Indoor Positioning and Navigation with a Camera Phone

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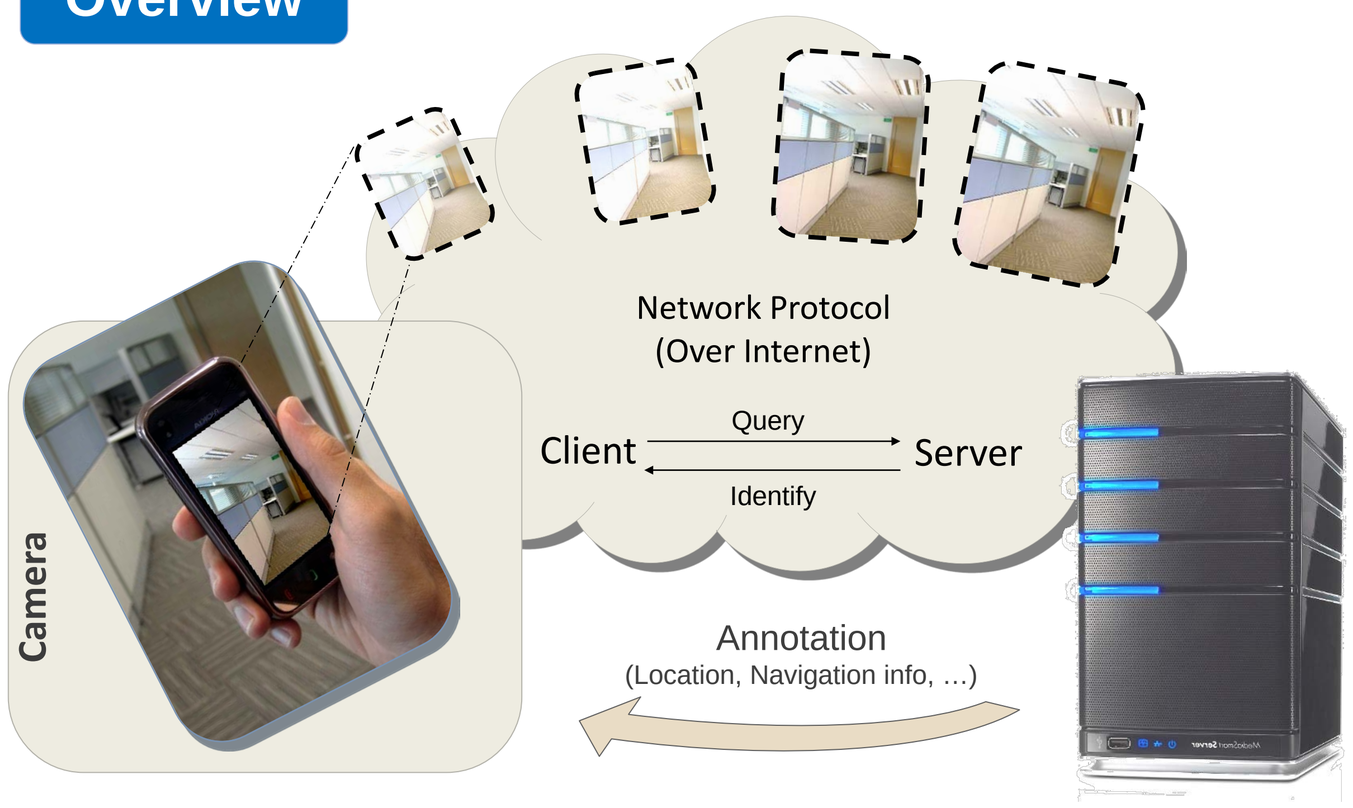
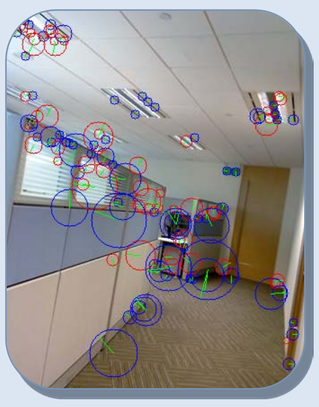
Motivation

