Synthesis of Tile Pattern

Yaoyi Li
Jan 14, 2015

Outlines

- Introduction
- Related Works
- Factor Graphs
- BlockSS
- Implementation
- Improvement

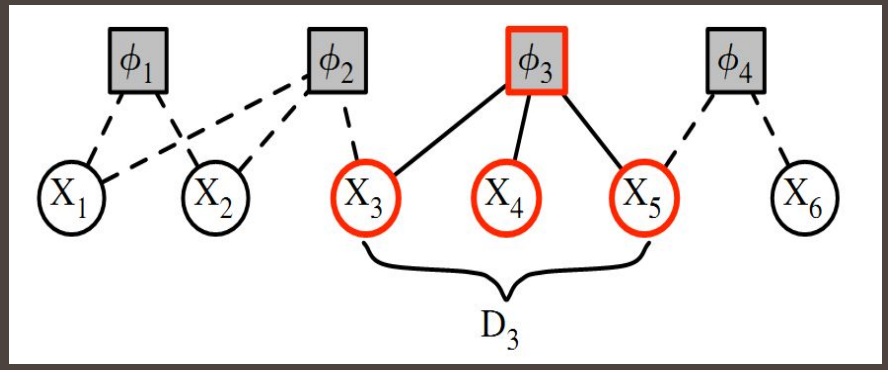
Introduction

- Described a method for synthesizing new patterns of tiles on a regular grid that are similar in appearance to a set of example patterns.
- Modeled a pattern as a probabilistic graphical model called a factor graph.
- Proposed a synthesis algorithm BlockSS

Related Works

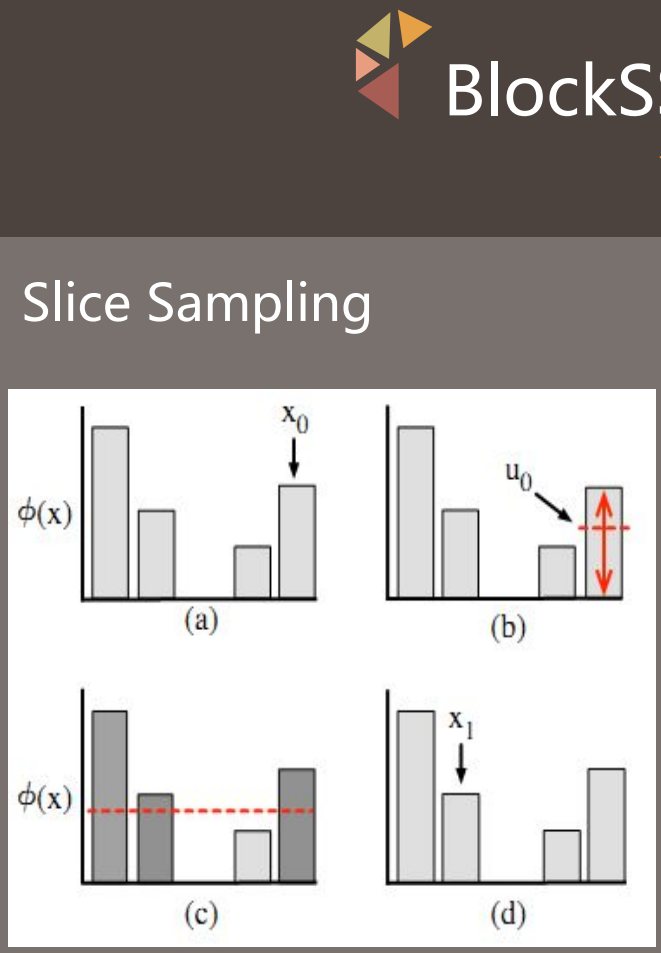
- Tile-based patterns.
- Procedural modeling.
- Model synthesis.
- Markov random fields in texture synthesis.

