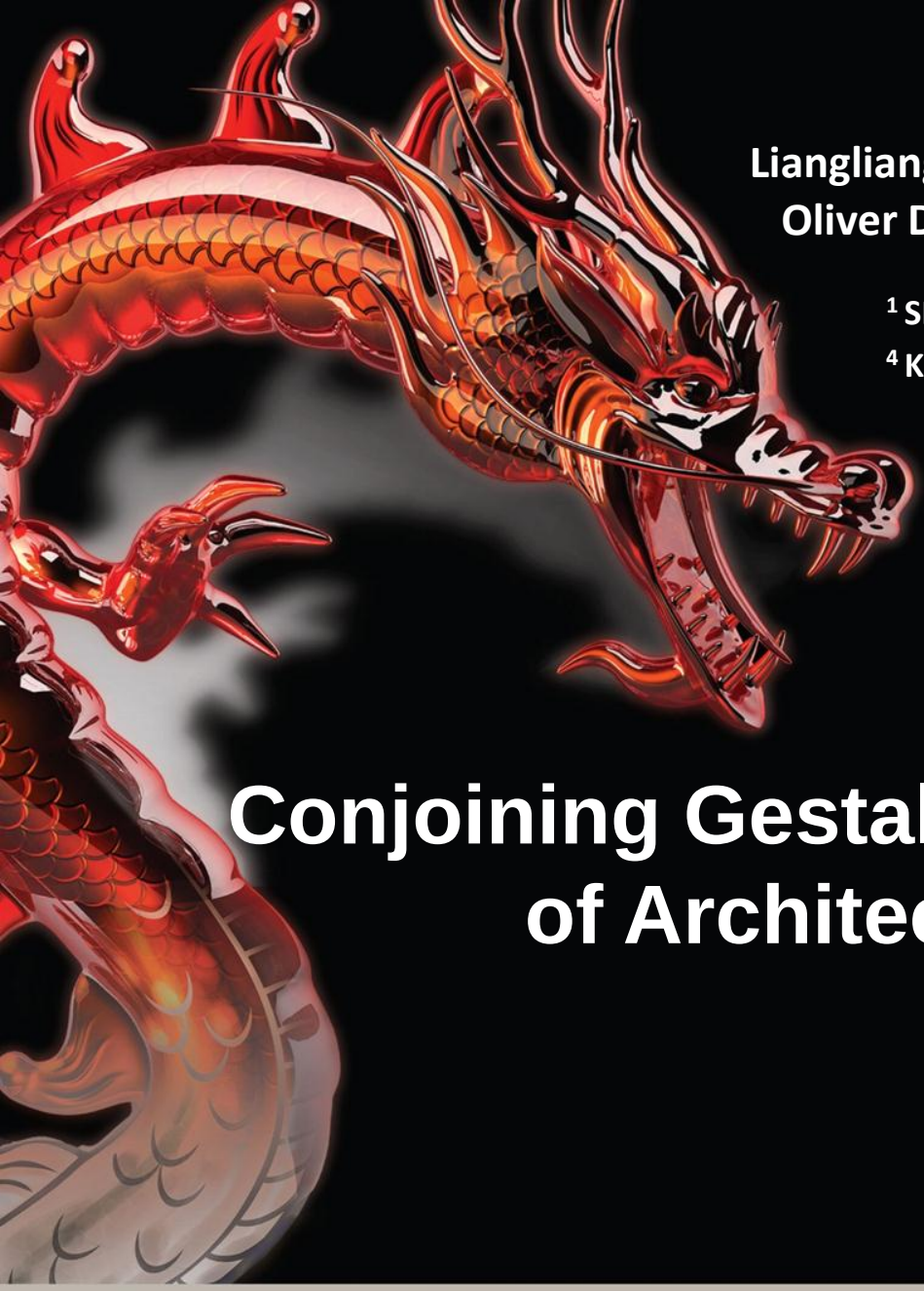

Liangliang Nan[1], Andrei Sharf[2], Ke Xie[1], Tien-Tsin Wong[3]
Oliver Deussen[4], Daniel Cohen-Or[5], Baoquan Chen[1]

