# 2013WS Praktika

Geometry aware cutting

Motivation

- Given
  - a set of objects = meshes / segmented volume data
  - view point
  - user indicates focus object(s)
- Output
  - show focus object(s)
  - keep *essential* objects
  - remove objects that *clutter*
- Approach
  - resolve *essential/clutter* by geometric rules motivated by work from expert illustrators
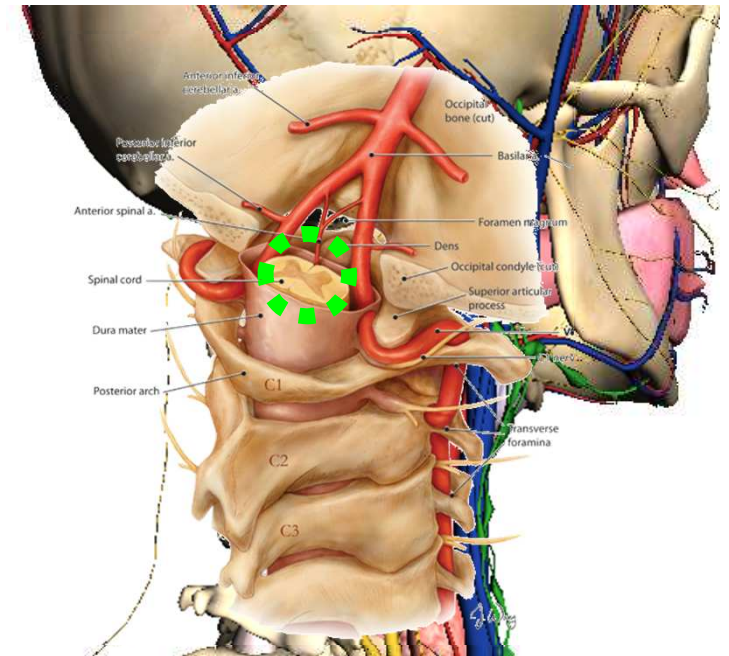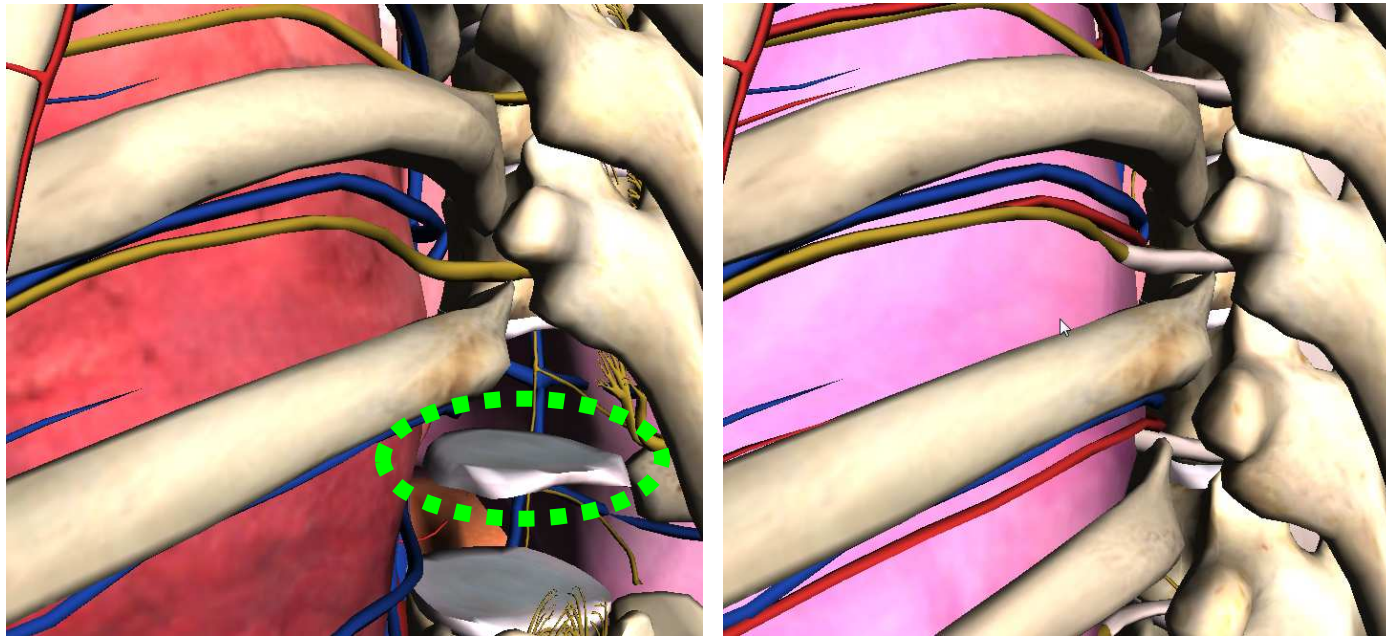
Manual solution