Factor Graph



The full distribution over X is given as a product of these factors, where each factor specifies dependencies over the variables of its scope.

$$P(X = x) = \frac{1}{Z}\prod_j \varphi_j(d_j)$$



Slice Sampling

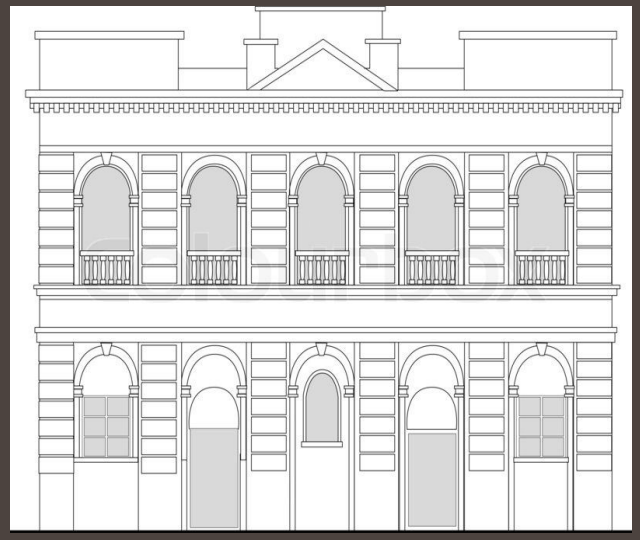
(1) Form slices by sampling auxiliary variables based on the current state.

(2) Generate the next state, in which each factor score exceeds the corresponding auxiliary variable value sampled in (1).

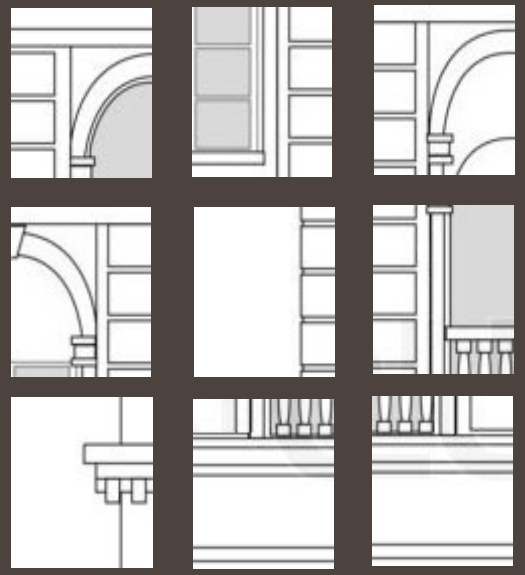
BlockSS(Cont)

