non-final version

Measuring and segmentation in CT data using deformable models

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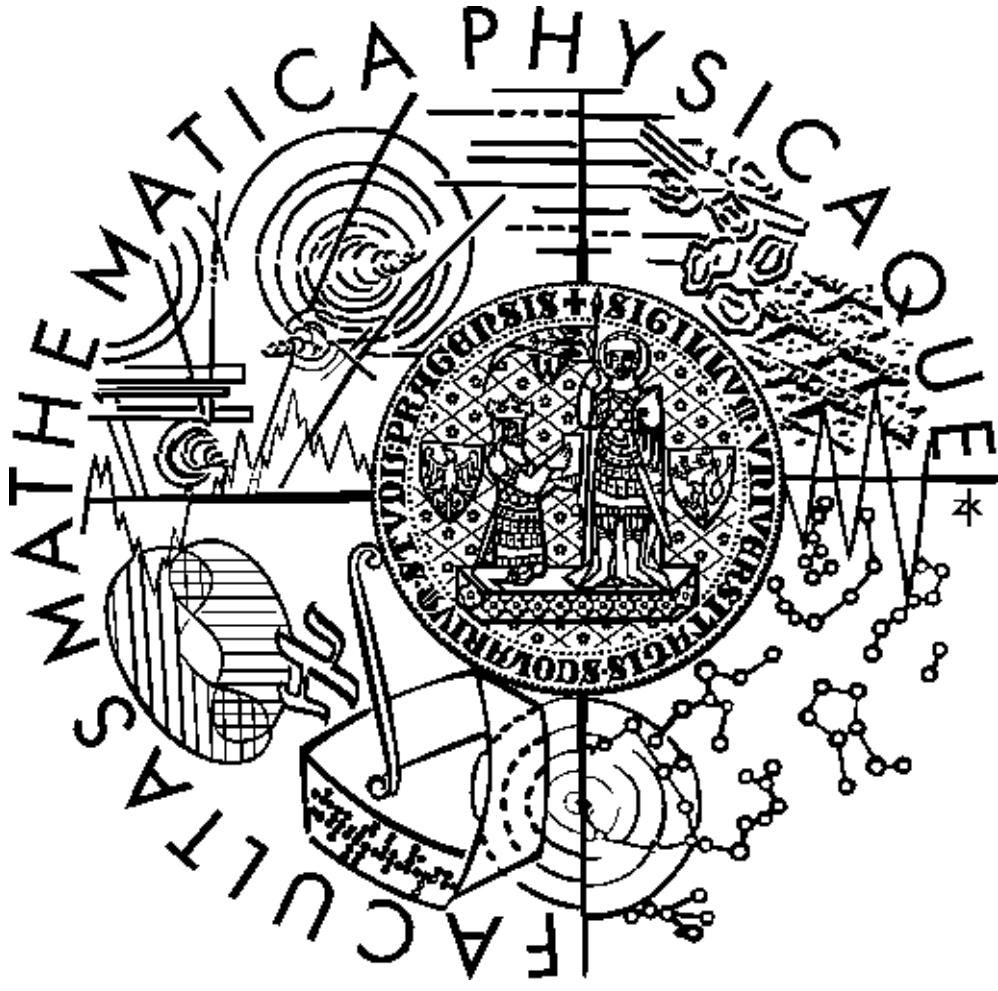
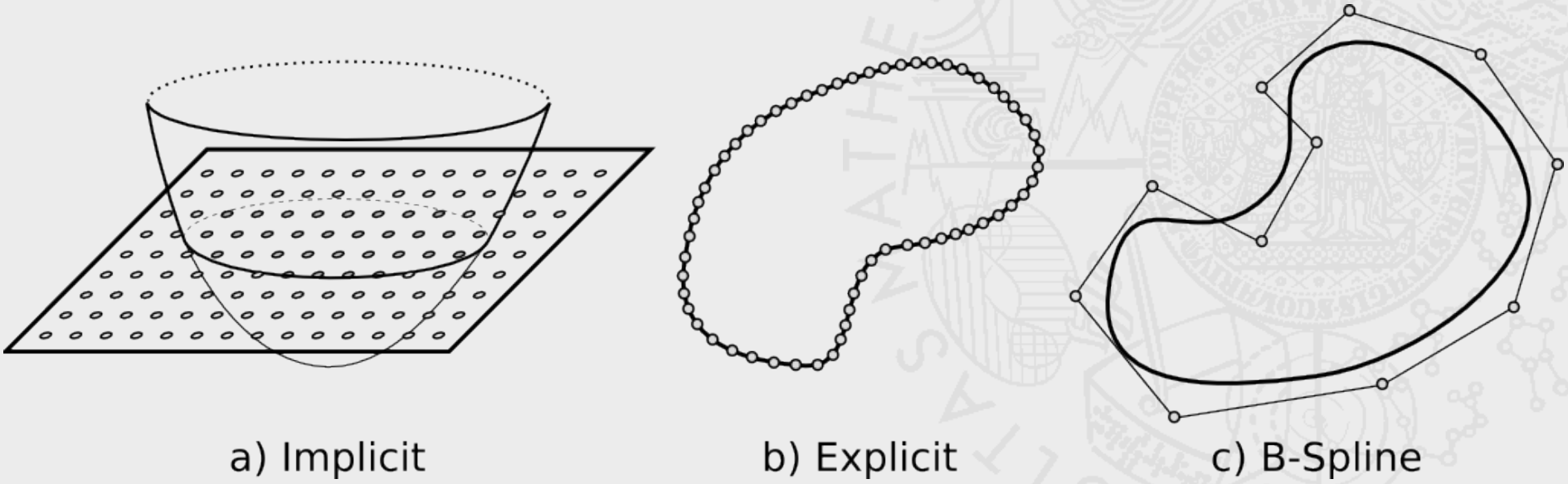


