iCoseg: Interactive Cosegmentation with Intelligent Scribble Guidance

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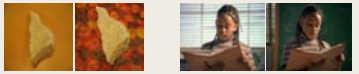
Unsupervised Cosegmentation

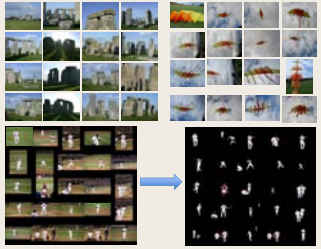
Prior unsupervised cosegmentation works



- Pairs of images to perform cosegmentation
- Foreground same, backgrounds unrelated

In this work: *Groups* of images where foreground and background are *both* very similar

Interactive Cosegmentation



Topically related images:
Interactive Co-segmentation

Energy functions per image

$$E^{(k)}(\mathcal{X}^{(k)}:\mathcal{A}) = \sum_{i\in\mathcal{V}^{(k)}} E_i(X_i^{(k)}:A_1) + \lambda \sum_{(i,j)\in\mathcal{E}^{(k)}} E_{ij}\left(X_i^{(k)}, X_j^{(k)}:A_2\right)$$

Unary Appearance Model (GMMs)

Pairwise Appearance Model (Distance Metric Learning)

Basic setup:

- Scribble image(s)
- Learn Group Appearance Models
- Set up energy minimization problem
- Minimize independent energies via Graph-cut

CMU-Cornell iCoseg Dataset

Largest co-segmentation dataset in literature

Publicly available!

CMU-Cornell iCoseg:

38 groups
643 images
~17 im/gp

Previous Works

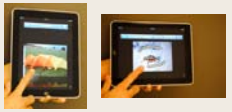
~20 groups
~40 images
2 im/gp

Our System

HP TouchSmart

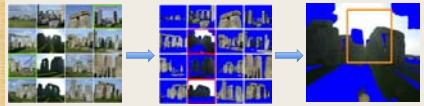
Interface (iScribble) publicly available!

iPad



iCoseg

Cannot analyze each cut-out to provide more scribbles

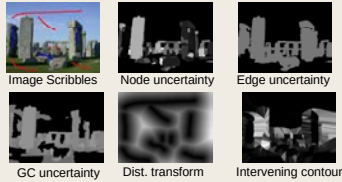


Recommendation map

iCoseg: Guiding user scribbles

Cues used to guide the user scribbles

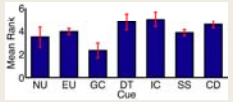
Image cues:
- Segment Size
- Codeword Distribution



Logistic Regression

Recommendation Map

Machine Experiments



Performance of cues

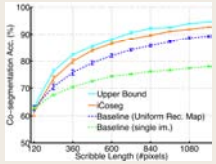
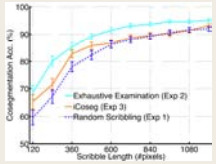


Image | Recommendation Map | Automatic scribble generation

User Study



Random scribbling (Exp. 1)

Exhaustive examination (Exp. 2)

iCoseg (Exp. 3)

Carnegie Mellon

http://chenlab.ece.cornell.edu/projects/touch-coseg/

Advanced Multimedia Processing Lab

Cornell University