

Learning complex visual concepts

early motion abilities

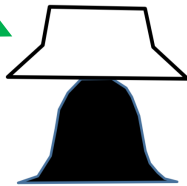
- detection
- segmentation
- tracking



hands



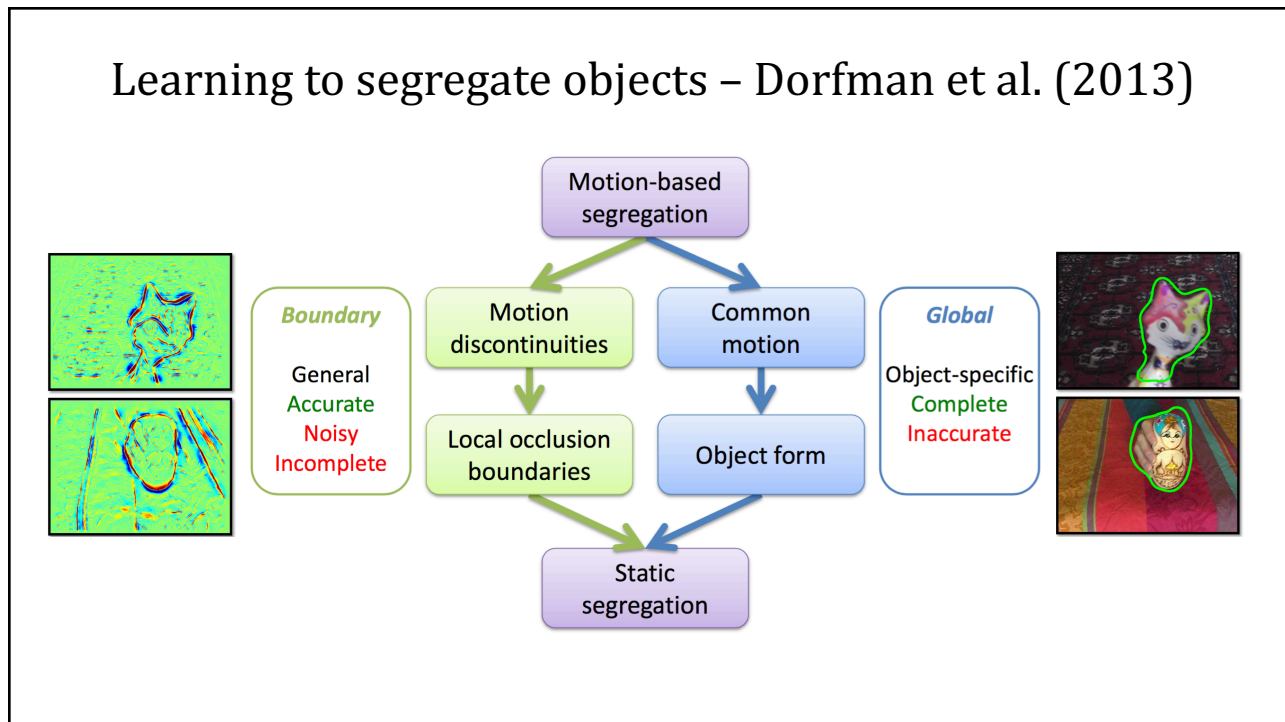
gaze direction



object segregation

learn to perceive coherent objects

Dorfman, Harari, Ullman

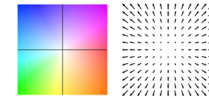


Computing the 2D motion field

used an “off-the-shelf”
motion algorithm
(Sun et al., 2010)



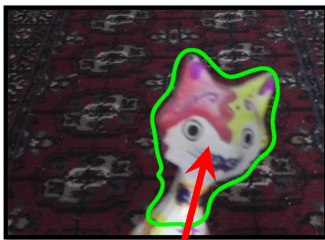
divide image into
stationary background
+ moving regions



select a moving region for
further processing...



