

**MATH 676**

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**Finite element methods in  
scientific computing**

Wolfgang Bangerth, Texas A&M University

# Lecture 5:

## A first example

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### The *step-1* tutorial program: Triangulations (Part 1: The simplest mesh)

# step-1

## **Step-1 shows:**

- The *Triangulation* class
- How to think of a triangulation: as a collection of cells
- How to query cells for information, and what to do with them
- How to output a mesh, and a way to visualize it.

# step-1

## **Tutorial programs have the following structure:**

- Introduction:
  - lays out the problem to be solved
  - discusses the numerical method
  - introduces basics of the implementation
- Thoroughly documented code, processed for better readability
- Results section, often with suggestions for further extensions
- Copy of the code without the comments

All programs use similar structure and naming convention.

# step-1

Read through the commented program at

[http://www.dealii.org/7.1.0/doxygen/deal.II/step\\_1.html](http://www.dealii.org/7.1.0/doxygen/deal.II/step_1.html)

## **Notes when reading:**

- Read the introduction!
- If you want to *understand the entire code*, read from the top
- If you just want to *follow the flow* of the program, read from the bottom!
- Think about modifying the code as you read.

# step-1

## **After reading, play with the program:**

```
cd examples/step-1  
cmake -DDEAL_II_DIR=/path/to/deal.II .  
make run
```

This will run the program and generate output files:

```
ls -l  
okular grid-2.eps
```

**Next step:** Play by following the suggestions in the results section. This is the best way to learn!

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