

# Mesh Adaptivity and the Finite Element Method

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# Outline

# Grids & Meshes

Except when using spectral methods, computational grids and meshes are ubiquitous in computational science

- ▶ Grids of points for finite element methods

- ▶ Tessellations of subvolumes for finite volume methods

- ▶ Tessellations of elements for finite element methods

# Grids & Meshes

## Meshes/grids:

- ▶ can be structured or unstructured.
- ▶ describe geometry of problem.
- ▶ define a local resolvable resolution.
- ▶ help determine bounds on solution error.

Frequently fine resolution is only required in limited regions, which change with time.

Idea: progressively modify the mesh to put resolution where it is

needed.

## Adaptive Mesh Refinement

When this idea is followed through on structured meshes, it is often called adaptive mesh refinement. Blocks are subdivided in areas of refinement. Good for computer memory access, less good for physics.

