**Motivation**

Narrow field of view hinders context information:
1. Little interplay among objects; small # of objects per image
2. Occlusion is unpredictable: missing bed in bedroom

**Data driven context model**
1. Should be built in 3D space
2. Should be learnt from big data

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**Method**

**1. Vanishing Point Estimation:**
- Hough Transform: vote line segments to uniformly sample directions on sphere; and select the three orthogonal directions with maximal sum of votes as the vanishing director.

**2. Room Layout Estimation:**
- 4-line sampling: randomly sample 4 line segments to form a room layout hypothesis.
- Use surface normal consistency with GC and OM to score these hypotheses and choose the top 5. This guarantees recall.

**3. Object Hypothesis Generation:**
- Randomly sample 5 line segments to form a room layout hypothesis.
- Use surface normal consistency with GC and OM to rank these hypotheses.
- Project webpage: http://panocontext.cs.princeton.edu

**4. Data-driven sampling & Holistic ranking:**
- Whole-room sampling to generate complete scene hypothesis:
  - 1. Randomly select a room layout according to their score evaluated by GC and OM.
  - 2. Decide the number of instances for each type of objects.
  - 3. Decide the sampling order for different object types according to statistic prior.
  - 4. Start from the 1st object; search for cuboids of the selected object type, and randomly choose a cuboid according to the unary constraints (rectangle scores, unary size distribution, random forest score).
  - 5. Go to the next object; randomly select cuboids further considering the pairwise constraint with already selected objects. Repeat until all the types are sampled.

**Evaluation**

- Room Layout & Object Recall
  - X: Image Score, Y: Semantic Score
  - Object Detection Compare with DPM
  - Pixelwise Accuracy of Room Layout Estimation

**More Results**

- Input Image & Reprojected 2D Result
- Merged OM+GC & Object Hypotheses
- 3D Result

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**References**

1. PanoContext: Accepted by ECCV 2014. Code and dataset will be available soon.
2. Project webpage: http://panocontext.cs.princeton.edu