From moving regions to static object segregation

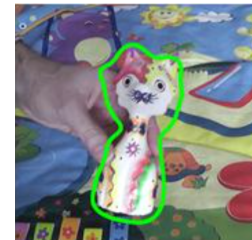


selected moving region



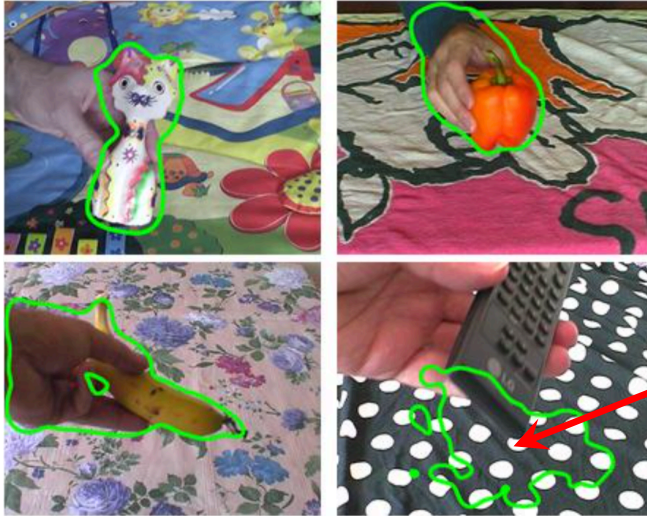
cover image region with
SIFT image descriptors
(Lowe, 2004)

- capture distribution of image gradients at multiple scales
- computed at “keypoints”
- store location of each SIFT descriptor relative to center of moving region



search for similar
distribution of SIFT
descriptors in new
static image

Testing object segregation in static images



learn object models from each movie (5 sec, 40 sec segments)

test on static images with variety of backgrounds, pose, lighting

overall good performance...

... but some errors

boundaries not delineated well

Learning boundary features

use motion discontinuities to learn static cues for occluding boundaries

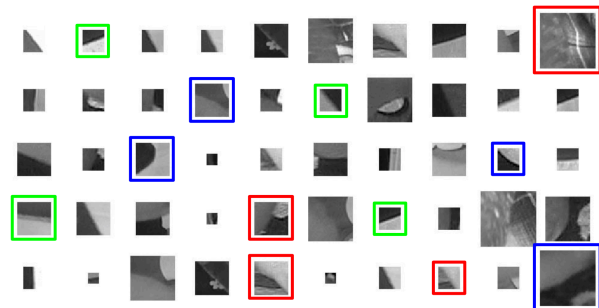
in each frame of the training movies:

- detect motion discontinuities
- extract image patches along boundaries (5 sizes)
- represent each patch with a SIFT descriptor
- label figure (moving) & ground (stationary) sides of boundary

in new static images:

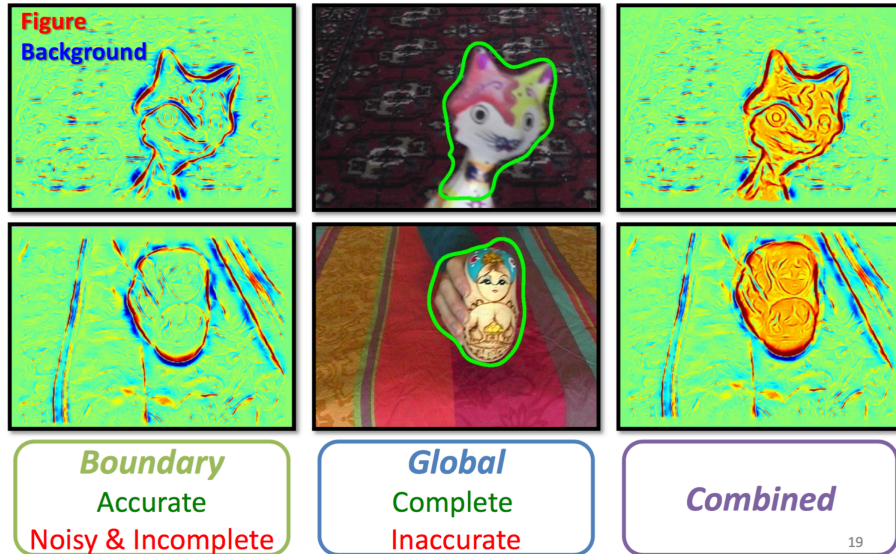
- look for image locations with similar SIFT descriptors for same 5 sizes of image patch centered on this location

Informative boundary features



T-junctions convexity extremal edges

Combining information sources



Summary

- object segregation is a complex task, learned gradually from infancy
- static object segregation can be learned from motion
- two mechanisms work in synergy:
 - from motion discontinuities, learn cues to occlusion boundaries
 - from regions of common motion, learn object forms



enough to get started...

... but object segregation by adults is much more complex!