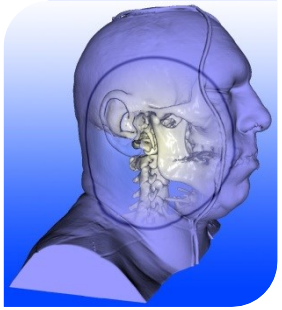
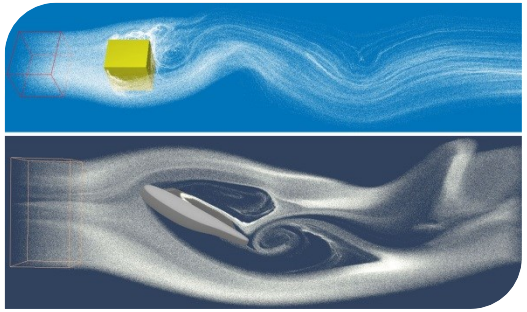
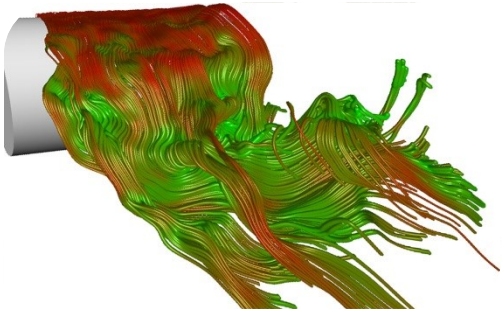
Master Practical Course

