Objective of This Paper

- As a first technical step, jointly perform two tasks...
  - Cosegmentation
  - Alignment of photo streams

Evaluation of Alignment

- Task: Foreground detection

Evaluation of Cosegmentation

- Examples

Background

- Information overload problem in visual data
  - Ex) Query scuba+diving from Flickr

Image Descriptor and Similarity Measure

- Image descriptor: HSV color SIFT / HOG features + spatial pyramid histogram
- Image similarity measure: Segmentation enhances the image alignment.

Alignment of Photo Streams

- Input: A set of photo streams (PS): \( P = \{P_1, ... , P_N\} \)
- Pairwise alignment
  - Find a matching btw a pair of PS: \( f: P_i \rightarrow P_j \)
  - Optimization: MRF-based energy minimization
  - Data term: The matched image pairs should be visually similar.
  - Time term: The matched pairs should be temporally similar.
  - Smoothness term: The matched images to neighbors in \( P \) should be neighbors in \( P \).

Cosegmentation

Build an image graph \( G = (I, E) \)
- \( E_{ij} \): Edges between two images
- \( E_{ii} \): Edges within a single image

Iteratively perform base cosegmentation (MFC) [Kim and Xing, 2012], guided by the image graph
- Learn FG models from neighbors of \( I \)
- Run region assignment on \( I \)
- Iteratively solve...

Summary of Algorithm

- Build K-NN graph btw photo streams (PS)
- Align all photo streams at once joined by the PS graph
- Build K-NN graph between images
- Cosegment all images at once guided by the image graph

Computation time: \( O(T(E)) \)

Conclusion

- Ultimate goal: building photo storylines from large-scale online images
- As a first technical step, jointly perform alignment and cosegmentation
- Message-passing style optimization as unified framework for both tasks