



## Surface Detection and Segmentation

Dahl, Vedrana Andersen

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## Surface Detection and Segmentation

Vedrana Andersen Dahl

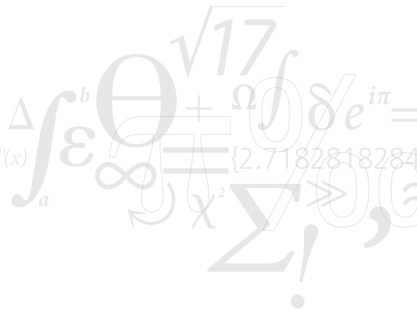
DTU Compute

MEK/Compute seminar, 3 October 2014

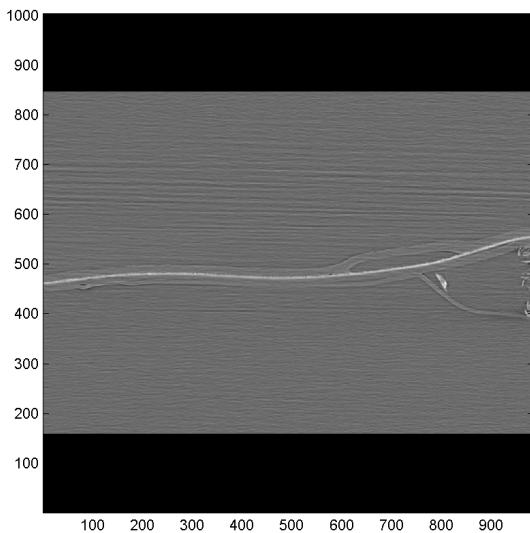
$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$



## Surface detection

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$


## Motivation



## Optimal surface search

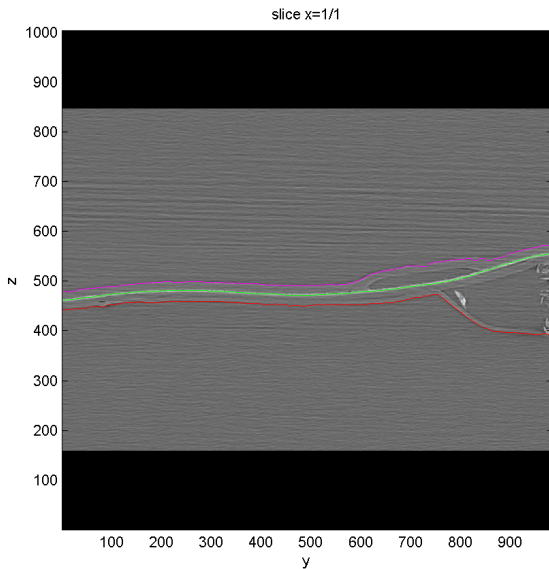
### Problem

- ▶ Surfaces in 3D volume
- ▶ Local smoothness constraint
- ▶ Data support

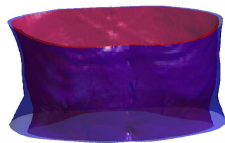
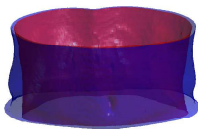
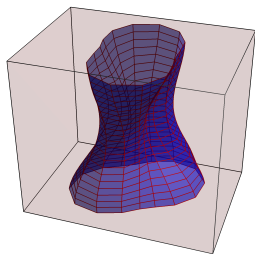
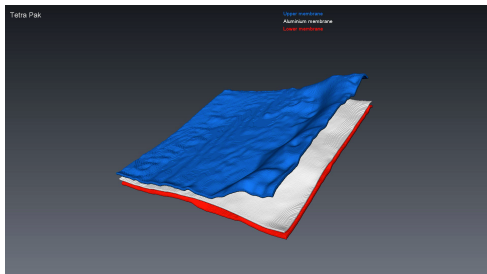
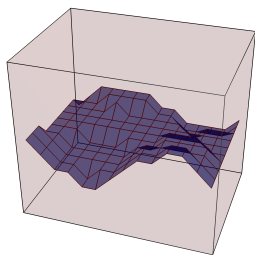
### Solution