[1] SIAT, China [2] Ben Gurion Univ., Israel [3] CUHK, China
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Conjoining Gestalt Rules for Abstraction of Architectural Drawings

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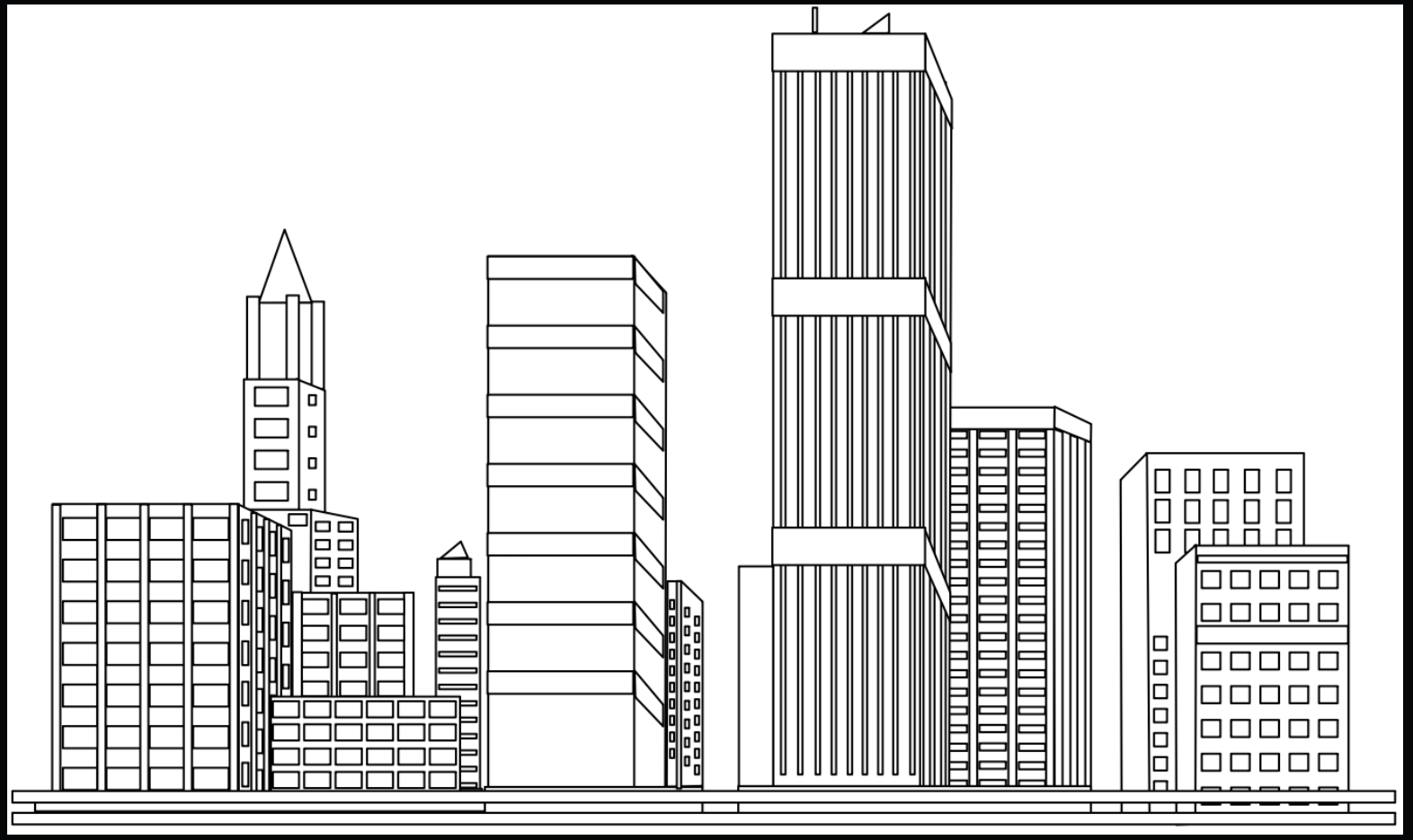
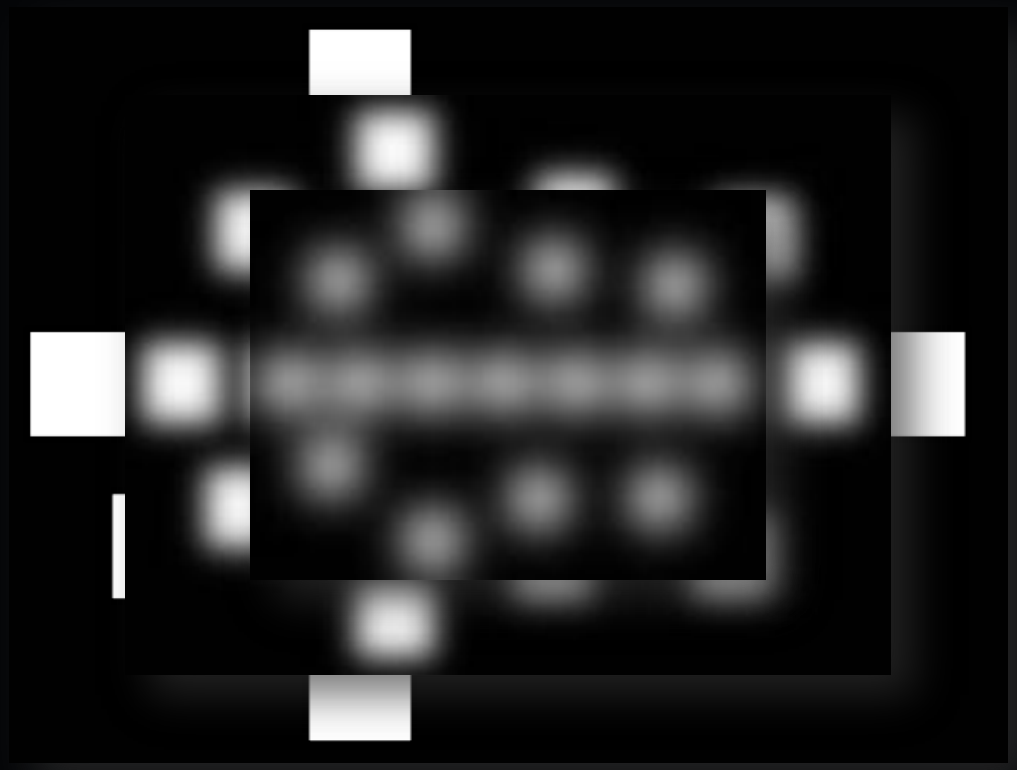
