Probability Models for Visual Search

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Overview of talk

- Introduction to Human Visual system (HVS)
- Motivation for fixation point selection models
- Previous work
- Visual search
- Conclusions

Introduction

- HVS non uniform sampling grid
- Data acquisition by fixation and saccade
  - Information gained during fixation and eyes move to new point during saccades
  - 10% of the time is spent in saccade
- Foveation - Concept of multi resolution retinal image

Sampling in the retina
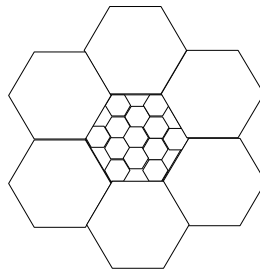
Fixation and Saccades

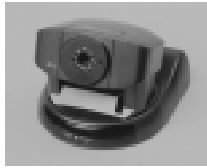# Foveated Image Example

Uniform resolution image

Foveated image

Motivation

- Where is the foveation point ?
- Solution-
  - Eye trackers
- Models for fixation

Previous work 1

- Algorithmic region of interest (ROI) [Privitera and Stark, 1999]
  - Find human ROI by eye tracking
  - Design algorithmic ROI by applying many image processing algorithms
- Establishes some low lever "attractors"
- "Global fixation"

Previous work 2

- Probability models [Klarquist and Bovik, 1998]
  - Uses multiple " low level features" simultaneously to determine fixations point
  - Fixation point is dependent on current fixation point
- No comparisons given to hROIs

Previous work 3

- Saliency method [Henderson et al, 1999]
  - Low level to cognition model
  - Develops initial fixation map based on low level features
  - Model "understands" image and searches
  - Fixation point + duration of fixation
- Cognition is task specific and hence no generic model

Visual search

- Task is to search for a target in the image
- Try to understand why people fixate at certain regions in search process
- Analyze regions around fixations and target
  - Edge co-occurance
  - Cross correlation

Conclusions

- Determination of fixation points is significant for applications involving foveation
- Goal is to develop a dynamic probabilistic model for visual search
- Future work will be to extend search to "visual surveillance"