Task

- Volume measuring through object reconstruction
- Based on deformable models
- Build-up fast, robust, extensible framework for segmentation, reconstruction
- Evaluate efficiency
- Reconstruction from successive slice segmentation

B-Spline Snakes

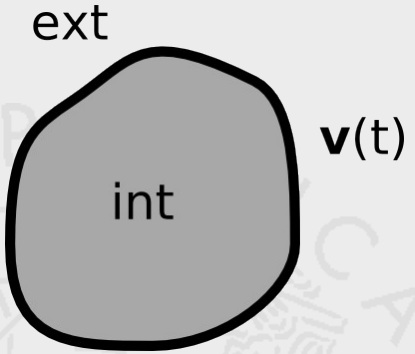
- Relatively fast
  - Least parameters to optimize from all known methods
  - But more work concentrated to each parameter
- Noise aware



a) Implicit b) Explicit c) B-Spline

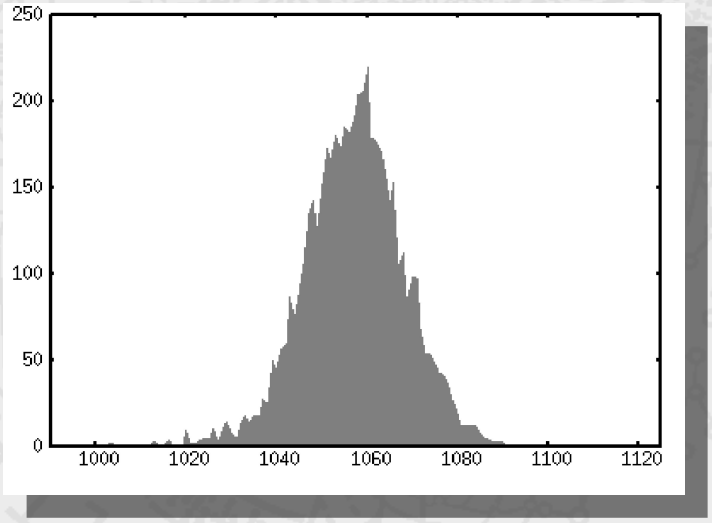
Model

- Region based
  - Edges are unreliable
  - Statistics of region known a priori
- Incorporated similarity to template



$$E_{region} = \int_{\text{int}} \log\left(\frac{P_{\text{int}}}{P_{\text{ext}}}\right) dxdy$$

