active contour models

Jason Lawrence (some slides by Szymon Rusinkiewicz)
CS 651, Spring 2007: Computer Vision
active contours in use

image manipulation
medical image processing
object tracking
spring constraint forces
case study: corpus callosum
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conclusion: males have a larger corpus callosum

[Davatzikos and Prince]
active contour

[Davatzikos and Prince]
active contour with corners

\[ \beta(s) = 0 \]

[Wang et al.]
edge affinity

$|\nabla I(x, y)|$
spring constraint forces
explicit integration

Figure 5: Instabilities. Above: Time step too large; left: initial curve, right: result after one iteration. Below: Time step too small; left: initial curve, right: result; in the left part of the curve the regularization forces were dominant.
FIG. 7. Box. (a) Original contour, (b) Kass method, (c) Dynamic programming algorithm, (d) Greedy algorithm.
Init (1.5 s)  
Kass (1.5 s)  
DP (30s)  
Greedy (1.2s)
local minima
balloons

neighborhood
too small

stuck at
local minima

with inflationary
force

[Cohen 91]
balloons

Figure 10: NMR image. Evolution of the balloon curve to detect the left ventricle.
color affinity

Add energy term for constant-color regions of a single color

[Davatzikos and Prince]
brain cortex segmentation

cellular snake results

[Davatzikos and Prince]
brain cortex segmentation

find features; add as constraints

[Davatzikos and Prince]
brain cortex segmentation

[Davatzikos and Prince]
multi-scale processing
gradient vector fields
gradient vector fields

[Xu and Prince]
gradient vector fields

[Xu and Prince]
gradient vector fields
3D active surfaces
issues with boundary reps