IMPROVING SEMANTIC CONCEPT DETECTION AND RETRIEVAL USING CONTEXTUAL ESTIMATES

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Problem Overview

Motivation

The main trend for retrieval of semantic concepts is first training a model (e.g. SVM) for each concept using annotated training images or videos and then using these models for detecting concepts in testing images and videos. However such models generally are built independent of each other, lacking the relationship among semantic concepts.

Goal

Improving detection scores of semantic concepts in videos and images using the semantic relations between each other.

Approach

Feature Extraction (Color Moments)

Contextual Fusion using Probabilistic Estimates (CFPE)

Concept Relations

- Directed models represent relationships better than undirected co-occurrence models.
- When car concept exists, we are very likely to see an outdoor concept.
- When outdoor concept exists, we are less likely to see a car concept.

CFPE Algorithm

Select a target concept $C_i$ for each image

Compute Individual SVM Detector Scores

Incorporate Priors

Incorporate Evidence from All SVM Detectors

Combine Estimates

Results

Test Data

- TRECVID 2005
- LSCOM-Lite annotation of 39 concepts.
- 74523 video shots
  - 50% training
  - 25% validation
  - 25% testing

Performance

- +3.9% improvements in 29 out of 39
- -1.6 degradation in 10 out of 39
- +2.5% increase over all concepts
- Over +5% increase in Maps, Urban Scenes, Waterscape

Average Precision Plots of All 39 Concepts for Baseline and Our Two Experimental Approaches

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