

Spoken Tutorial Simulating flow in Lid Driven Cavity using OpenFOAM

Talk to a Teacher

<http://www.sakshat.ac.in>

National Mission on Education through ICT

<http://www.spoken-tutorial.org>

Rahul Joshi
March 26, 2012



Talk to a Teacher



Learning Objectives

- Lid Driven Cavity File Structure



Talk to a Teacher



Learning Objectives

- **Lid Driven Cavity File Structure**



Talk to a Teacher



Learning Objectives

- Lid Driven Cavity File Structure
- Meshing the geometry



Talk to a Teacher



Learning Objectives

- **Lid Driven Cavity File Structure**
- **Meshing the geometry**



Talk to a Teacher



Learning Objectives

- Lid Driven Cavity File Structure
- Meshing the geometry
- Solving and post-processing results in Paraview



Talk to a Teacher

Learning Objectives

- **Lid Driven Cavity File Structure**
- **Meshing the geometry**
- **Solving and post-processing results in Paraview**



Talk to a Teacher



Learning Objectives

- Lid Driven Cavity File Structure
- Meshing the geometry
- Solving and post-processing results in Paraview
- Plotting and validating results on a spreadsheet



Talk to a Teacher

System Requirement

- **Linux Operating System Ubuntu version 10.04**



Talk to a Teacher



System Requirement

- **Linux Operating System Ubuntu version 10.04**



Talk to a Teacher



System Requirement

- **Linux Operating System Ubuntu version 10.04**
- **OpenFOAM version 2.1.0**



Talk to a Teacher



System Requirement

- **Linux Operating System Ubuntu version 10.04**
- **OpenFOAM version 2.1.0**



Talk to a Teacher

System Requirement

- **Linux Operating System Ubuntu version 10.04**
- **OpenFOAM version 2.1.0**
- **ParaView version 3.12.0**



Talk to a Teacher

System Requirement

- The tutorials were recorded using the versions specified in previous slide.
- Subsequently the tutorials were edited to latest versions.
- To install latest system requirements go to Installation Sheet.



Talk to a Teacher

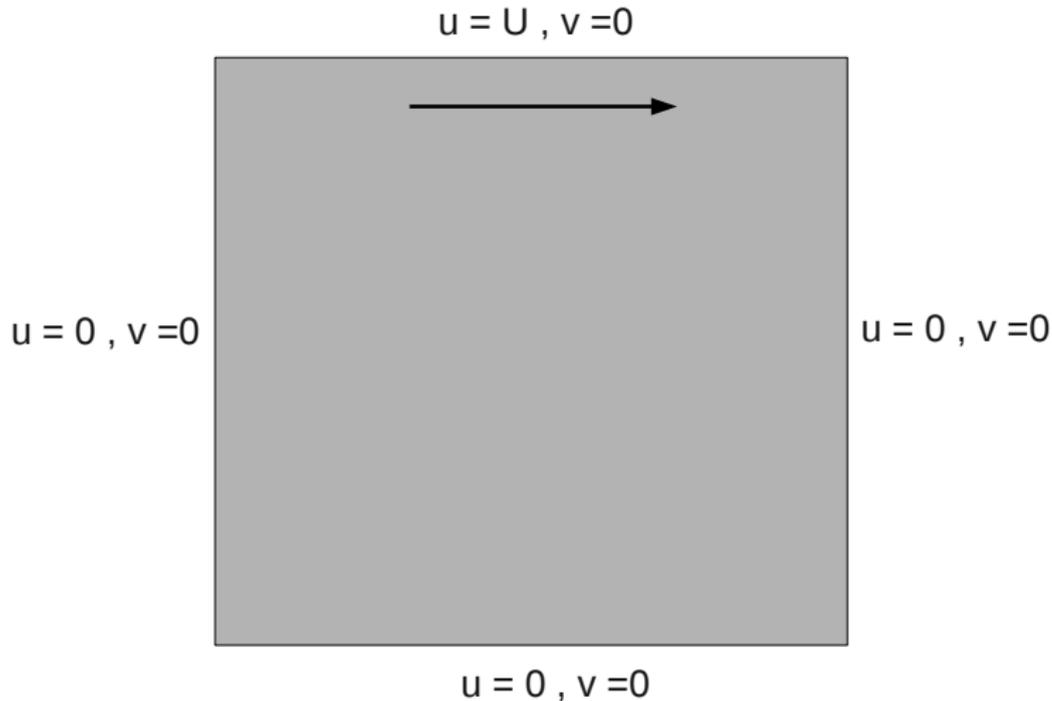
About Lid Driven Cavity

- It is the most widely used 2D test case for validation of a CFD code



Talk to a Teacher

Lid Driven Cavity



(All velocities are in m/s)