- Its manual → time consuming
- View point changes → repeat process
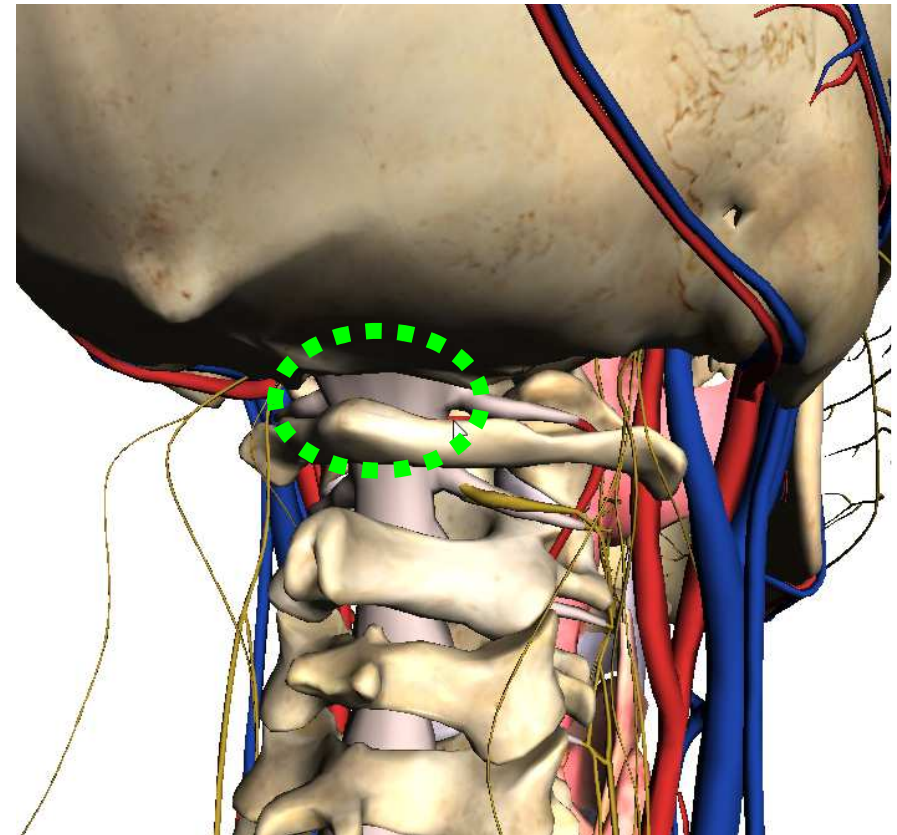
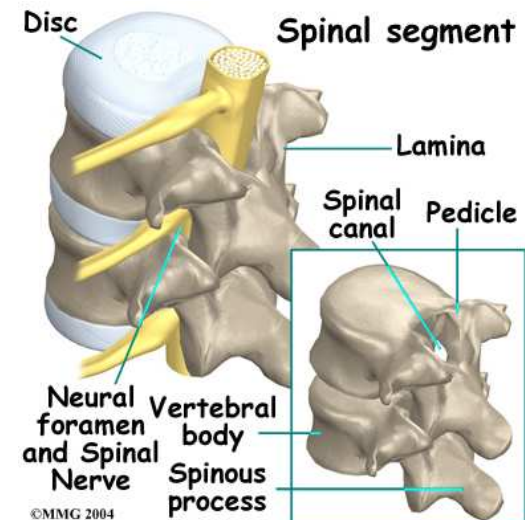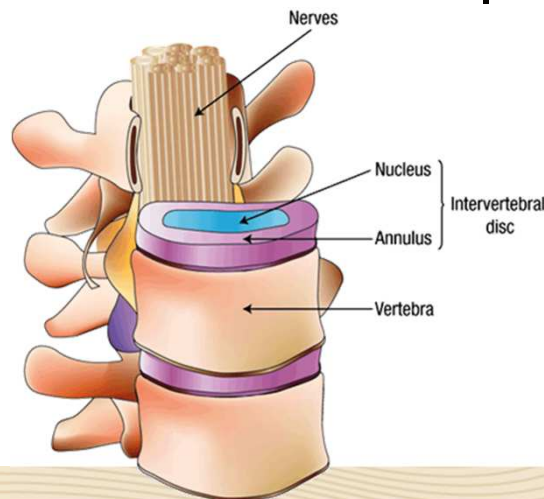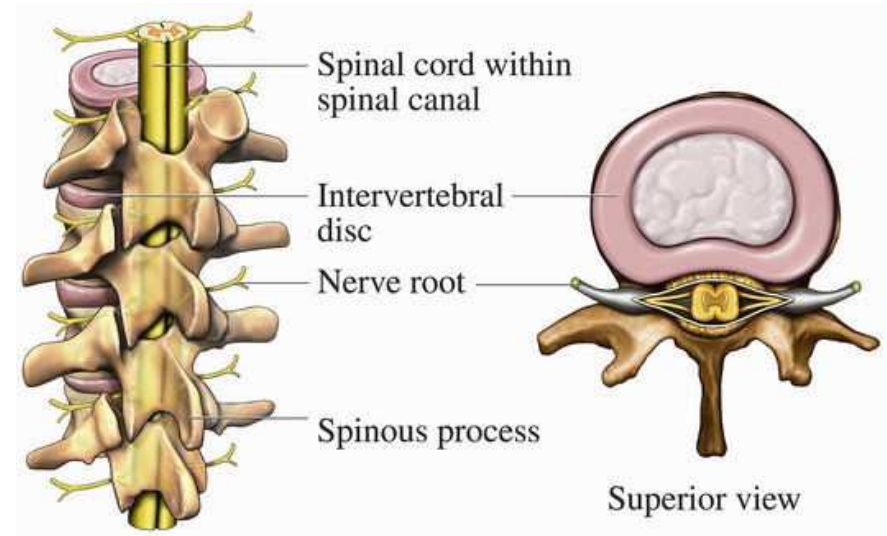# Simple automatic solution: remove all occluding parts

