

# Turbulent flow in a Lid driven cavity using OpenFOAM

**Talk to a Teacher**

<http://spoken-tutorial.org>

**National Mission on Education through ICT**

<http://sakshat.ac.in>

**Rahul Joshi**

**Date: October 26, 2012**



Talk to a Teacher

# Learning Objectives

- Solving turbulent flow case in OpenFOAM



Talk to a Teacher

# Learning Objectives

- Solving turbulent flow case in OpenFOAM



Talk to a Teacher

# Learning Objectives

- Solving turbulent flow case in OpenFOAM
- Plotting StreamLines in paraview



Talk to a Teacher

# System Requirement

- **Linux Operating System Ubuntu version 12.04**



Talk to a Teacher

# System Requirement

- **Linux Operating System Ubuntu version 12.04**



Talk to a Teacher

# System Requirement

- **Linux Operating System Ubuntu version 12.04**
- **OpenFOAM version 2.1.1**



Talk to a Teacher

# System Requirement

- **Linux Operating System Ubuntu version 12.04**
- **OpenFOAM version 2.1.1**
- **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

# Prerequisite

- Turbulence modelling



Talk to a Teacher

# Prerequisite

- **Turbulence modelling**



Talk to a Teacher

# Prerequisite

- **Turbulence modelling**
- Knowledge of how to simulate flow in a Lid Driven Cavity



Talk to a Teacher

# Prerequisite

- Turbulence modelling
- Knowledge of how to simulate flow in a Lid Driven Cavity
- If not, please refer to the relevant tutorials on <http://spoken-tutorial.org>



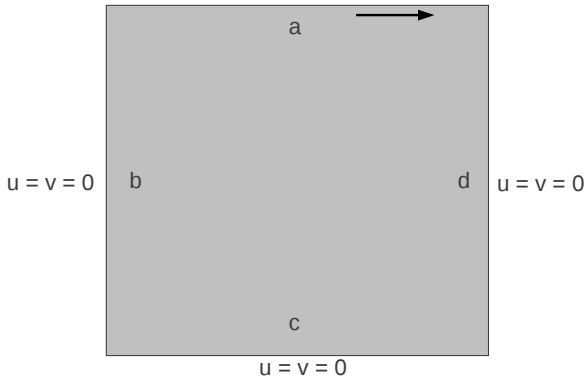
Talk to a Teacher

# Lid Driven Cavity

b,c,d – STATIONARY WALLS

a – MOVING WALL

$u = 1\text{m/s}$  ,  $v = 0$



# Lid Driven Cavity

- The lid velocity  $U=1\text{m/s}$



Talk to a Teacher

# Lid Driven Cavity

- The lid velocity  $U=1\text{m/s}$
- We are solving this for a reynolds number  $Re=10,000$



Talk to a Teacher

- We are using a Transient solver



Talk to a Teacher

# Solver

- We are using a Transient solver
- for incompressible



Talk to a Teacher

- We are using a Transient solver
- for incompressible
- turbulent flow of Newtonian fluids



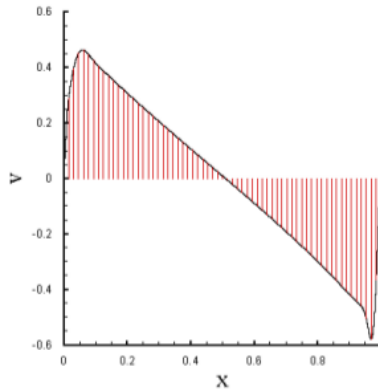
Talk to a Teacher

- We are using a Transient solver
- for incompressible
- turbulent flow of Newtonian fluids
- **PisoFoam**



Talk to a Teacher

# Lid Driven Cavity-Ghia et al

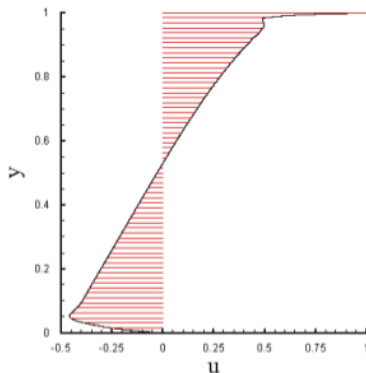


e)  $Re=10,000$



Talk to a Teacher

# Lid Driven Cavity-Ghia et al



e)  $Re=10,000$



Talk to a Teacher

# Summary

- In this tutorial we learnt :



Talk to a Teacher

# Summary

- In this tutorial we learnt :



Talk to a Teacher

# Summary

- In this tutorial we learnt :
  - Turbulent Flow in a Lid Driven Cavity



Talk to a Teacher

# Summary

- In this tutorial we learnt :
  - Turbulent Flow in a Lid Driven Cavity



Talk to a Teacher

# Summary

- In this tutorial we learnt :
  - Turbulent Flow in a Lid Driven Cavity
  - Plotting Streamlines in paraview



Talk to a Teacher

# Assignment

- Modify the grid size of the cavity



Talk to a Teacher

# Assignment

- Modify the grid size of the cavity
- Change it to (100 100 1)



Talk to a Teacher

# Assignment

- Modify the grid size of the cavity
- Change it to (100 100 1)
- Visualise the results in paraview using streamlines



Talk to a Teacher

# About the Spoken Tutorial Project

- Watch the video available at [http://spoken-tutorial.org/What\\_is\\_a\\_Spoken\\_Tutorial](http://spoken-tutorial.org/What_is_a_Spoken_Tutorial)



Talk to a Teacher

# About the Spoken Tutorial Project

- Watch the video available at [http://spoken-tutorial.org/What\\_is\\_a\\_Spoken\\_Tutorial](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



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

# 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](mailto:contact@spoken-tutorial.org)



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