$$E_{temp} = \int_0^N min\left(\sqrt{(v(t) - temp)^2}\right) dt$$

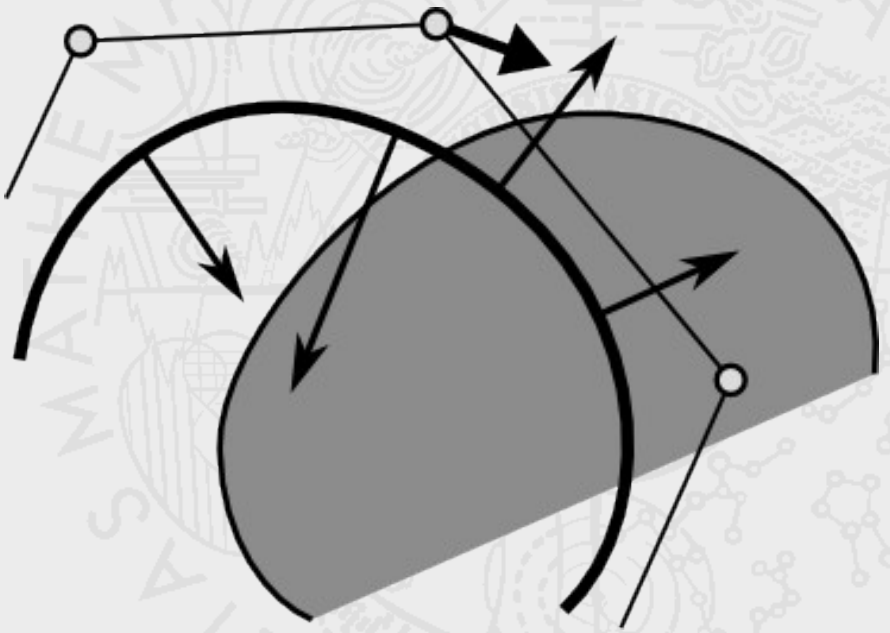


Optimization

- Gradient descent
- Computation of derivatives
- Heuristic equivalent to exact computation
  - In fashion of balloons