- Isolation → context lost
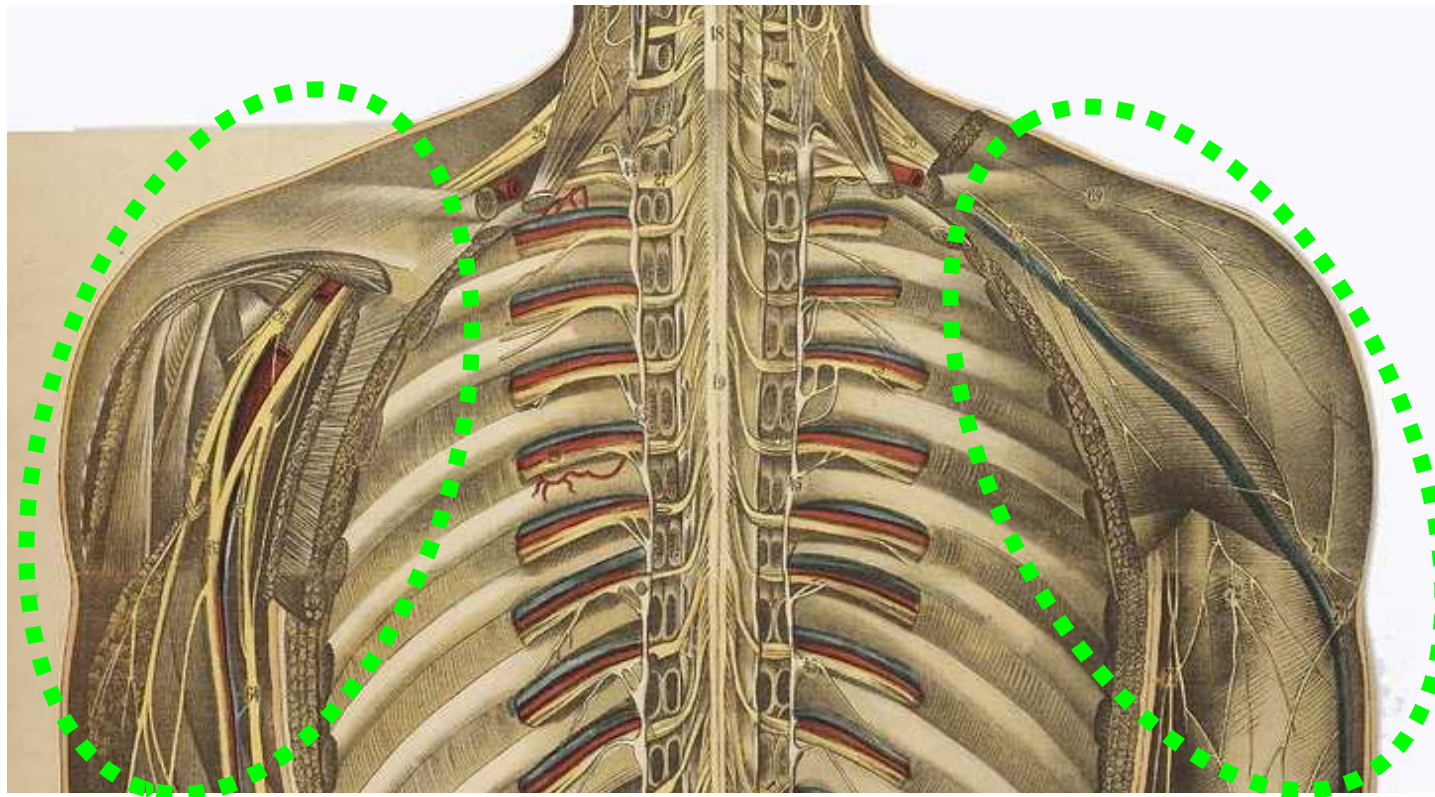- Assumption: context loss → harder to understand
- Avoid!

Solutions by artists

- Nice results
- Artists want
  - money
  - time
- Choose certain view – may not adapt to others
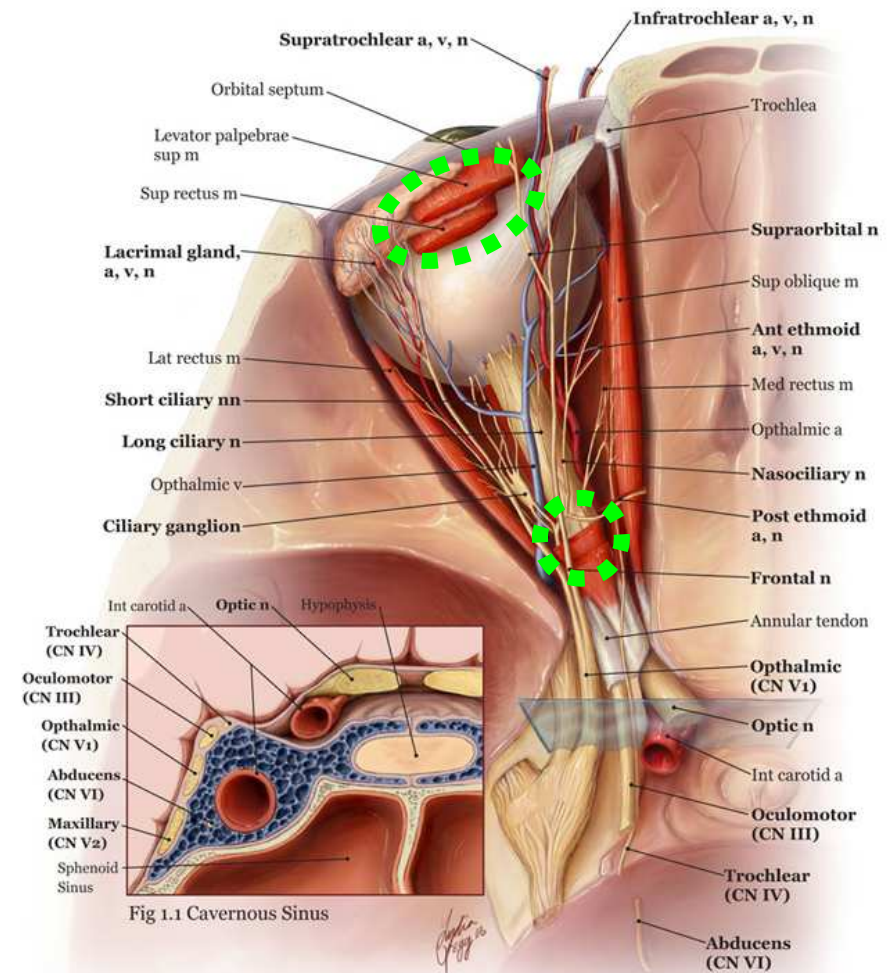- Rules that we can adopt?

