



Outline



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Navier-Stokes Equations

Navier-Stokes Equations: an example



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

Mass conservation

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

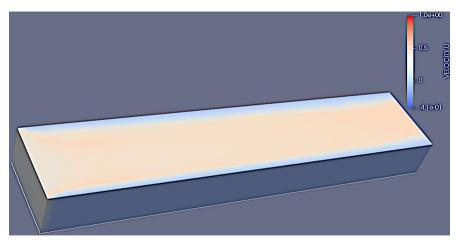
Momentum conservation

$$\rho g_{x} - \frac{\partial p}{\partial x} + \mu \left(\frac{\partial^{2} u_{x}}{\partial x^{2}} + \frac{\partial^{2} u_{x}}{\partial y^{2}} + \frac{\partial^{2} u_{x}}{\partial z^{2}} \right) = \rho \left(\frac{\partial u_{x}}{\partial t} + u_{x} \frac{\partial u_{x}}{\partial x} + u_{y} \frac{\partial u_{x}}{\partial y} + u_{z} \frac{\partial u_{x}}{\partial z} \right)
\rho g_{y} - \frac{\partial p}{\partial y} + \mu \left(\frac{\partial^{2} u_{y}}{\partial x^{2}} + \frac{\partial^{2} u_{y}}{\partial y^{2}} + \frac{\partial^{2} u_{y}}{\partial z^{2}} \right) = \rho \left(\frac{\partial u_{y}}{\partial t} + u_{x} \frac{\partial u_{y}}{\partial x} + u_{y} \frac{\partial u_{y}}{\partial y} + u_{z} \frac{\partial u_{y}}{\partial z} \right)
\rho g_{z} - \frac{\partial p}{\partial z} + \mu \left(\frac{\partial^{2} u_{z}}{\partial x^{2}} + \frac{\partial^{2} u_{z}}{\partial y^{2}} + \frac{\partial^{2} u_{z}}{\partial z^{2}} \right) = \rho \left(\frac{\partial u_{z}}{\partial t} + u_{x} \frac{\partial u_{z}}{\partial x} + u_{y} \frac{\partial u_{z}}{\partial y} + u_{z} \frac{\partial u_{z}}{\partial z} \right)$$



Images: an example





A figure caption



Videos

LWW

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
- \rightarrow see what exactly changed (optional)
- \rightarrow stage changed files \rightsquigarrow DOT adds all
- \rightarrow commit changes and provide a message
- → verify integrity of local and remote changes
- \rightarrow push changes

```
Use a colorbox to display code or no colorbox
```

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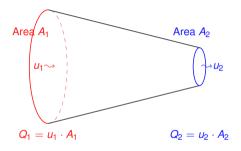


Working with TIKZ



An example for creating a tikzpicture

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



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Animations

Animations

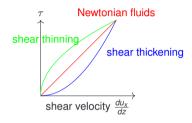


Another TIKZ picture that appears only on click

Animations



Another TIKZ picture that appears only on click





Thank you for listening



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