- MC-SAT, SampleSAT
- Update by Blocks
- Simulated Annealing

Implementation

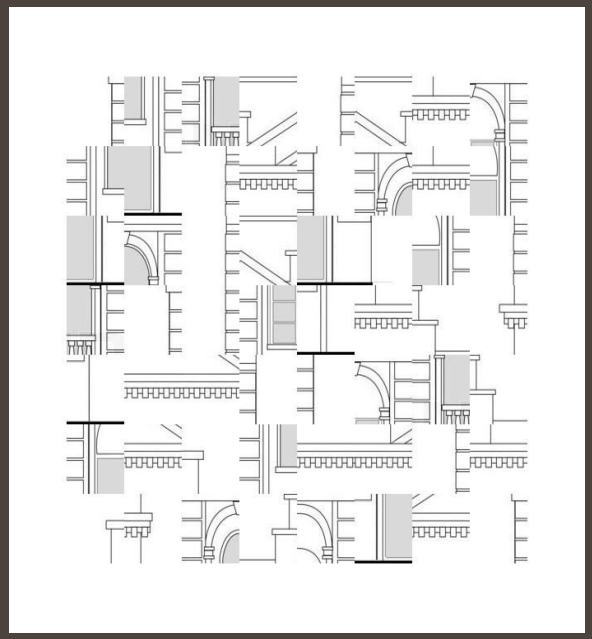


Origin design

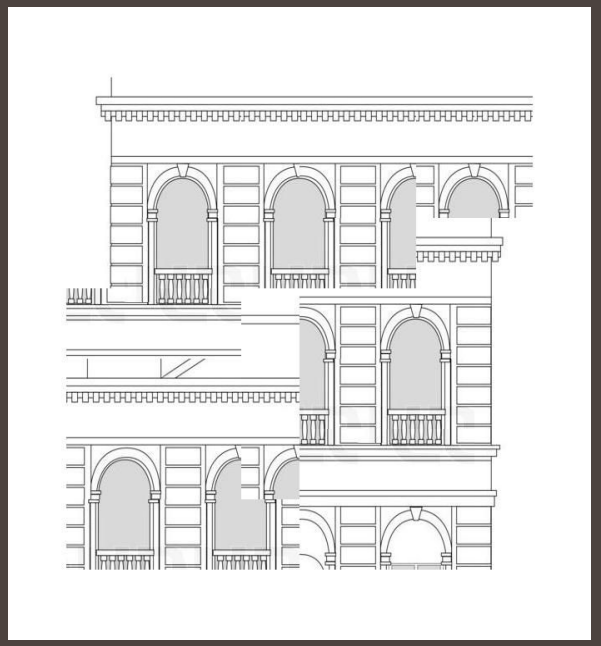


Cutted tiles

Implementation(Cont)

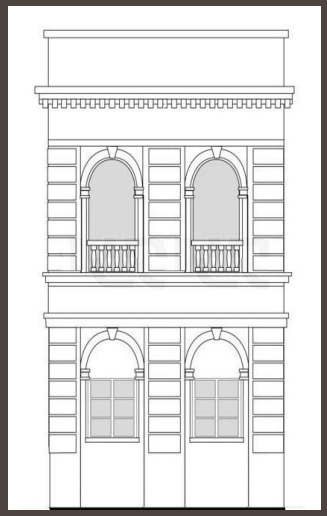


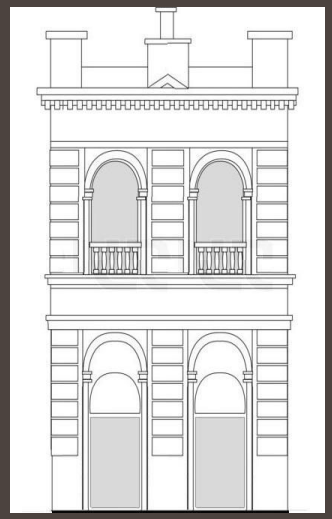
Random pattern

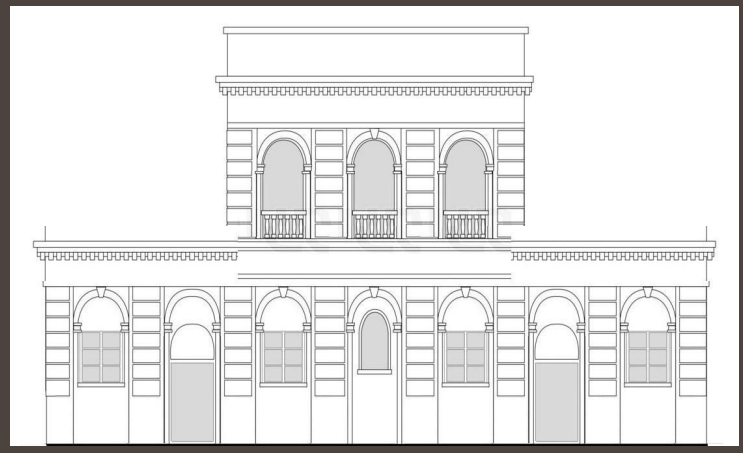


Pattern after 1000 iterations

Implementation(Cont)







Some exemplars

Improvement

- Select better pattern by KL-divergence
- Automatic parameter by the size of constraint and entropy
- A data structure for sampling

Thank you for your valuable time!