Simulating Hagen-Poiseuille flow in OpenFOAM.

Talk to a Teacher

http://www.sakshat.ac.in

National Mission on Education through ICT

http://spoken-tutorial.org

Saurabh Sawant

Date: March 13, 2013

Learning Objectives

- **To create and mesh 3D cylindrical pipe.**

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- **To create and mesh 3D cylindrical pipe.**
- **To simulate the Hagen-Poiseuille flow having fixed pressure ratio.**
- **To visualize the velocity contour in ParaView.**

System Requirement

- **Linux Operating System Ubuntu version 12.04**

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- **OpenFOAM version 2.1.1**
- **ParaView version 3.12.0**

Prerequisites

- **Basic Fluid Dynamics**

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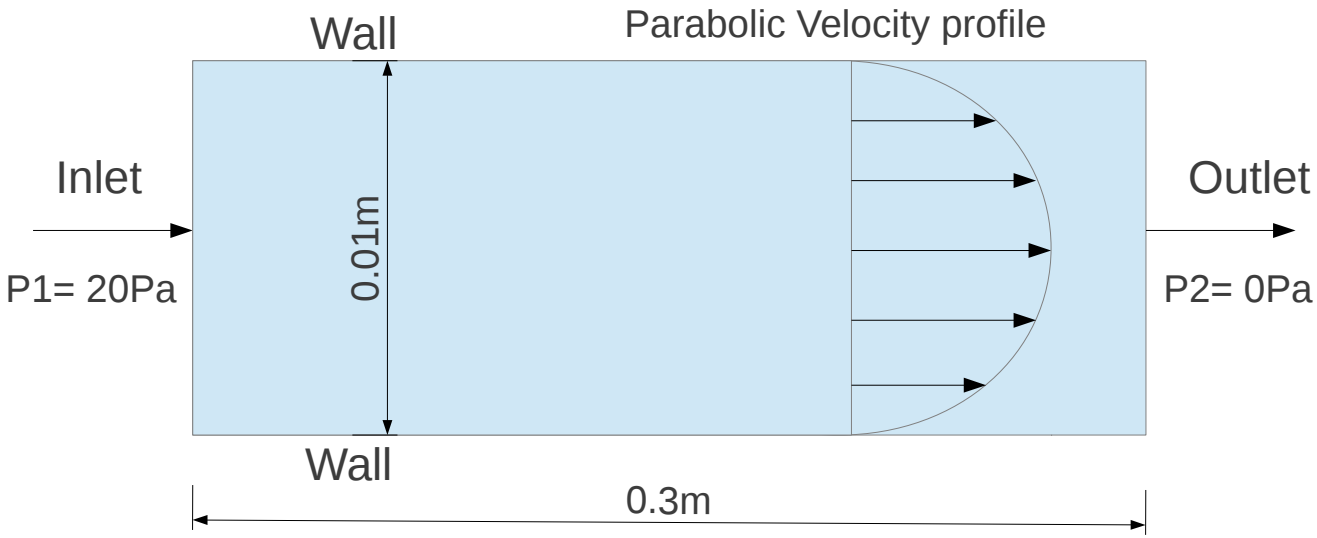
- **Basic Fluid Dynamics**
- **Hagen-Poiseuille flow**

Hagen-Poiseuille Flow Diagram



For Water,
μ = Dynamic Viscosity = 1e-03
η = kinematic viscosity = 1e-06

Talk to a Teacher

Formulas and Analytical Solution

- **Pressure Drop along the pipe:**

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Formulas and Analytical Solution

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  - **Hence, the flow is transient.**

Solver

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- **It is a Transient Solver**

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- **Used for Incompressible, laminar flow of Newtonian fluid**

