Study Guide: Introduction to Finite Element Methods

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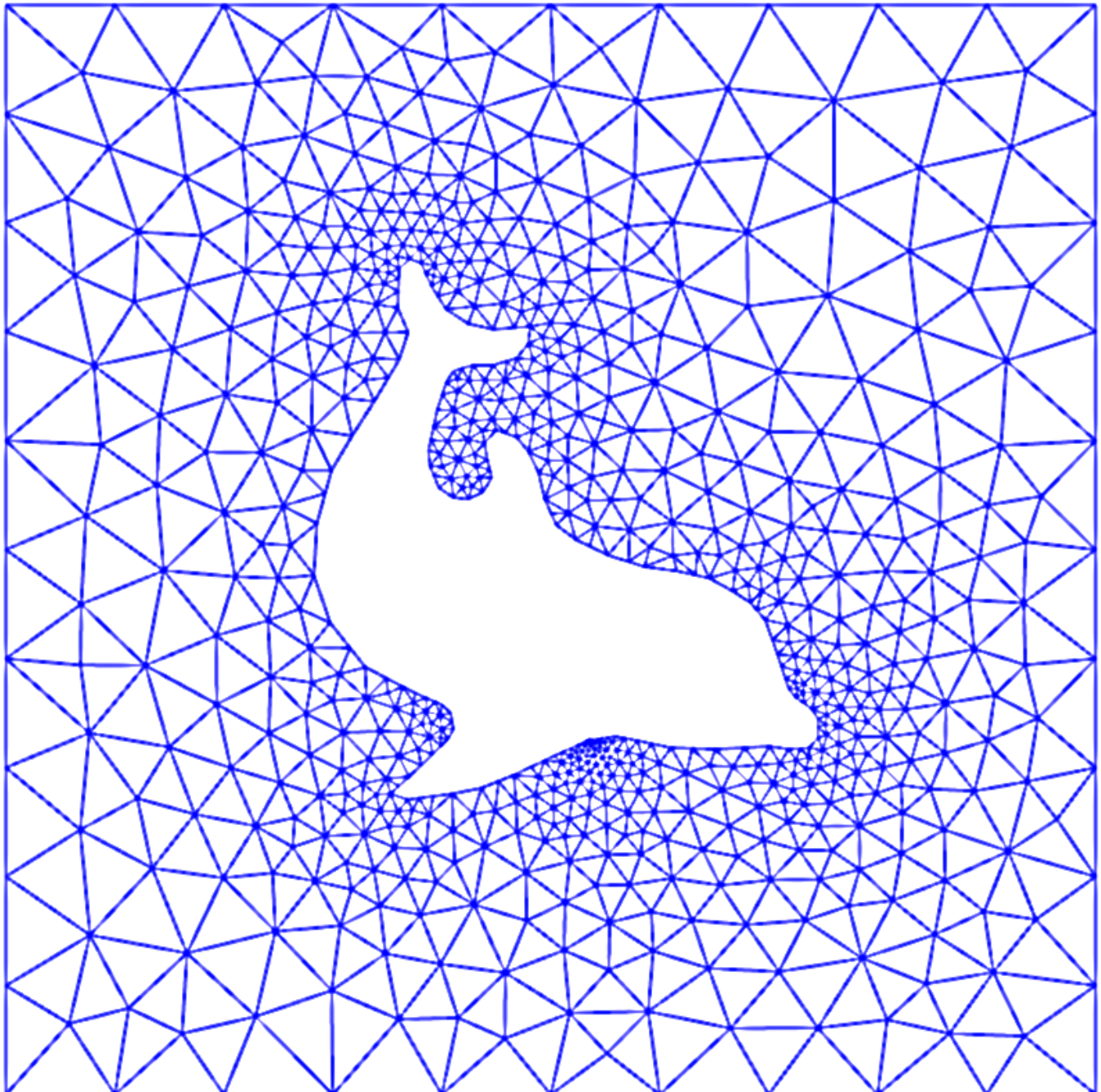
Sep 26, 2013

