Make it home: automatic optimization of furniture arrangement

The objective is to optimize a furniture arrangement automatically. The result can be used in the game and movie industry where the furniture arrangement in a large number of rooms is required. The previous work in this problem, procedural arrangement, encounter problems such as non-scalable, per object specification needed and no ergonomics, hence, unlivable. This research's approach take input as room + furniture and provide proper furnished rooms as outcome.

Components

- Learning Component

  Use example base by take in good example. Furnitures in example represent by accessible space, viewing frustum and other attribute. Then relationships between each furniture extracted from example.

  Relationship

  - With wall (spatial)
  - With parent e.g. lamp on table
  - With pair e.g. sofa opposite to couch.

- Optimization Component

  Use iterative stochastic optimization method find the best arrangement which minimize cost.

  The cost is weighted total some of:

  - Cost calculated with overall configuration e.g. Accessibility cost, Visibility cost, Pathway cost.
  - Cost calculated from extracted relationship e.g. Prior Distance Cost, Prior Orientation Cost, Prior Pairwise Distance Cost.

  The optimization use annealing approach which start by randomly generate aggressive (kinda bad arrangement) which make the arrangement more flexible. Each iteration a "move" is propose and either be accepted or rejected with probability.

  The model provide multiple arrangement from one input and look good for me. In addition, the result can be alter by change cost term.