Variation Through Symmetry

- **Clearly(?)** symmetric instances can show different information layers or can be cut away
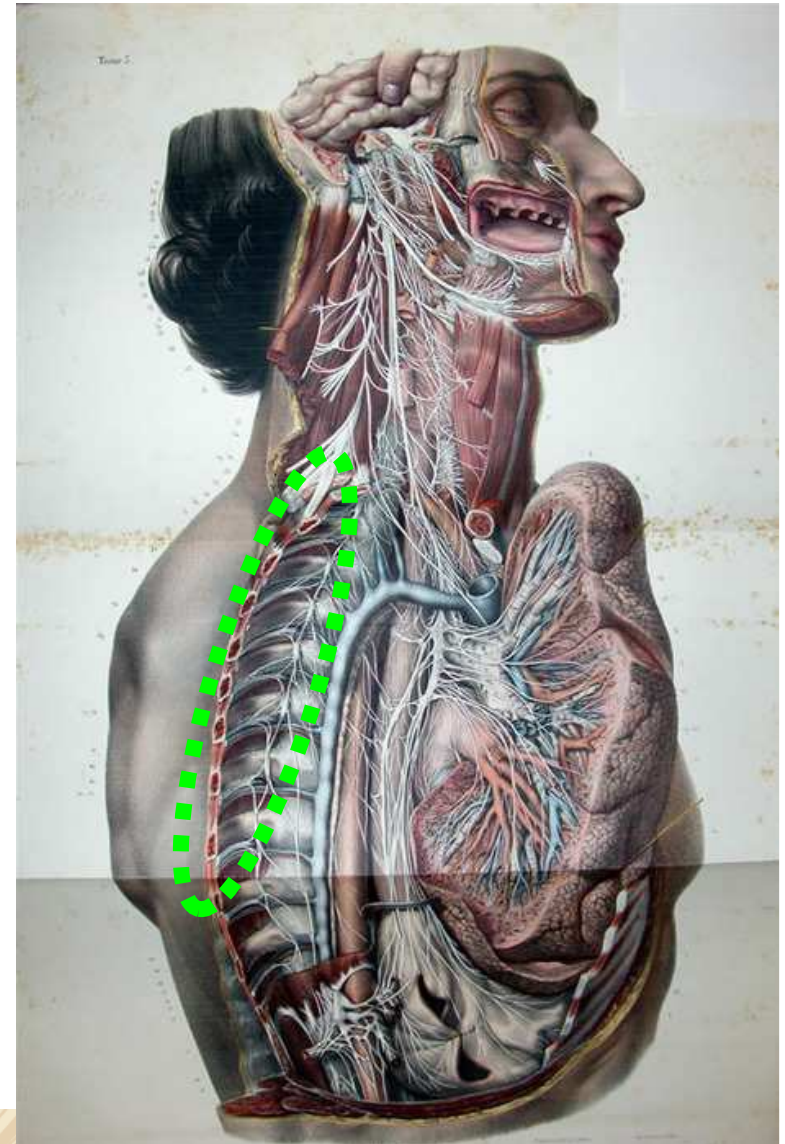
Symmetry/occlusion guided cuts

- Cut to avoid occlusion of features, but

- Keep **enough(?)** to understand geometry

→Viewer can interpolate

→Remove occluding symmetric parts

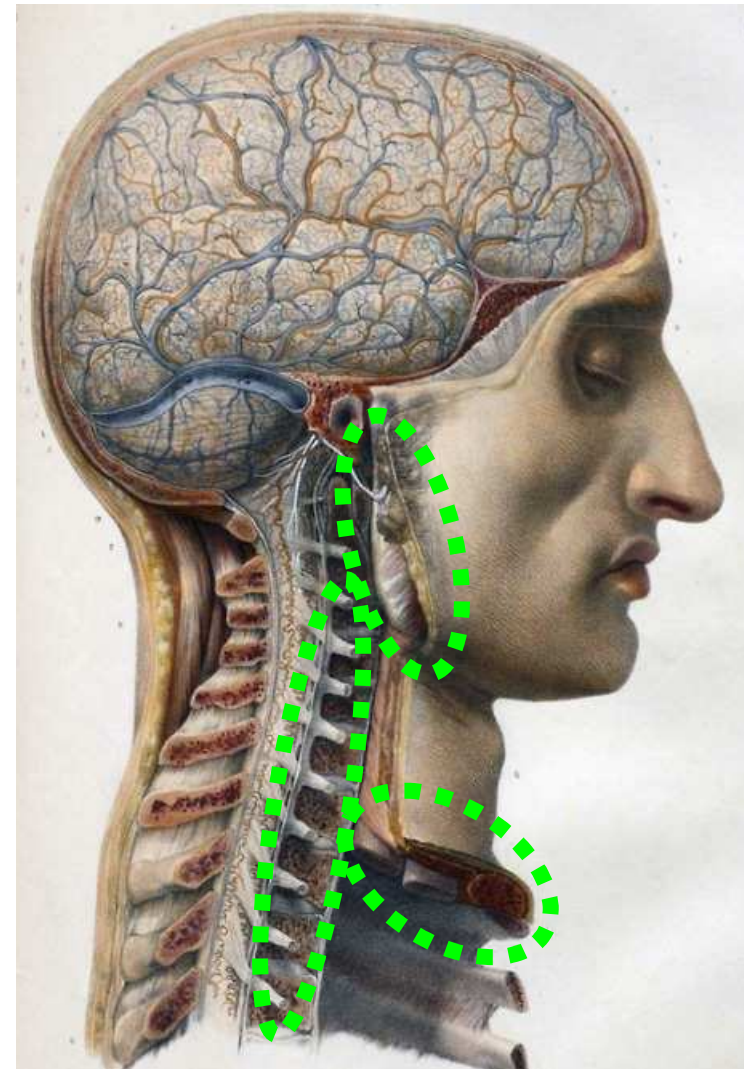Fig 1.1 Cavernous Sinus

Symmetry/occlusion guided cuts

- Cut to avoid occlusion of features, but

- Keep **enough(?)**
  to understand geometry

→Viewer can interpolate

→Remove occluding
  symmetric parts

Physically plausible cuts

- Layered cuts
- Different cuts for different materials
- Simulates material properties
- Simulates physical cutting process

