IMRESTAURANT(): MATLAB FOR FEATURE-BASED RESTAURANT LOGO RECOGNITION

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LOGO MATCHING ALGORITHM

**Input Photograph Image**

1. **Preprocessing**
   - RGB to Gray
   - Blurring
   - Nonlinear Noise Reduction & Sharpening

2. **Training**
   - LOGO DATABASE
     - 100+ Images

   - For each logo in database:
     - SIFT
     - Push Descriptors to Tree
     - Generate Scoring Histogram

3. **Query Image**
   - SIFT
   - Push Descriptors to Tree
   - Generate Scoring Histogram

4. **Ratio Test**
   - For each keypoint in camera image:
     - Calculate Euclidean distance to all features in database image
     - Calculate ratio of two minimum distances
     - If ratio < threshold, store correspondence between features

5. **RANSAC**
   - Random Sample Consensus method for determining a mathematical model

6. **HIERARCHICAL K-MEANS**
   - Create hierarchical tree for efficient logo database search
   - Use K-means clustering on feature descriptors to group keypoints from all database images more generally

   Once tree is generated, push each feature descriptor of the camera image through the tree
   Each leaf corresponds to score weights toward voting for database image matches.
   TF-IDF Weight for Scoring: \[ W_i = \log \frac{N}{N_i} \]
   Perform feature-based matching between camera image and top ten images with highest scores.

**RESULTS**

- **Round Table**
  - The Last Honest Pizza

- **SUBWAY**

- **Höagen-Dazs**

**FEATURE-BASED MATCHING TECHNIQUES**

**RATIO TEST**

- For each keypoint in camera image:
  - Calculate Euclidean distance to all features in database image
  - Calculate ratio of two minimum distances
  - If ratio < threshold, store correspondence between features

**RANSAC**

- **Selection of 3 Correspondences**
  - For each logo in database:
    - SIFT
    - Push Descriptors to Tree
    - Generate Scoring Histogram

- Compute Consensus Set
  - Least Mean Squares
  - Calculate Error/Consensus Set Size

- Database Image Frames
  - Query Image Frames
  - Better Affine Model

- **Plot Matches**

**HIERARCHICAL K-MEANS**

- Create hierarchical tree for efficient logo database search
- Use K-means clustering on feature descriptors to group keypoints from all database images more generally

**SIFT**

- Scale-Invariant Feature Transform