

# Grid Resolution and Convergence in OpenFOAM

**Spoken Tutorial Project**

**<https://spoken-tutorial.org>**

**National Mission on Education through ICT**

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

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# Learning Objectives

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## We will learn to:

- ▶ Refine **a** mesh **using** `blockMeshDict`
- ▶ **Change the** time step **to** **achieve** numerical stability
- ▶ **Perform a** grid independence study



# System Specifications



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- ▶ **gedit Text Editor**



# Prerequisites



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- ▶ **You should be familiar with setting up a case and creating a mesh in OpenFOAM**



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- ▶ **You should be familiar with** setting up a case **and** creating a mesh **in** OpenFOAM
- ▶ **You should also be familiar with** basic post-processing **using** ParaView



# Prerequisites

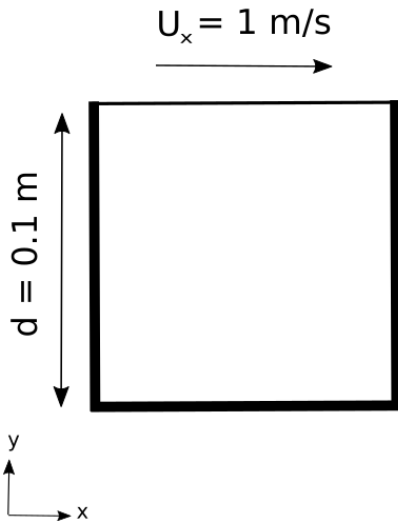
- ▶ If not, please go through the prerequisite OpenFOAM tutorials on <https://spoken-tutorial.org>



# Lid Driven Cavity



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# Probe Location

- ▶ Probe Location filter **shows the details of the points within an arbitrary sphere**



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- ▶ Probe Location filter **shows the details of the points within an arbitrary sphere**
- ▶ **By default, this sphere is centered at the center of the domain and has 0 radius**



# Probe Location

- ▶ **Changing these parameters will change the probe location or the range of the probe**



# Mesh Refinement

- ▶ **This process of dividing the existing cells is called** mesh refinement



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- ▶ **This process of dividing the existing cells is called** mesh refinement
- ▶ Mesh refinement **changes a** coarse mesh **into a** finer mesh

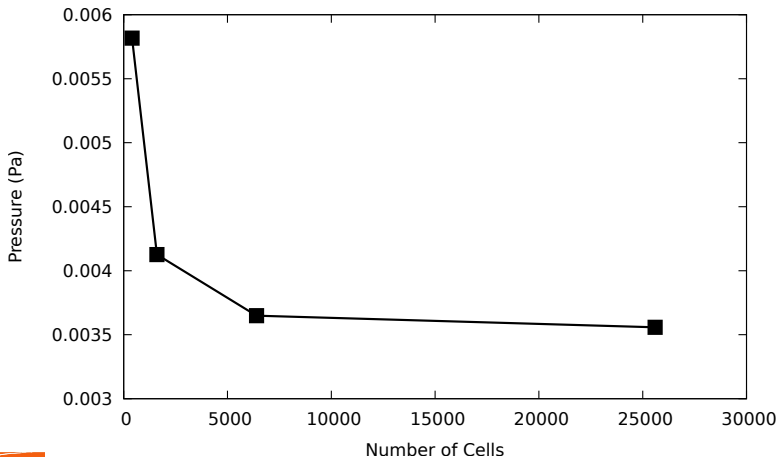


# Pressure at the Centre

Number of Cells	Pressure (Pa)
<b>20 X 20 = 400</b>	<b>0.00581712</b>
<b>40 X 40 = 1600</b>	<b>0.00412639</b>
<b>80 X 80 = 6400</b>	<b>0.00364832</b>
<b>160 X 160 = 25600</b>	<b>0.00355786</b>



# Pressure at the Centre



# Summary

## We have learnt to:

- ▶ Refine **a** mesh **using** `blockMeshDict`
- ▶ **Change the** time step **to** **achieve** numerical stability
- ▶ **Perform a** grid independence study



# About the Spoken Tutorial Project

- ▶ Watch the video available at [https://spoken-tutorial.org/What\\_is\\_a\\_Spoken\\_Tutorial](https://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](mailto:contact@spoken-tutorial.org)



# Spoken Tutorial Forum

- ▶ **Questions in THIS Spoken Tutorial?**
- ▶ **Visit** <https://forums.spoken-tutorial.org/>
- ▶ **Choose the minute and second where you have the question**
- ▶ **Explain your question briefly**
- ▶ **The Spoken Tutorial project will ensure an answer**

**You will have to register to ask questions**



# FOSSEE Forum

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



# FOSSEE Case Study Project

- ▶ **The FOSSEE team coordinates solving feasible CFD problems of reasonable complexity using OpenFOAM**
- ▶ **We give honorarium and certificates to those who do this**
- ▶ **For more details, please visit:**  
<https://cfd.fossee.in/>  
<https://fossee.in/>



# Acknowledgements

- ▶ **Spoken Tutorial Project is supported by the MHRD, Government of India**