- ▶ Graph based
- ▶ Flexible

## Tetrapak

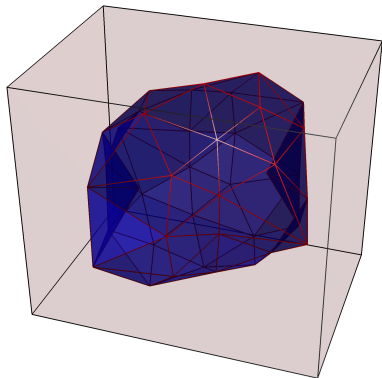


## Terrain-like and tubular surfaces

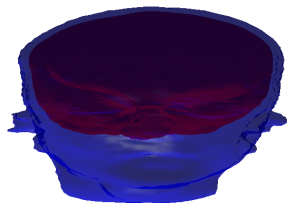


Grid based solution, allows detecting multiple interrelated surfaces

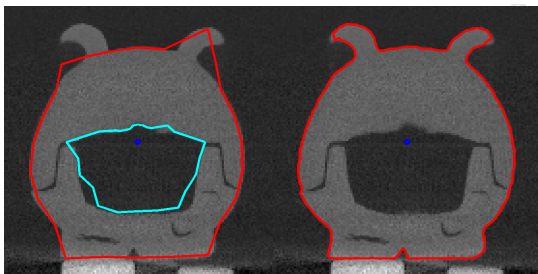
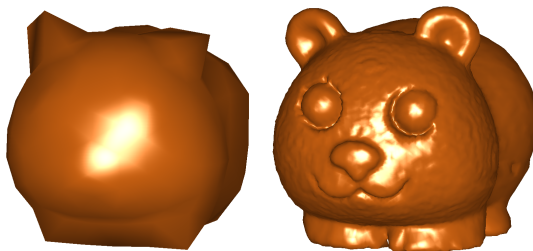
## Round surfaces



Mesh based solution

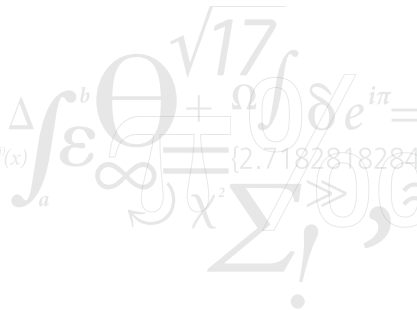


## Round surfaces



Allows detecting multiple interrelated surfaces and iterative refinement

## Image segmentation using the deformable simplicial complex method

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$




## Deformable models and DSC

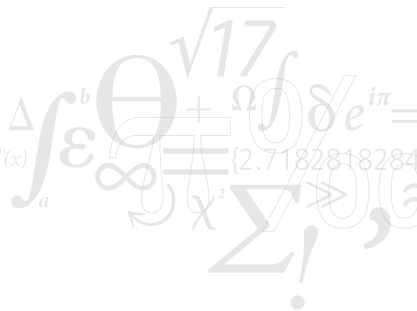
### Deformable models for image segmentation

- ▶ Curves or surfaces that can move under: internal forces (smoothness or other prior info) and external forces (image or volume data).
- ▶ Depending of the representation of the interface: parametric deformable models (explicit interface, Lagrangian framework) or geometric deformable models (implicit interface, Eulerian framework).

### The deformable simplicial complex method

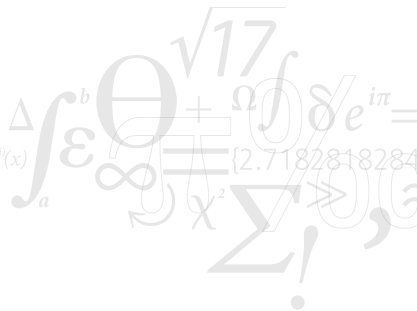
- ▶ generic method for tracking deformable interfaces (curves in 2D, surfaces in 3D)
- ▶ applications in fluid simulation, topology optimization, now also image segmentation

## DSC segmentation

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$


Adaptive topology, multi phase support

## The DSC method in 3D

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$


## DSC segmentation current work

- ▶ 3D
- ▶ Texture segmentation

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$

Thank you!

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$