Interactive Visual Data Analysis

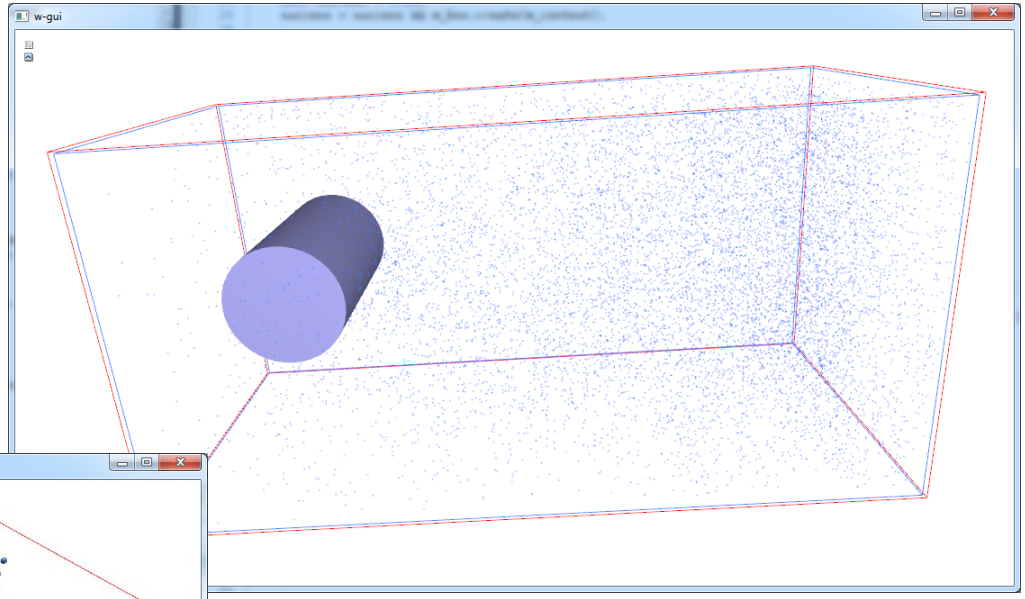





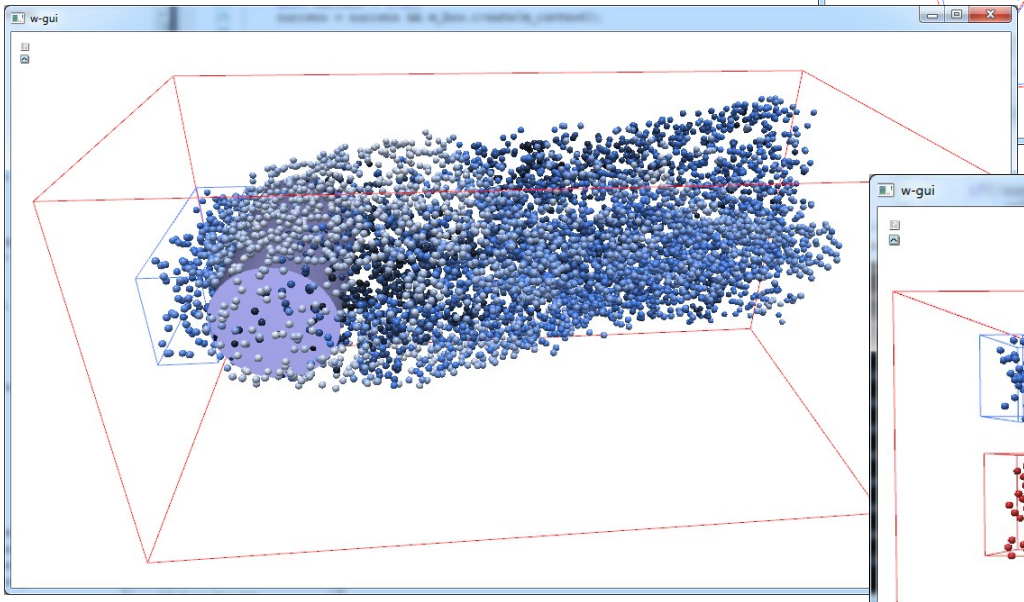
tum.3D

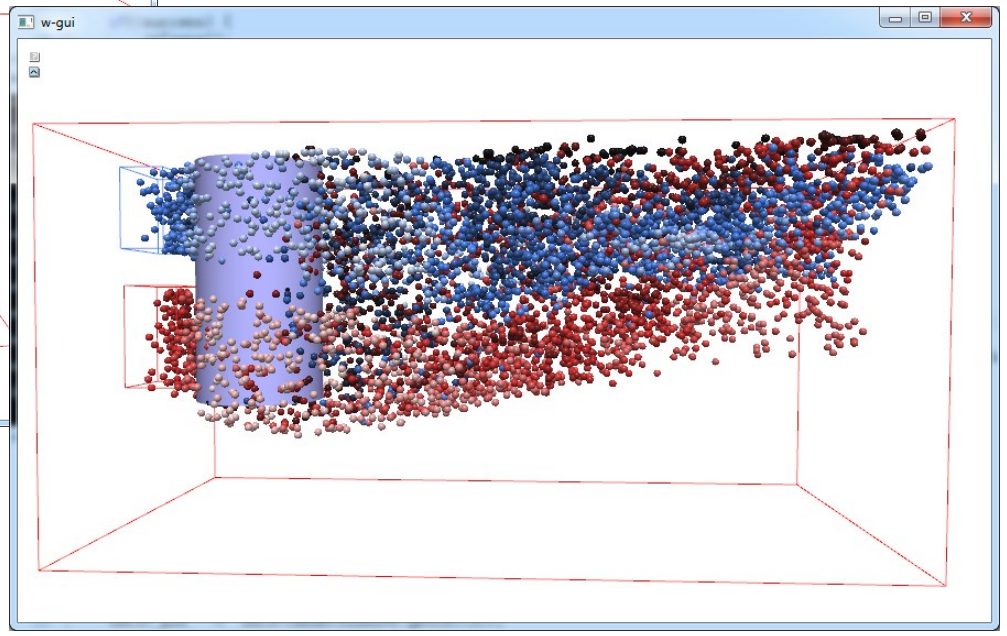
computer graphics & visualization

Today

- Assignment 8
  - Probes
  - Nicer Particles





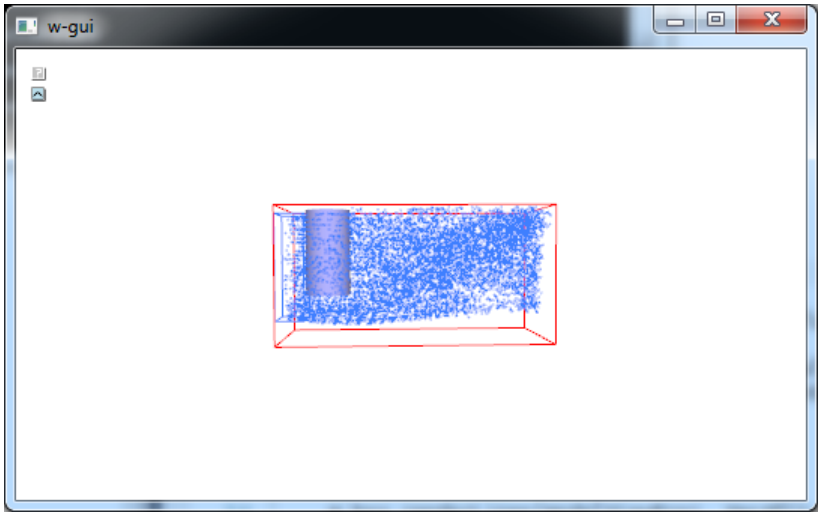


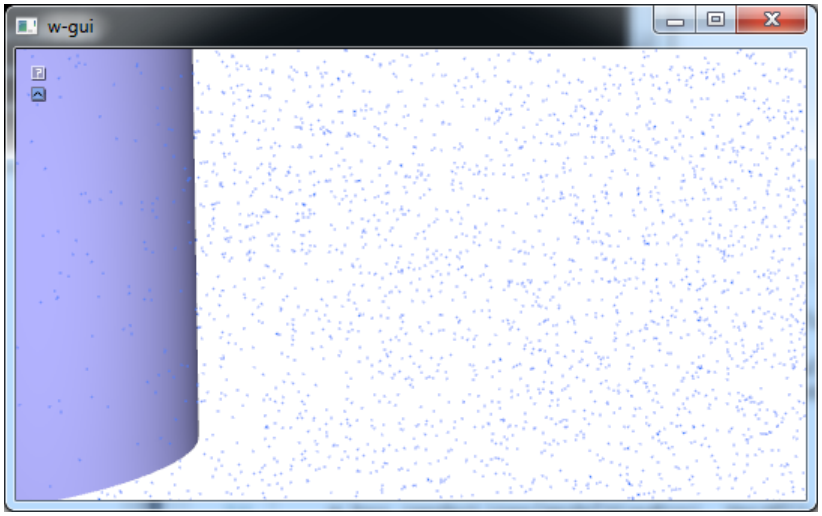
Probes

- Let user specify seed region(s)
  - Axis-aligned box
  - Control position and size with the mouse („drag&drop“)
    - e.g. mouse delta x/y snap to largest world space axes wrt. camera
- Per-probe parameters:
  - Particle count
  - Color
  - Lifetime
  - …
- Also allocate resources per probe!

Particles as Points

- Problems with points:
  - Inconsistent look when zooming





  - Poor depth perception
  - No lighting
- We need some real geometric representation!

Particles as Geometry

- One option: Render meshes
  - …but: 10s or 100s of thousands of particles
  - How many triangles?
  - LoD?

