Automatic video annotation via hierarchical topic trajectory model considering cross-modal correlations

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ABSTRACT

• We propose a generative model named Hierarchical Topic Trajectory Model (HTTM) for automatic video annotation and video retrieval.
• HTTM is a unified model for automatic video annotation and video retrieval.
  ö Incorporates low-level features together with keyframe-wise topic models that can encode an arbitrary number of cross-modal correlations
  ö Deals with temporal topic transitions by hidden Markov models (HMM)
• Some behaviors have been analyzed through TRECVID Semantic Indexing task.

METHOD

(1) Motivation
• Modeling relationships between images and texts:
  • Objects: Co-occurrences are useful.
  • Events: Co-occurrences are almost necessary, sometimes they might be the only cue.
• Incorporating temporal information into the model:
  • A hierarchical temporal structure would be necessary.
  • Standard approaches: Discriminative (ex. SVM)
  • Difficult to incorporate "co-occurrences"
• Our approach: Generative (topic models)

(2) Hierarchical topic trajectory model (HTTM)
- Latent variables
  - HMM is used (Observations = latent variables).
  - Each hidden state might corresponds to a concept or a story expressed by a sequence of topics.
- HMM is feasible for simple expression of topic transition
- Topic variation can be easily introduced by using Gaussian mixtures (GMM).

EXPERIMENTS

(2) Conditions
[Dataset] 127 video clips, 56191 shots from TRECVID2005
[Image features] VIREO-374 (SIFT keypoints & descriptors + BoW (Bag of Visual Words))
[Labels] 47 concepts selected from LSCOM and LSCOM-lite
[Evaluation] Mean average precision (meanAP, commonly used measure in TRECVID)

(2) Results

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