1D structures - vessels

- Reduce clutter

- Aid understanding

- Not physical

- Able to guess form from visible parts

  - Show continuity

  - Check for curvature/topology changes at occluded position

  → Allow occlusion for simple connections

  → Allow transparency (as a last resort) for complex connections
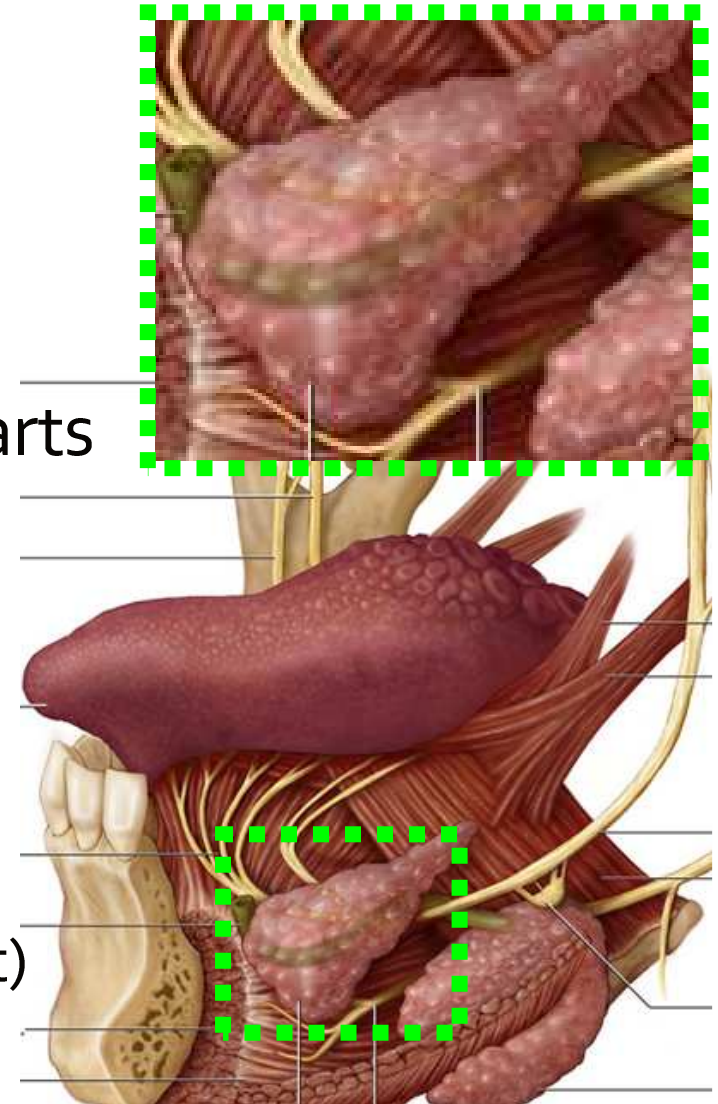
Algorithm should be able to

- Adapt to view changes interactively (quick)

- Easy learning/exploration for any user (automatic)

- Algo. detects importance by contact, symmetry, …

- Two main issues

  - what objects to keep/remove

  - for kept objects which parts to show for context
   (how and were to cut, use transparency)

Approach outline

- Assume: context reflected in
  - ▪ <mark>contact</mark> areas/points between meshes
  - ▪ inter-mesh <mark>symmetries</mark>
- Extract graph with these relations
- Extract 1d structures
- Use to show focus part in context
- Tools
  - ▪ **cut**: view dependent, contact aware
  - ▪ **removal**: unconnected/occluding components
  - ▪ **transparency**: curvature/occlusion
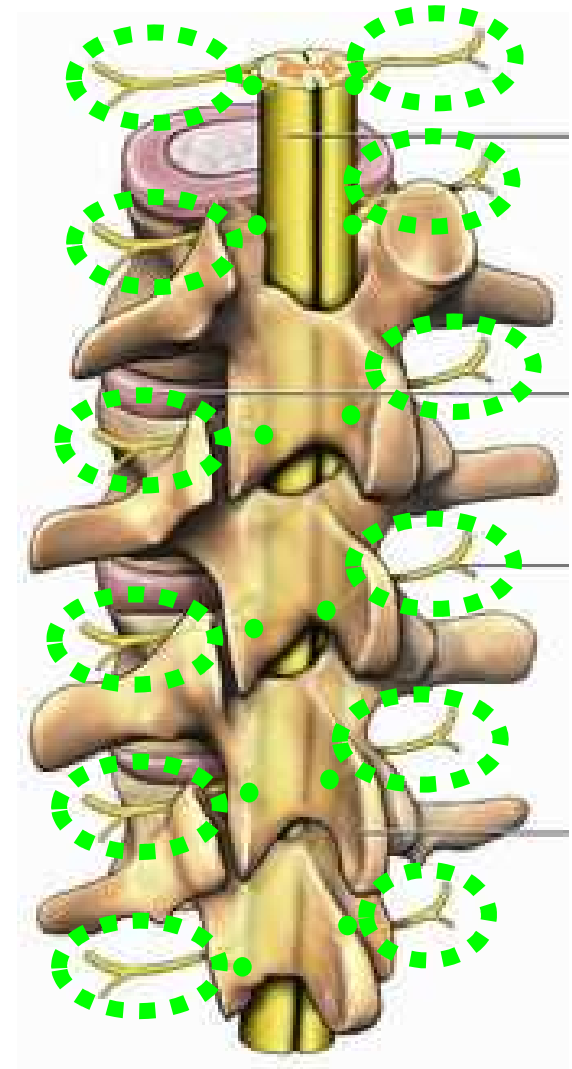
Further ideas