Overview



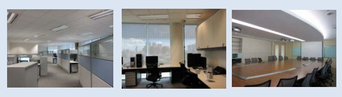
Positioning

Feature Extraction

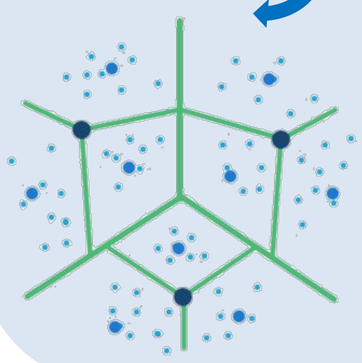


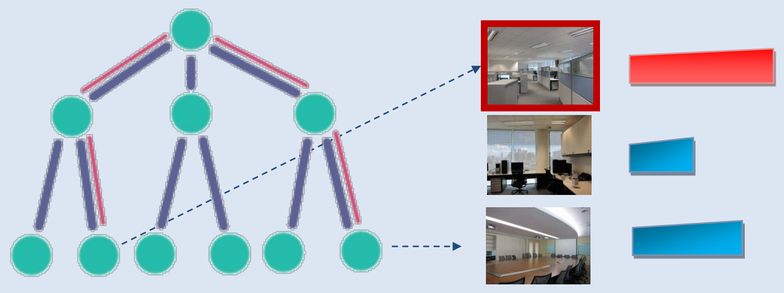
- **SURF**
  - Finding Key points
  - Scale, Rotation, Illumination, and Affine Invariant.
- Image Resolution is 320*420 .
- Average number of key points is 120.

Image Matching



K-Means algorithm



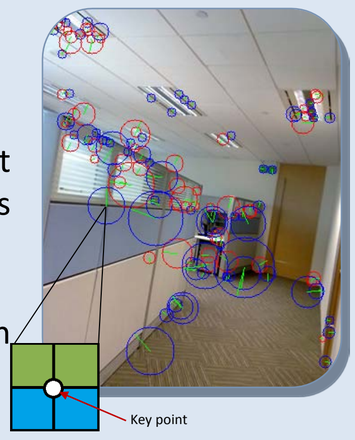


- Decomposing and organizing the feature space with a vocabulary tree
- Feature-based indexing and voting
- Deciding the top-ranked 10 candidate images

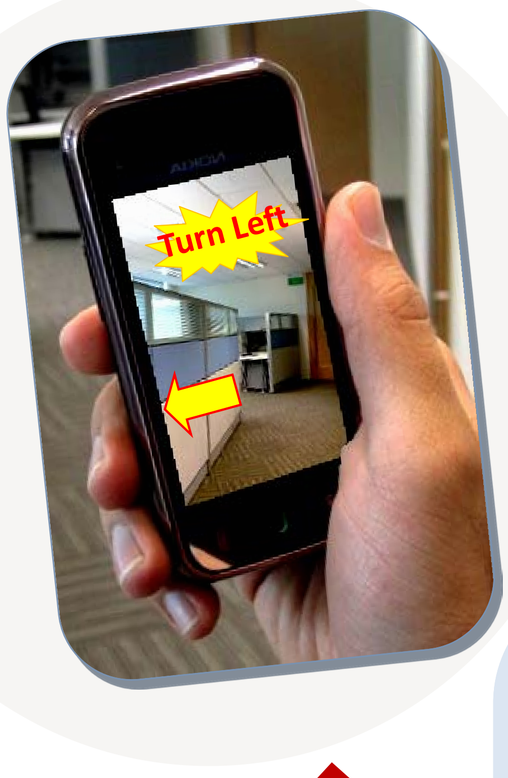
Re-rank the Top-Ranked Images

Color Consistency Check

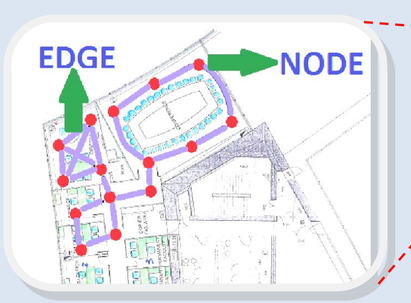
- Quantize hue values of pixels.
- For each key point compute most repeated hue value in the 4 regions around it.
- Noticeable improvement in recognition accuracy.



Navigation



Modeling Environment using Graph



Floor Map

Next Move

Shortest Path (BFS)

- Current place
- Current direction
- User-specified destination

Geometric Verification

Geometry Test:

- Vertical consistency in each partition.
- Horizontal consistency among partitions.

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