Conjoining Gestalt Rules for Abstraction of Architectural Drawings



How to group ?



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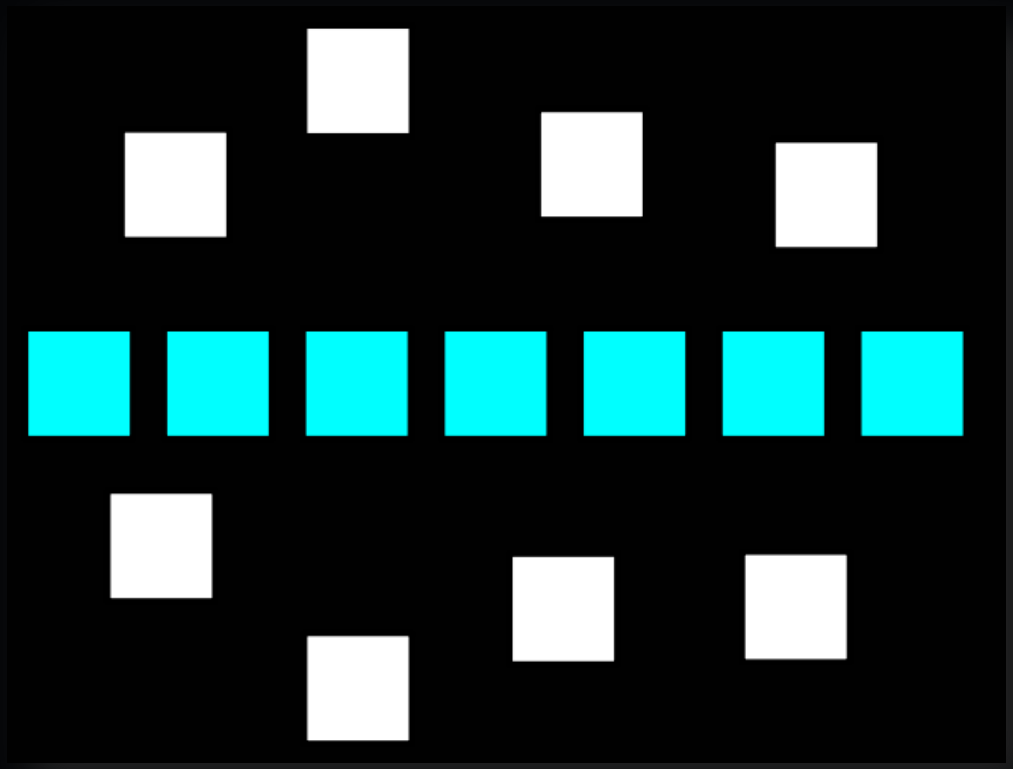

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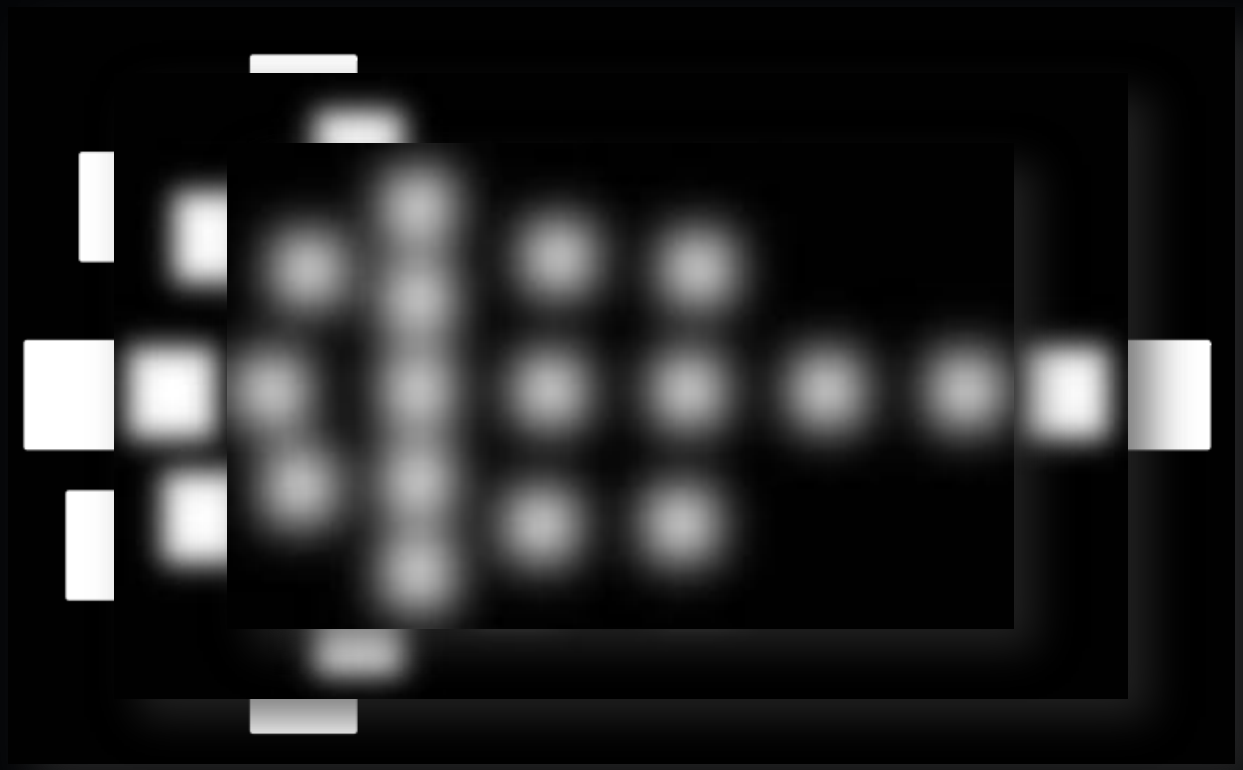