- Interaction of parts (animation):
  - flow in tubes: blood flow (SG asia 2011 paper for 2d)
  - deformations: swallow
- Physical simulation for cutting (respect gravity, material properties)
- Automatic splitting in multiple views if
  - occlusion not solvable
  - …
- Other artistic methods…

Thank you for your attention!
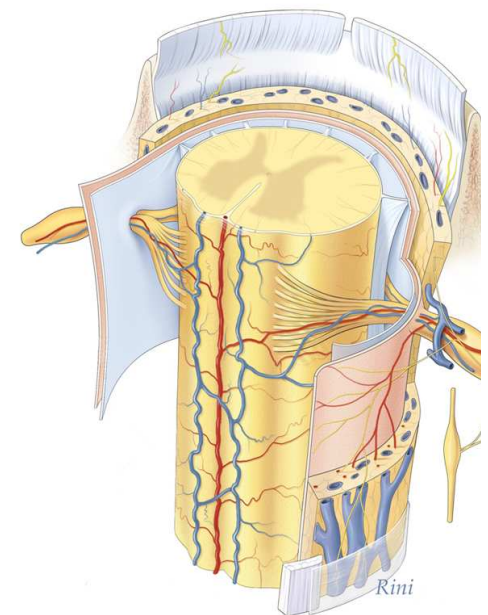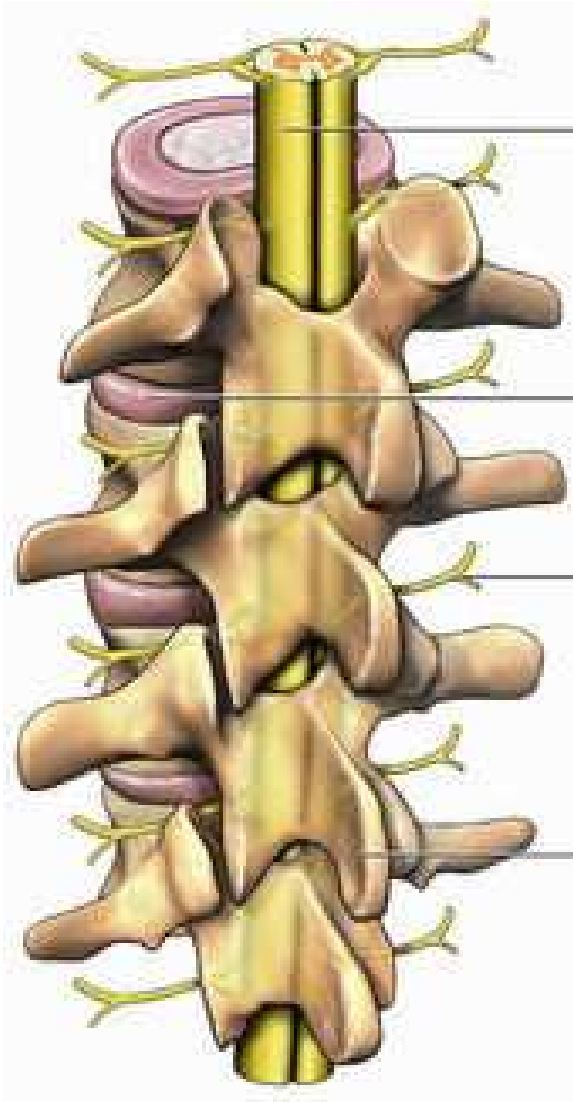
Comments?

