order to discretize the problem
  Mesh → Structured → Lines → Assign size: use size 5.0
- In the box that appears, set size to 5.0 and click the *Assign* button. Then select all lines of the structure and press *Esc*
- Then assign the size to surface
  Mesh → Structured → Surface
- Select the surface and press *Esc*
- *Now generate the mesh by pressing Ctrl+ g.*



Note: Size for the mesh could be chosen as it was used in the Tutorial4_2D. This set up could be later used for performing FSI with **matching grid**. Now assuming 5.0 for a **non-matching grid**.

Solve the problem

- Save your model
  Files → Save
  or *Ctrl + s*

- Launch Kratos with
  Calculate → Calculate
  or *F5*

- The input data will be checked for errors

- The calculation should take few seconds

Solution Postprocessing

Postprocessing

For viewing deformed shape