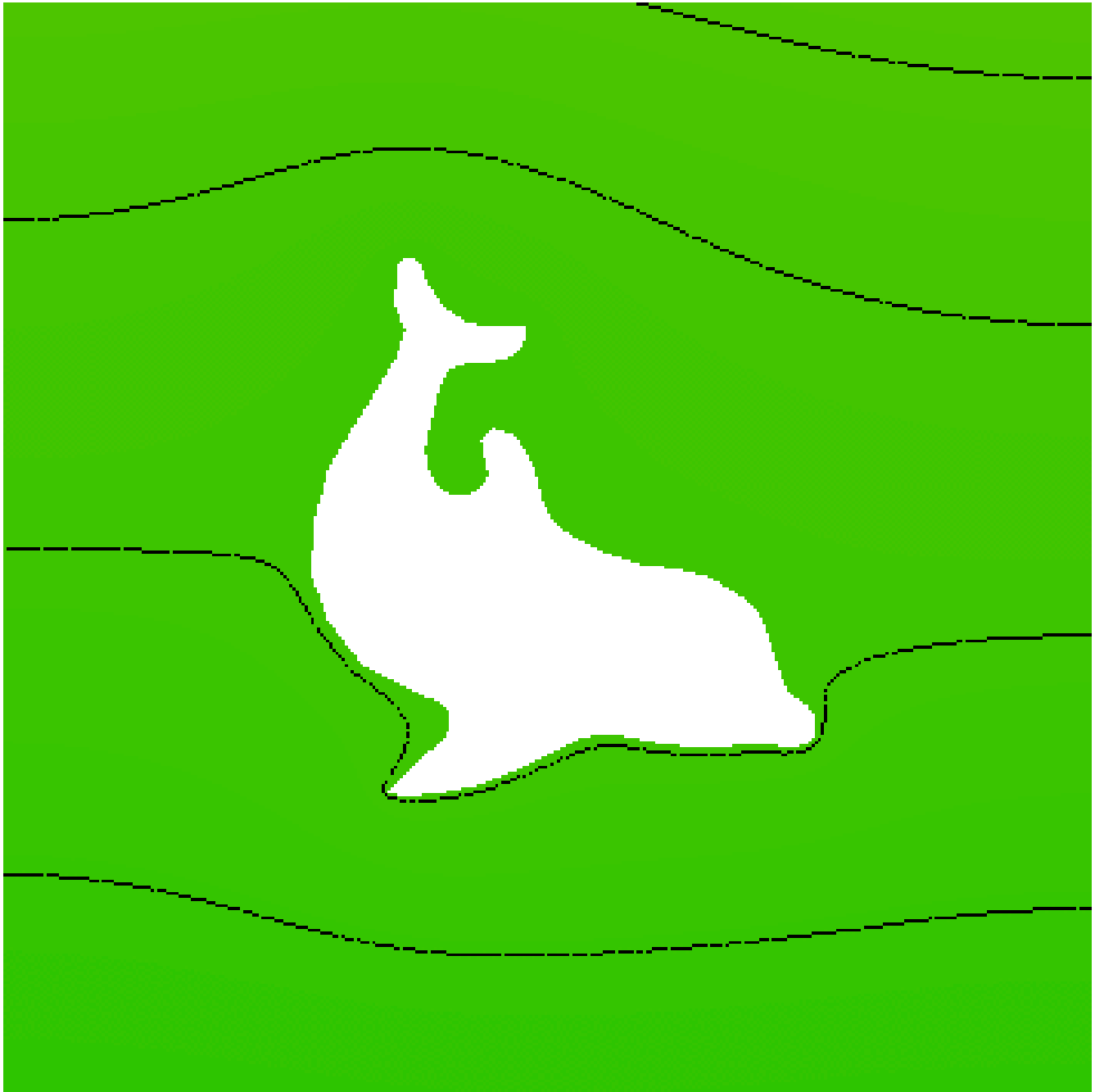
Why finite elements?

- Can with ease solve PDEs in domains with *complex geometry*
- Can with ease provide higher-order approximations
- Has (in simpler problems) a rigorus mathematical analysis framework (not much considered here - not powerful enough to uncover the serious limitations of the method in time-dependent problems and the necessary adjustments)

Domain for flow around a dolphin



The flow



Basic ingredients

- Transform the PDE problem to a *variational form*
- Define function approximation over *finite elements*
- Use a machinery to derive *linear systems*
- Solve linear systems

Learning strategy