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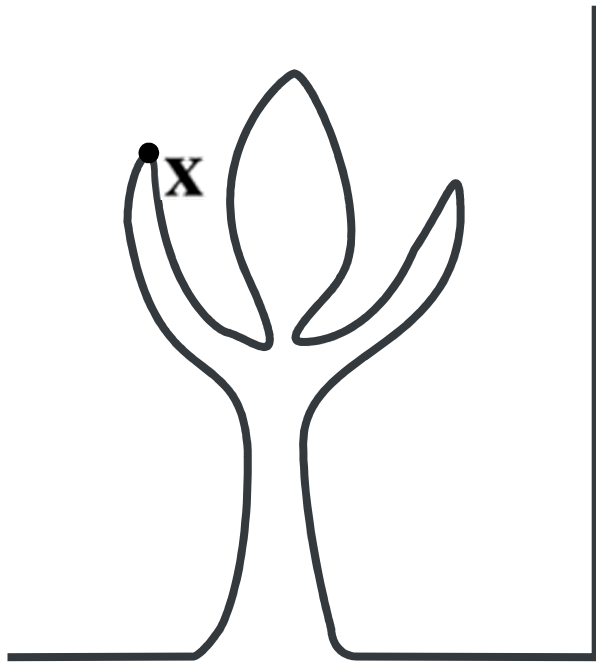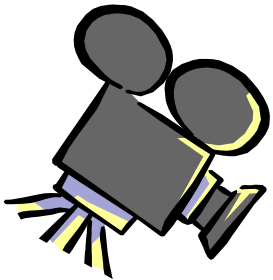
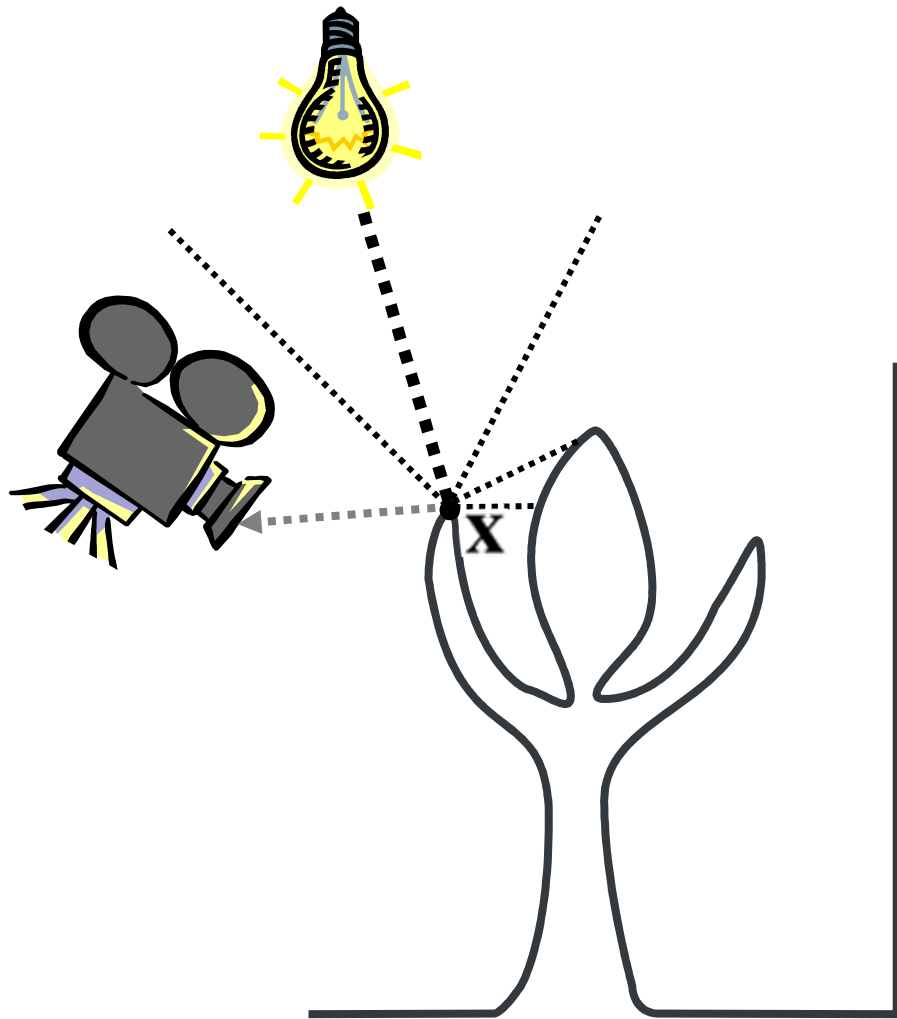**Real-time global illumination**

What Do We Want?
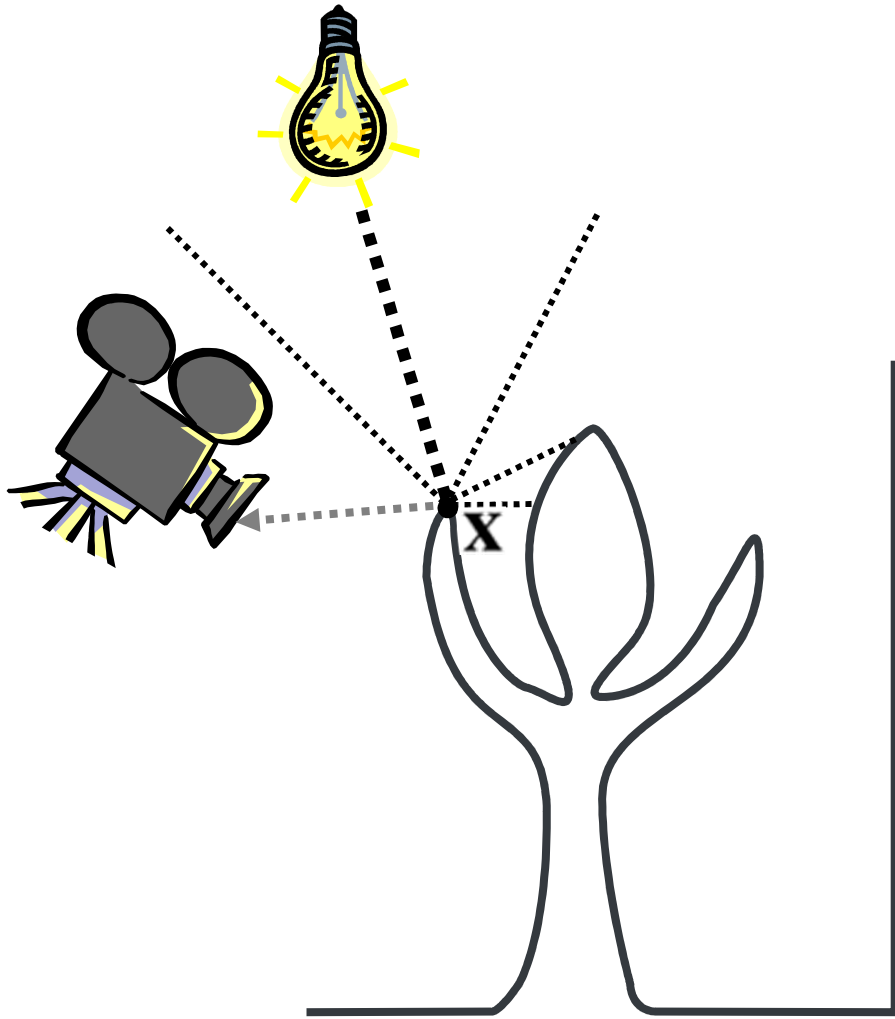
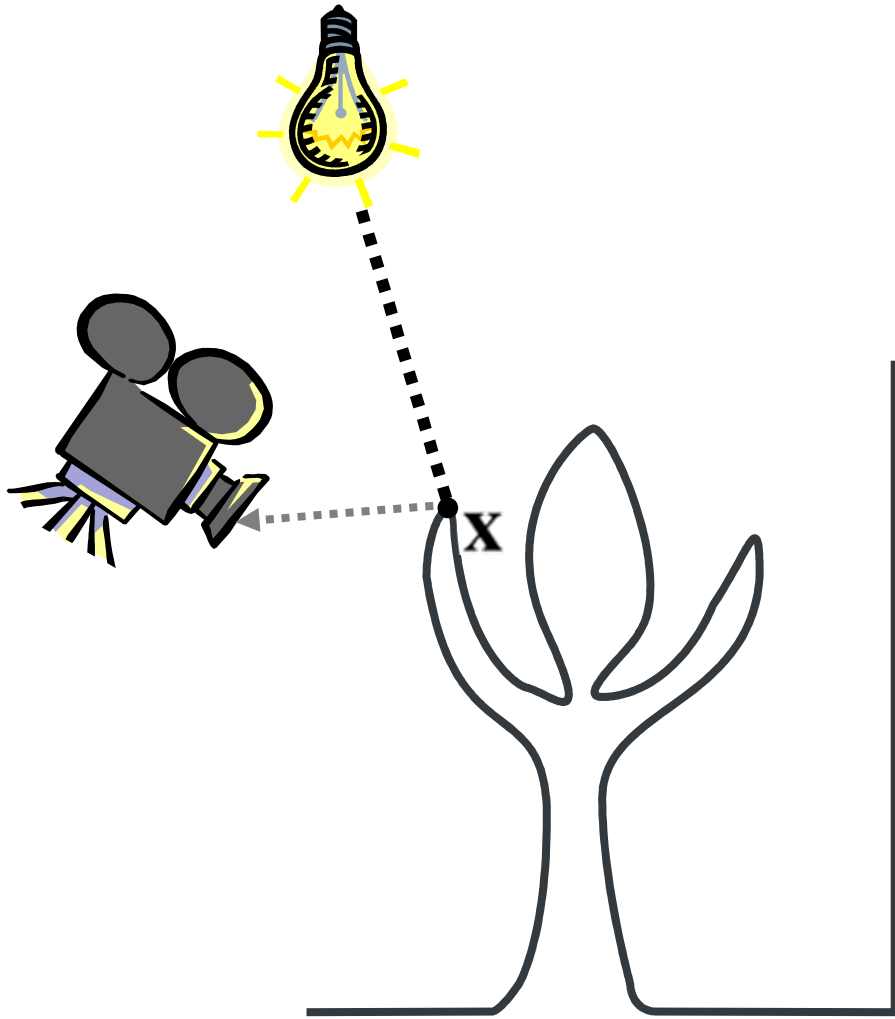# Light Transport

