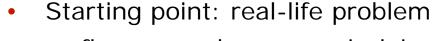


Modelling and approximation

Modelling and approximation



- flow around a car or airplain
- · flow in the Golf stream
- flow of blood in the cardiovascular system
- propelling of liquid ink droplets in inkjet printers



- Computational resources
- Modelling level



Flow physics

complex and unintuitive flow fields

- level of approximation
- turbulence (and transition to) modelling
- structure interaction
- real gas effects
- combustion
- non-newtonian fluid
- two-phase flows
- magneto hydro dynamical flows



boundary conditions

Defines the problem

- inflow, outflow
- far field
- wall
- symmetries



Computational grid

Solution never better than the grid

- resolving gradients
 shocks, boundary layers, free shear layers, vortices, adaptation,
 ...
- scale separation
 global scales, viscous scales (turbulence), molecular scales
 (shocks), ...
- grid topology
 stretching, cell orientation and shape,
 structured/unstructured/hybrid grids
- geometry approximations of details



Numerical method

no universal method

- basic conceptFEM, FVM, FDM, ...
- solution methods
 pressure or density based, multi-grid, implicit, explicit, steady state, ...
- spatial schemes
 central, upwind, higher order, ...



Computational resources

Never enough

- Computational time
 parallelization
 number of grid points (~100.000 points 1 CPUh)
- Memory use number of grid points (100-1.000 byte / grid point)

