Semantic Perception for Robots

Yogesh Girdhar, McGill University
yogesh@cim.mcgill.ca

INPUT: Observations

Feature Extraction

Quantized Observations

Topic Modeling

OUTPUT: Context

Intuition: Observations which co-occur often, probably have the same underlying cause (context).
Topic Modeling

- Dirichlet($\alpha$)
  - observations

- Dirichlet($\beta$)
  - words
  - freq.

Each topic is a distribution of low level observation words.

- Each time step is a distribution of topic.

Dirichlet priors ensure sparseness.
• Automatically evolve models for different context labels from streaming sensor data -- **NO TRAINING**.

• Many feature extractors already implemented:
  • ORB words, SIFT words, HSV words, MFCC words (audio)

• Applications:
  • Loop Closing and environment recognition (ICRA2013, using just audio)
  • Summarization (IJRR2013, using vision)
  • Surprise Detection (IJRR2013, using vision)
  • Exploration

• Realtime ROS based implementation!

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