X

Light Transport

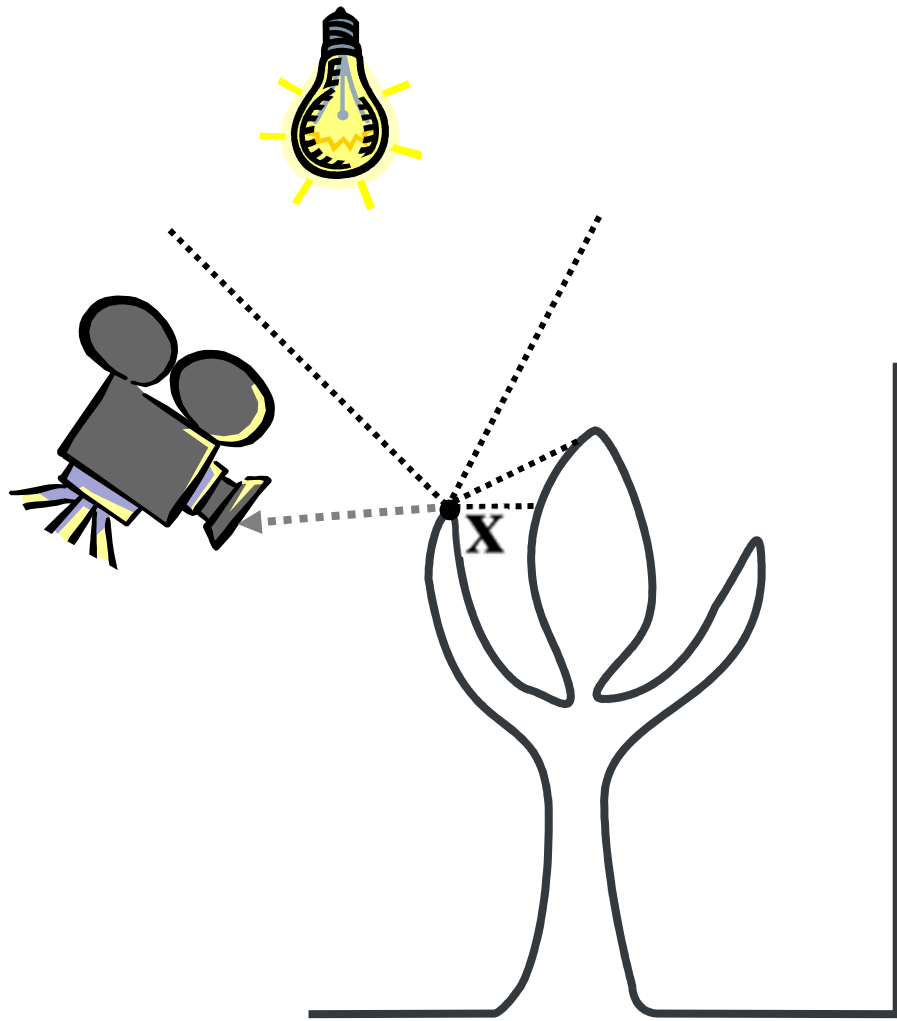- Incident light arrives at **x**
- Calc outgoing radiance
- Arrives at the camera

Light Transport

Light Transport – Direct

Light Transport – Indirect

2013WS Praktika

Diskrete LOD level blending

Level-of-Detail Rendering

- Use different levels of detail at different distances from the viewer
- More triangles closer to the viewer

Discrete LOD Blending: Motivation

Discrete LOD Blending: Motivation