Talk to a Teacher

Boundary Conditions

- A moving wall and three fixed walls



Talk to a Teacher

Boundary Conditions

- **A moving wall and three fixed walls**



Talk to a Teacher

Boundary Conditions

- A moving wall and three fixed walls
- Reynolds number (Re) = 100



Talk to a Teacher

Boundary Conditions

- **A moving wall and three fixed walls**
- **Reynolds number (Re) = 100**



Talk to a Teacher

Boundary Conditions

- A moving wall and three fixed walls
- Reynolds number (Re) = 100
- Moving wall velocity (u) = 1 m/s



Talk to a Teacher

- icoFoam



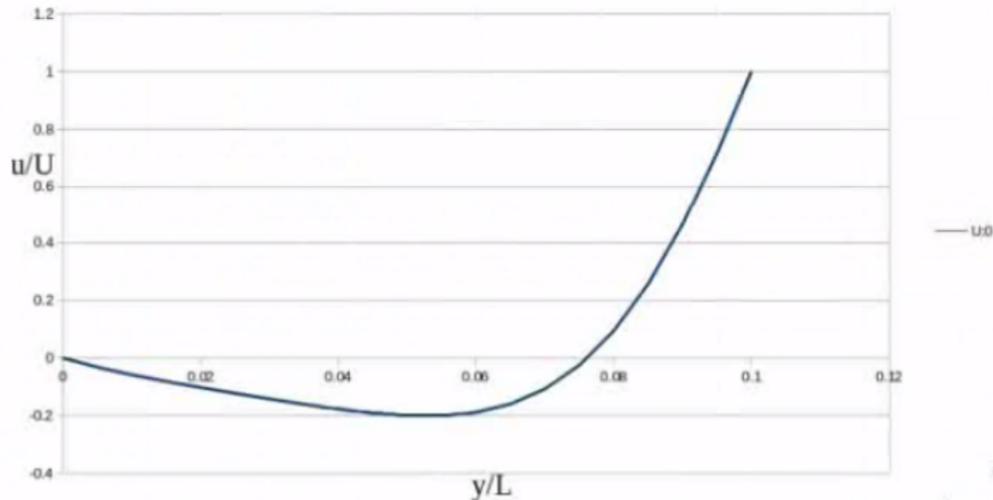
Talk to a Teacher

- **icoFoam**
 - **Transient Solver for Incompressible flow of Newtonian fluids**