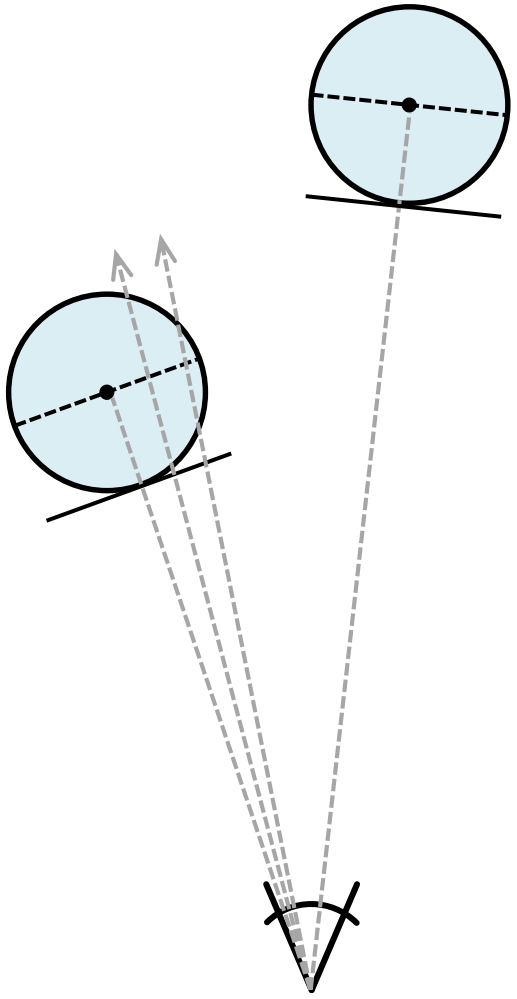
- (Probably) better option: Implicit geometry
  - Render simple proxy geometry
  - Compute ray-geometry intersection in PS
  - Somewhat similar to iso-surface ray-caster!

Particles as implicit Spheres

- Extrude Quad in GS
  - Perpendicular to view direction
  - At „front“ of sphere

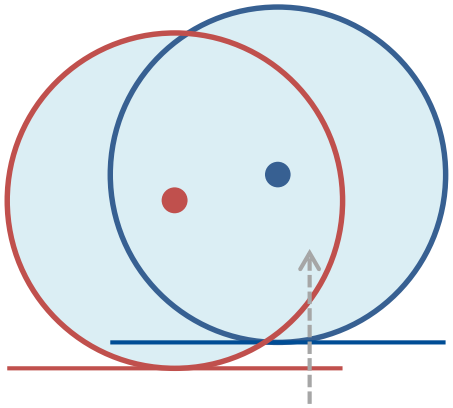
- Ray-sphere intersection in PS
  - Ray: $R(t) = O + tD$
  - Sphere: $(P - C)^2 = r^2$
  - Intersection: $(O + tD - C)^2 = r^2$

- Render with Phong lighting
  - If there is an intersection



Depth adjustment

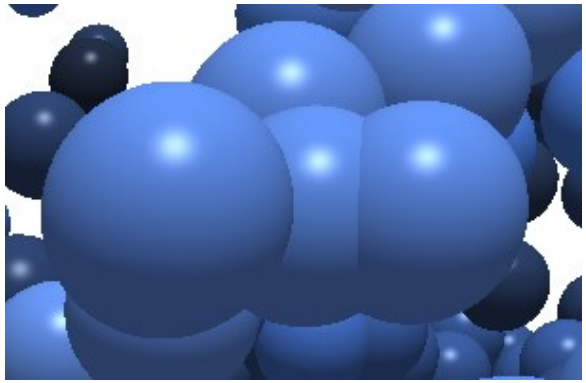
- Problem: Depth test based on proxy geometry‘s depth



Red always wins the z test!

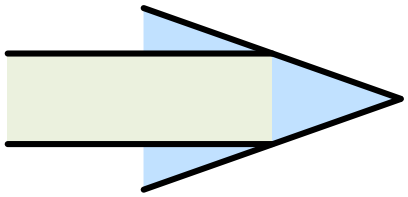
- We want correct sphere-sphere intersections!

- Compute correct depth in PS
  - Transform intersection to clip space
  - Divide by `.w` to get to NDC
  - Write `.z` to `SV_Depth`
  - See Slides_01!



MOAR INFORMATION!

- Put more information into an image by using particle
  - Color
  - Size?
- to display additional information such as
  - Velocity magnitude
  - Pressure, Temperature, Salinity, … (4th field component)
  - Direction?
- Optional: Oriented Particles
  - E.g. Cone + Cylinder



Questions ?