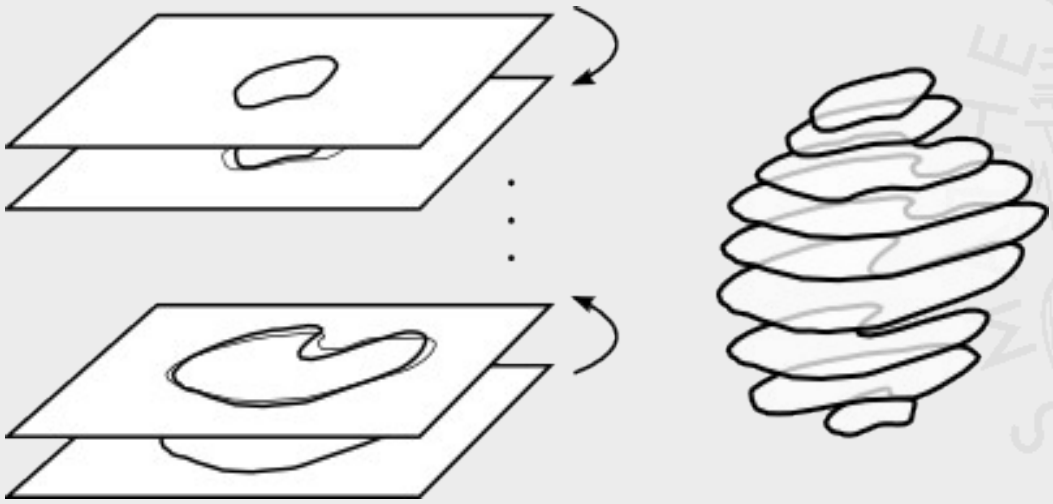
$$\nabla_{c_k} E_{region} = \ldots$$

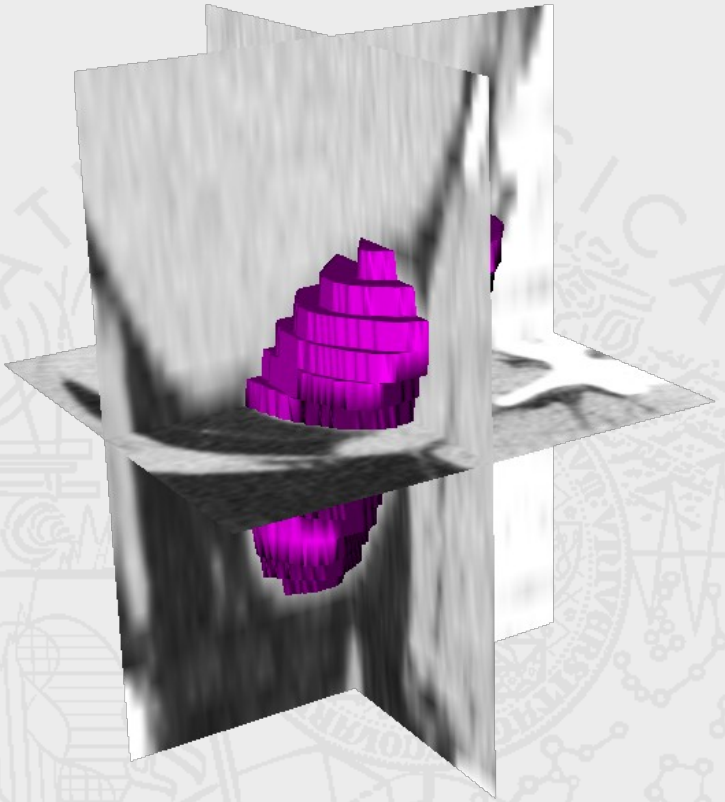
$$= \int_k^{k+deg} F \cdot B(t-k) \cdot \boldsymbol{n}(\boldsymbol{s})\, dt$$



Reconstruction

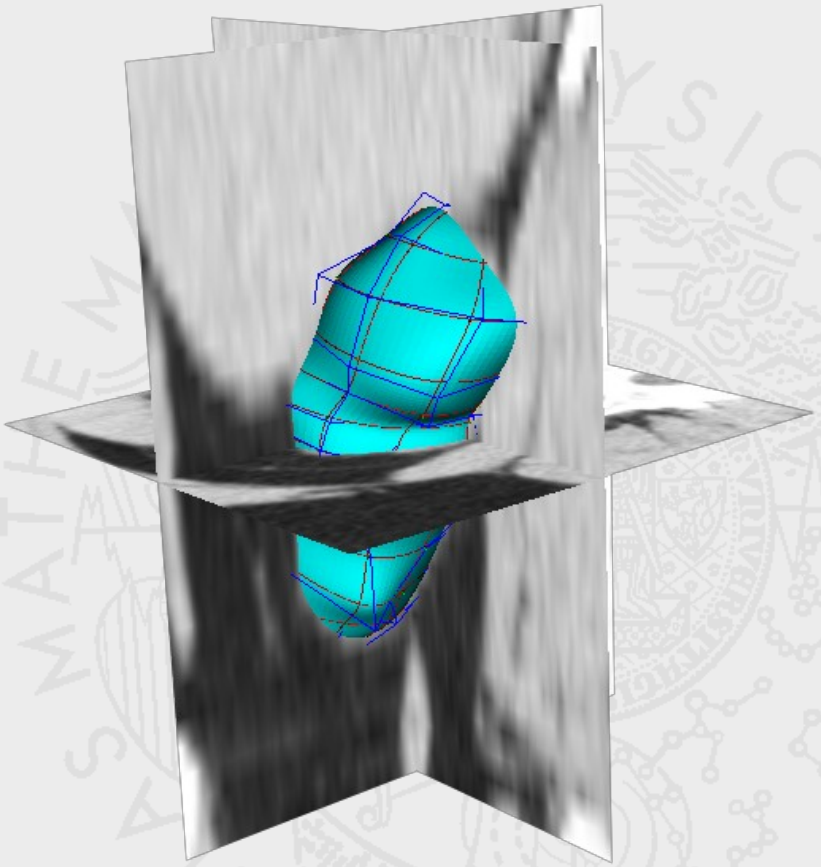
- Slice-to-slice propagation
  - Co-registration
  - Statistics recalculations
  - Nearest distance field





Future work

- Medical studies using our software
- B-Spline planes



References

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- T. Chan and L. Vese, Active contours without edges, 2001
- Mathews Jacob, Thierry Blu and Michael Unser, Efficient energies and algorithms for parametric snakes, 2004

Q & A