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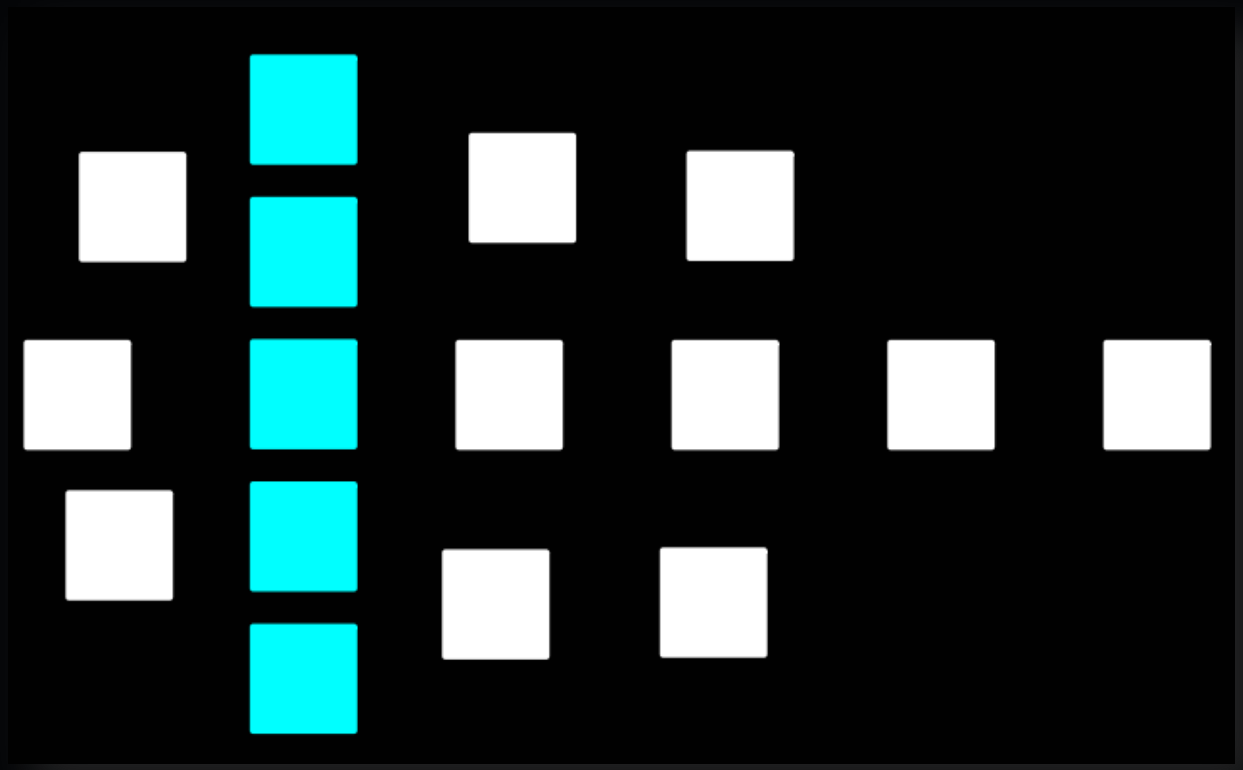

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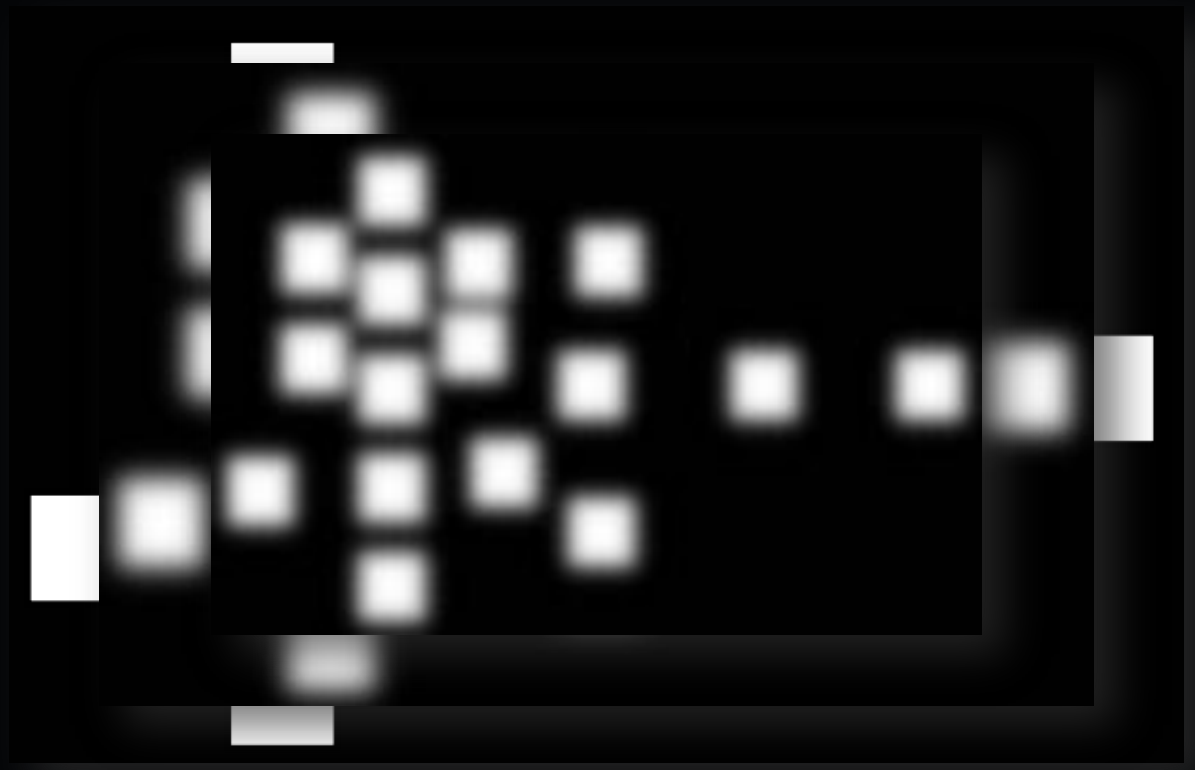

