Conjoining Gestalt Rules for Abstraction of Architectural Drawings
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How to group?
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Our Result
What is Gestalt?

Human visual system group objects into forms and create internal representations for them. - [Wertheimer 1923]
Conjoining Gestalts

Interactions between different Gestalt principles. The same scene might have different interpretations.

[Kanizsa 1980]
Modeling Conjoining Gestalts

• Contribution
  – Computational model
  – Abstraction of architectural drawings
The Gestalts we consider

- Regularity
The Gestalts we consider

- Proximity
The Gestalt we consider

- Similarity
Abstraction
Related Work

- Qualitative and empirical studies
  [Wertheimer 1923]

- Quantification of Gestalt principles and their interactions.
  [Desolneux et al. 2002],
  [Cao et al. 2007], [Kubovy and van den Berg 2008]

- Perceptual principle based abstraction
  [DeCarlo and Santella 2002], [Barla et al. 2005; 2006],
  [Mi et al. 2009]

- Stroke density based simplification
  [Grabli et al. 2004], [Shesh and Chen 2008]

- Building representation
  [Loya et al. 2008], [Adabala et al. 2009]
Related Work

Quantification and interaction of two Gestalt principles: 
Similarity VS. Proximity

[Kubovy and van den Berg 2008]
Ambiguities in Conjoining Gestalts

Different interpretations

input

vertical regularity

horizontal regularity
Proximity Graph Structure
Proximity Graph Structure
Optimization via Graph Cut

- Proximity labels

\[ L^p = \bigcup \{ p_i, p_j \} \mid d(p_i, p_j) < t_p \]
Optimization via Graph Cut

- Similarity Labels

\[ L^s = \bigcup \{ p_i, p_j \} \left\{ \frac{R(H_i, H_j) + R(W_i, W_j)}{2} \right\} > t_s \]
Optimization via Graph Cut

- Regularity Labels

\[ L^R = \bigcup \{ p_i \mid \xi(p_i) > t_r \} \]
Optimization via Graph Cut

- Data cost
Optimization via Graph Cut

- Smooth cost
Optimization via Graph Cut

- Label cost
Optimization via Graph Cut

Overall energy function

\[ E(f) = \sum_{p \in P} D(p, f) + \sum_{p,q \in N} V_{p,q} + \sum_{l \in L} h_l \cdot \delta_l(f) \]

- Data cost
- Smooth cost
- Label cost

Multi-label normalized graph-cut

[DeLong et al. 2010]
Optimization via Graph Cut

Groupings complying with Gestalt principles
Computation Results

Regularity VS. Proximity
Computation Results

Similarity VS. Proximity
Visual Abstraction

Embracing

Summarization
Level of Detail

Progressively simplified results
Results
Results
Results
Results
Extension to Mosaics
Extension to Mosaics
Conclusion

• Computational framework
• Abstraction of architectural drawings
• Attempt extension to mosaics
谢谢！