Motivation:
- Provide automatic lookup to retrieve similar past architectural projects to aid architects.
- Help property buyers to select floor plans with more specificity in terms of both room décor and layout.

Contribution:
- Room segmentation and adjacent room detection algorithm to represent layouts as an undirected graph.
- Graph spectral embedding feature to uniquely represent floor plans.
- Two stage matching technique comprising both room layout matching and room décor matching.

Framework:
- Stage 1: Segmentation
  - Closing gaps at door locations.
  - Floor plan boundary extraction.
  - Dilation + erosion with unit radius structuring element.

- Stage 2: Room Adjacency Detection
  - Thresholding adjacency in rooms.
  - Creating adjacency matrix and region adjacency graph.

- Stage 3: Feature representation and matching
  - Room segmentation and adjacent room detection algorithm.
  - Room décor matching for efficient matching.
  - Leading ‘n’ eigen values as feature vector ($F_k$).
  - 3-component vector through spectral embedding.
  - Similarity metric between query and database image feature vectors.

- Stage 4: Room Décor Matching
  - Detects adjacent rooms: $x^2 = 1 / (1 + ||x||^2)$.
  - Matches unique furniture ids in the layout $x$.
  - Count of furnishings in the layout $x$.

Related Work:
- Symbol spotting in graphical documents: Dutta et al. 2011, 2013
- Sketch based retrieval of architectural floor plans: Weber et al. 2013
- Room detection in architectural floor plans: Ahmed et al. 2012

Conclusions and Future Scope:
- An inclusive framework considering structural and semantic similarity.
- A novel room décor matching algorithm for specificity while retrieval.
- Spectral embedding approach to represent layout graphs.
- Sketch based mode of query retrieval forms a future scope.

Retrieval of Architectural Floor plans based on Layout Semantics
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