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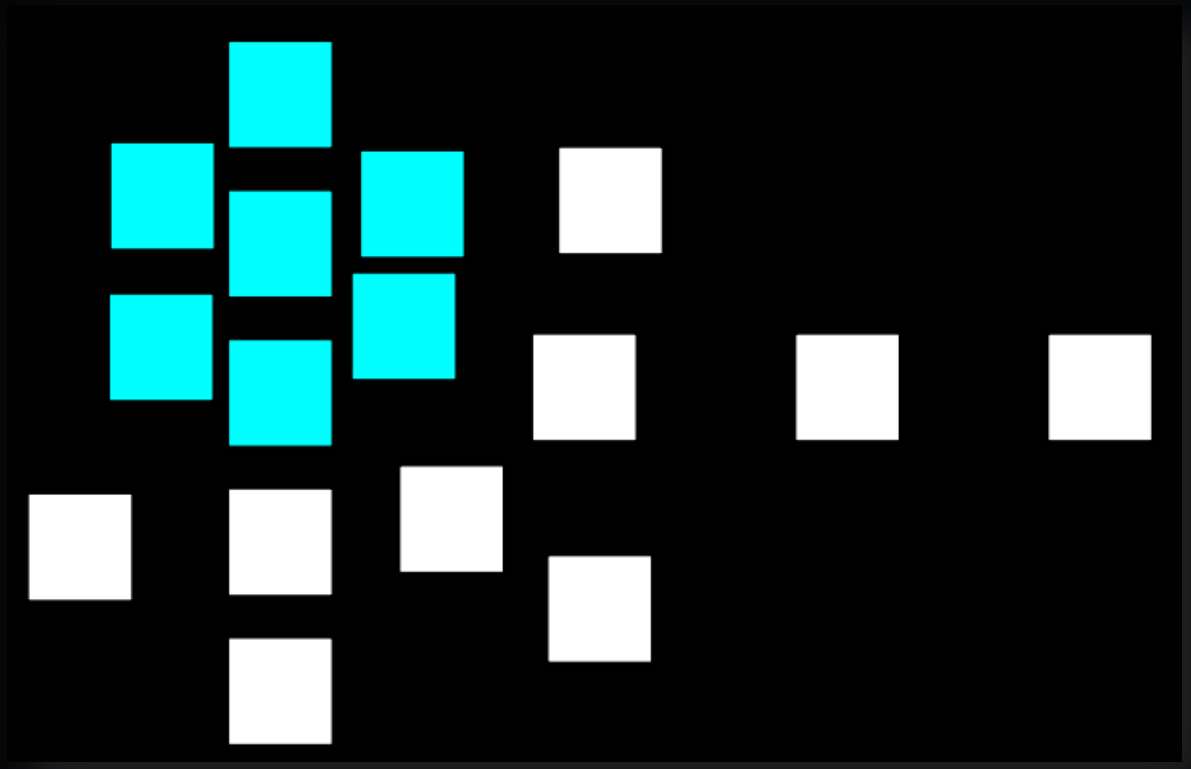

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