University of Stuttgart
Germany

Beamer
Template

Dr. sc. Sebastian Schwindt

Example

LWW

Outline

Navier-Stokes Equations

Navier-Stokes Equations: an example

The Navier-Stokes equations mathematically express **momentum** and **mass continuity** for **Newtonsche fluids**.

Mass conservation

$$\frac{\partial \rho}{\partial t} + \frac{\partial \rho u_x}{\partial x} + \frac{\partial \rho u_y}{\partial y} + \frac{\partial \rho u_z}{\partial z} = 0$$
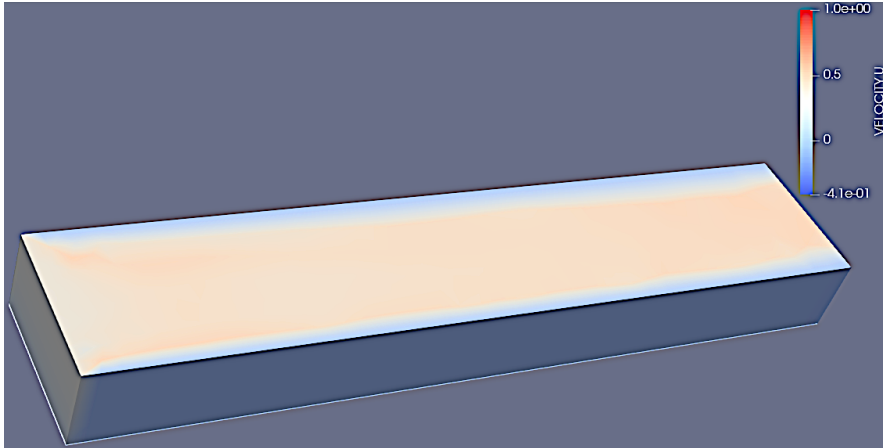
Momentum conservation

$$\rho g_x - \frac{\partial p}{\partial x} + \mu \left(\frac{\partial^2 u_x}{\partial x^2} + \frac{\partial^2 u_x}{\partial y^2} + \frac{\partial^2 u_x}{\partial z^2} \right) = \rho \left(\frac{\partial u_x}{\partial t} + u_x \frac{\partial u_x}{\partial x} + u_y \frac{\partial u_x}{\partial y} + u_z \frac{\partial u_x}{\partial z} \right)$$

$$\rho g_y - \frac{\partial p}{\partial y} + \mu \left(\frac{\partial^2 u_y}{\partial x^2} + \frac{\partial^2 u_y}{\partial y^2} + \frac{\partial^2 u_y}{\partial z^2} \right) = \rho \left(\frac{\partial u_y}{\partial t} + u_x \frac{\partial u_y}{\partial x} + u_y \frac{\partial u_y}{\partial y} + u_z \frac{\partial u_y}{\partial z} \right)$$

$$\rho g_z - \frac{\partial p}{\partial z} + \mu \left(\frac{\partial^2 u_z}{\partial x^2} + \frac{\partial^2 u_z}{\partial y^2} + \frac{\partial^2 u_z}{\partial z^2} \right) = \rho \left(\frac{\partial u_z}{\partial t} + u_x \frac{\partial u_z}{\partial x} + u_y \frac{\partial u_z}{\partial y} + u_z \frac{\partial u_z}{\partial z} \right)$$

Images

A figure caption

Videos

an example

An example video with thumbnail (source: Schwindt 2015)

Code and Color Blocks

Code and Color Blocks: fragile frames

An example FRAGILE frame with code blocks - attention: [*fragile*] is needed for code blocks

```
        git status
        [optional] git diff
        git add .
        git commit -m "Modified ...
    "
        git pull --rebase
        git push
```

→ verify files that you modified
→ see what exactly changed (optional)
→ stage changed files ⇝ DOT adds all
→ commit changes and provide a message
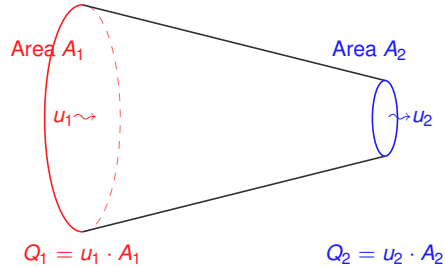→ verify integrity of local and remote changes
→ push changes

Inline code blocks

Use a colorbox `to display code` or no colorbox

Working with TIKZ

Working with TIKZ

An example for creating a tikzpicture

- more predefined shapes can be read from the beamerlww.sty style file

Area A_1

Area A_2

$u_1 \rightsquigarrow$

$\rightarrow u_2$

$Q_1 = u_1 \cdot A_1$

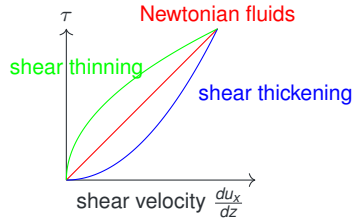$Q_2 = u_2 \cdot A_2$

Animations

Animations

Another TIKZ picture that appears only on click

Animations

Another TIKZ picture that appears only on click

University of Stuttgart
Germany

Thank you for listening

Dr. sc. Sebastian Schwindt
sebastian.schwindt@iws.uni-stuttgart.de
+49 (0)711 phone

University of Stuttgart