Pressure Boundary Conditions

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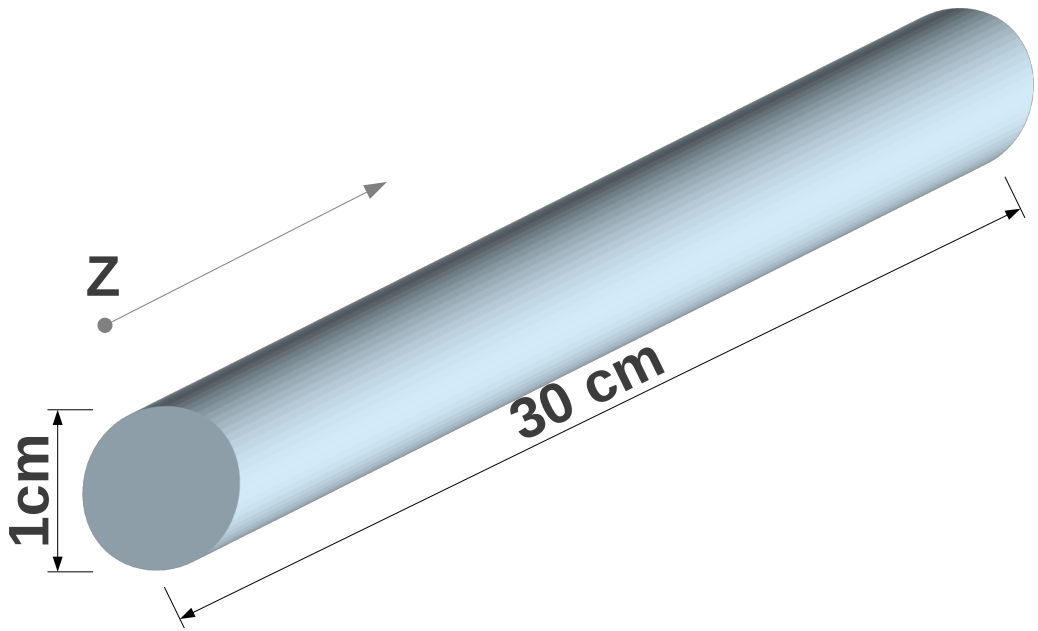
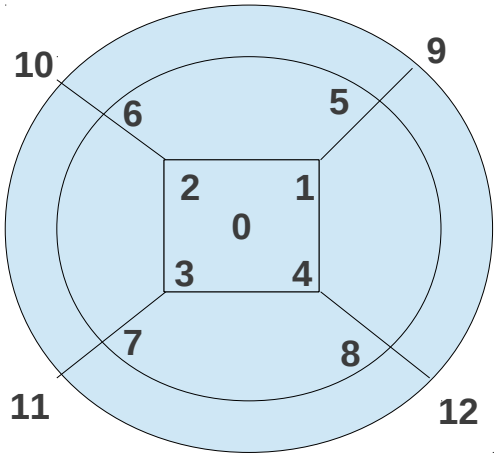
3D Pipe

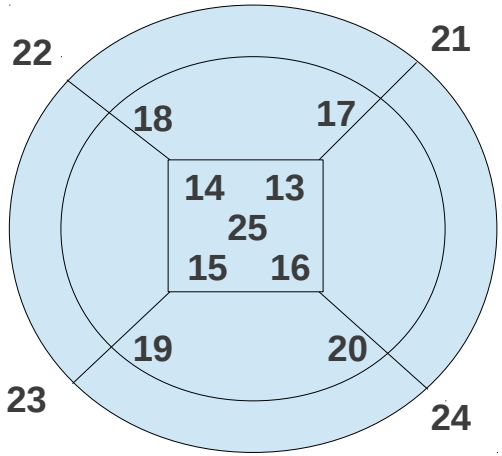


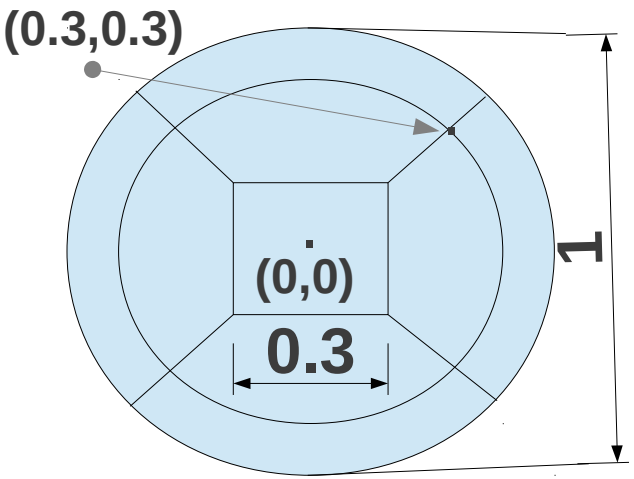
Blocking Strategy

Back Face:



Front Face:





DIMENSIONS (in cm)

Summary

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- To create and mesh a 3D pipe geometry.
- To simulate Hagen-Poiseuille flow for a fixed pressure ratio.
- To visualize the velocity results in paraFoam.

Assignment

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- **Change the corresponding pressure ratio.**
- **Use the fluid of different viscosity.**

About the Spoken Tutorial Project

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The Spoken Tutorial Project Team

- **Conducts workshops using spoken tutorials**
- **Gives certificates to those who pass an online test**
- **For more details, please write to contact@spoken-tutorial.org**

Acknowledgements

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- It is supported by the National Mission on Education through ICT, MHRD, Government of India
- More information on this Mission is available at http://spoken-tutorial.org/NMEICT-Intro