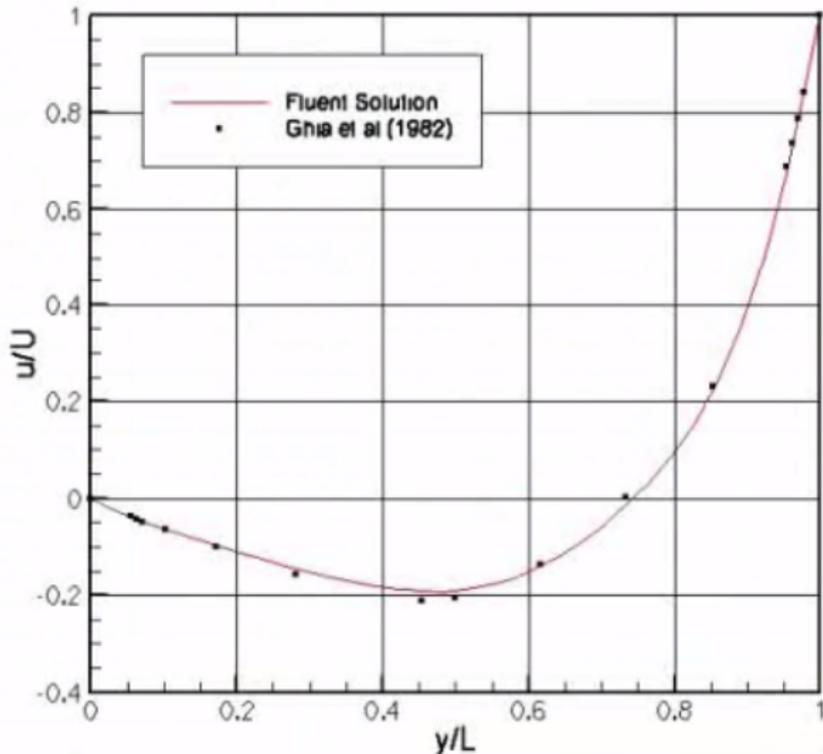
Talk to a Teacher

Lid Driven Cavity (OpenFOAM)



Talk to a Teacher

Ghia et al. (1982) and Fluent



Talk to a Teacher



Summary

- File structure of Lid Driven Cavity



Talk to a Teacher



- **File structure of Lid Driven Cavity**



Talk to a Teacher

Summary

- File structure of Lid Driven Cavity
- Solved Lid Driven cavity



Talk to a Teacher



Summary

- **File structure of Lid Driven Cavity**
- **Solved Lid Driven cavity**



Summary

- File structure of Lid Driven Cavity
- Solved Lid Driven cavity
- Post-processing of solution



Talk to a Teacher

Summary

- **File structure of Lid Driven Cavity**
- **Solved Lid Driven cavity**
- **Post-processing of solution**



Talk to a Teacher

Summary

- File structure of Lid Driven Cavity
- Solved Lid Driven cavity
- Post-processing of solution
- **Validation**



Talk to a Teacher

Assignment

- Change some parameters in the Lid Driven Cavity



Talk to a Teacher



Assignment

- **Change some parameters in the Lid Driven Cavity**



Talk to a Teacher

Assignment

- Change some parameters in the Lid Driven Cavity
 - Velocity Magnitude in the '0' folder



Talk to a Teacher

Assignment

- **Change some parameters in the Lid Driven Cavity**
 - **Velocity Magnitude in the '0' folder**



Talk to a Teacher



Assignment

- **Change some parameters in the Lid Driven Cavity**
 - Velocity Magnitude in the '0' folder
 - Kinematic viscosity in transportProperties in 'constant' folder



Talk to a Teacher

Assignment

- **Change some parameters in the Lid Driven Cavity**
 - **Velocity Magnitude in the '0' folder**
 - **Kinematic viscosity in transportProperties in 'constant' folder**



Talk to a Teacher

Assignment

- **Change some parameters in the Lid Driven Cavity**
 - Velocity Magnitude in the '0' folder
 - Kinematic viscosity in transportProperties in 'constant' folder
- Plot result of ' u/U ' v/s ' y/L '



Talk to a Teacher

About the Spoken Tutorial Project

- Watch the video available at http://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- It summarises the Spoken Tutorial project
- If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

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



Talk to a Teacher

Forum to answer questions

- Do you have questions on THIS Spoken Tutorial?
- Choose the minute and second where you have the question.
- Explain your question briefly.
- Someone from the FOSSEE team will answer them. Please visit <http://forums.spoken-tutorial.org/>



Talk to a Teacher

Forum to answer questions

- Questions not related to the Spoken Tutorial?
- Do you have general / technical questions on the Software?
- Please visit the FOSSEE Forum
<http://forums.fossee.in/>
- Choose the Software and post your question.



Talk to a Teacher

Lab Migration Project

- We coordinate migration from commercial CFD software like ANSYS to OpenFOAM
- We conduct free Workshops and provide solutions to CFD Problem Statements in OpenFOAM

For more details, please visit this site:

<http://cfd.fossee.in/>



Talk to a Teacher

Case Study Project

- The FOSSEE team coordinates solving past, current or new CFD projects using OpenFOAM
- We give honorarium and certificate to those who do this

For more details, please visit this site:

<http://cfd.fossee.in/>



Talk to a Teacher

Acknowledgements

- Spoken Tutorial Project is a part of the Talk to a Teacher project
- 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>



Talk to a Teacher