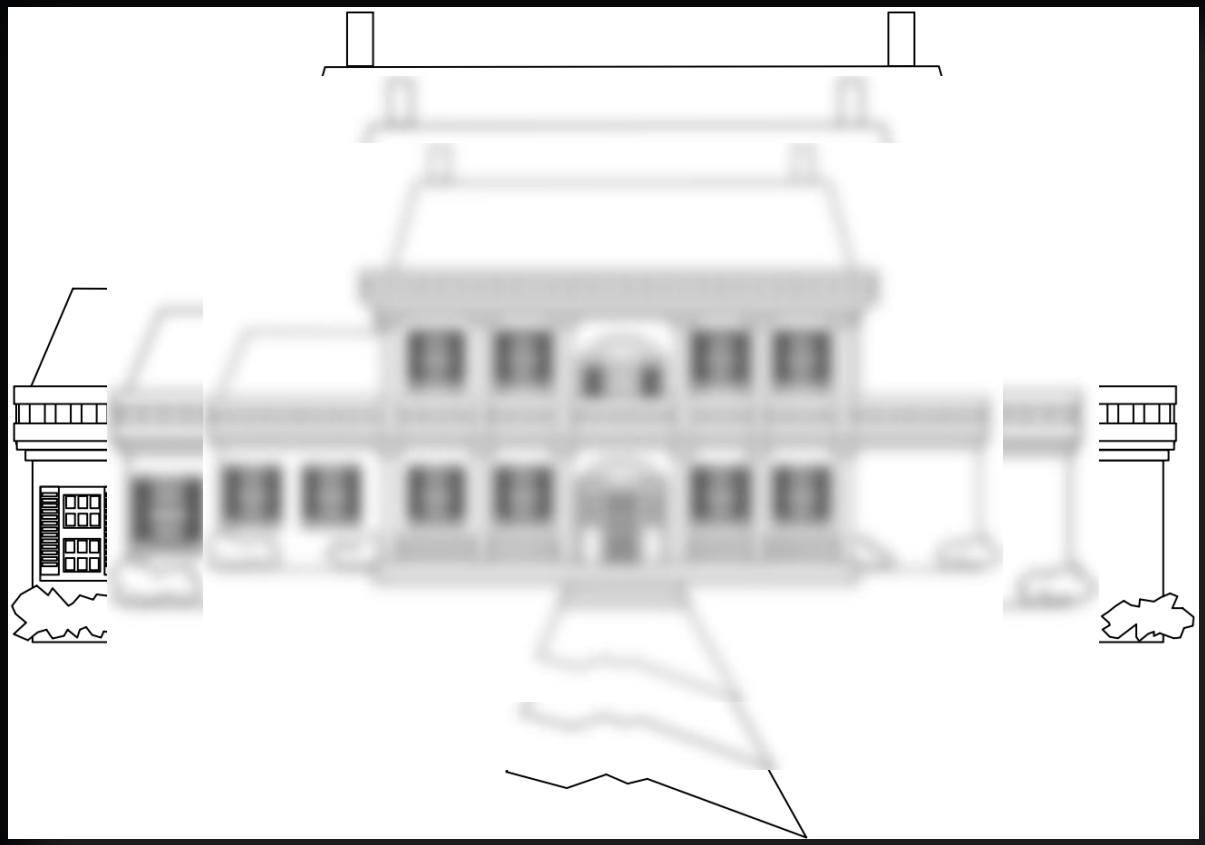
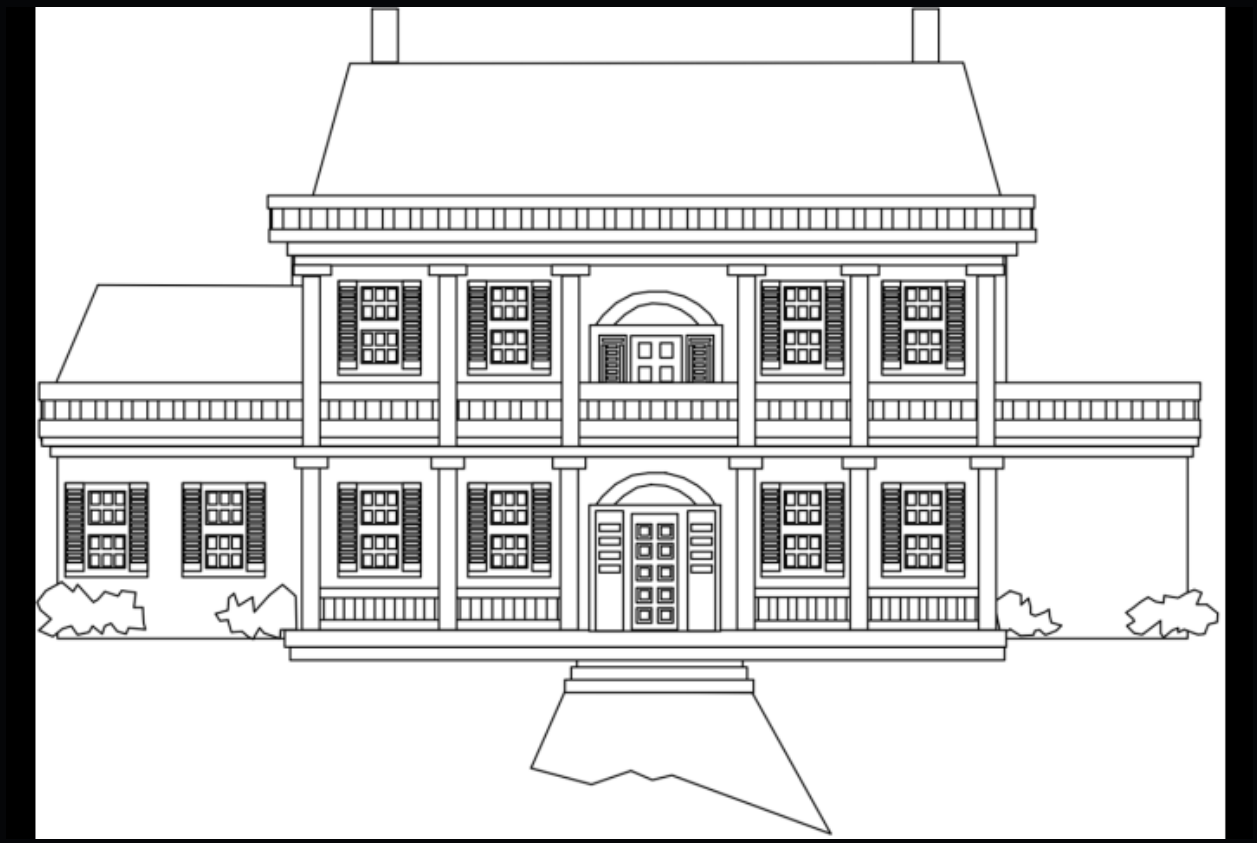
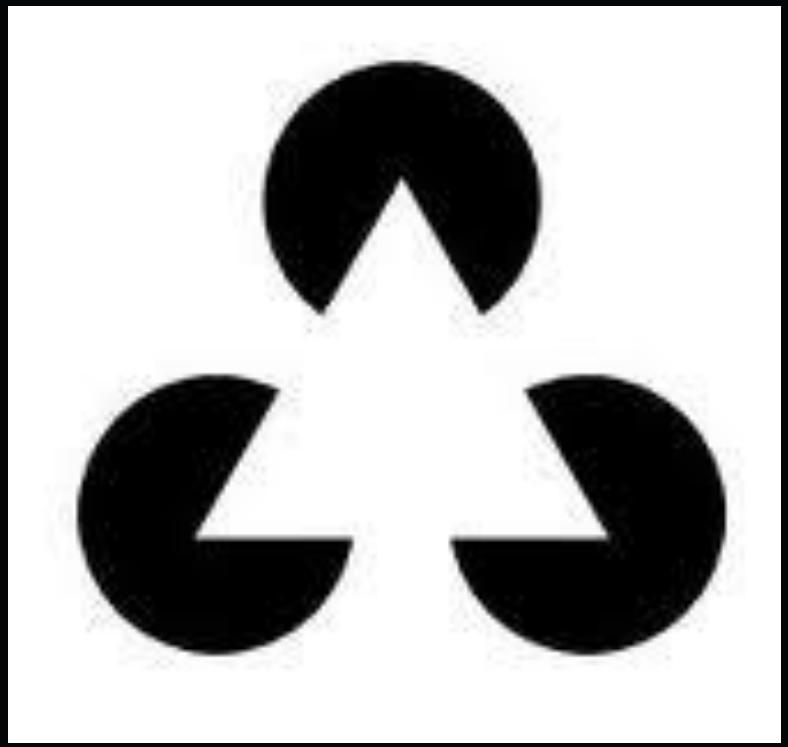


Our Result



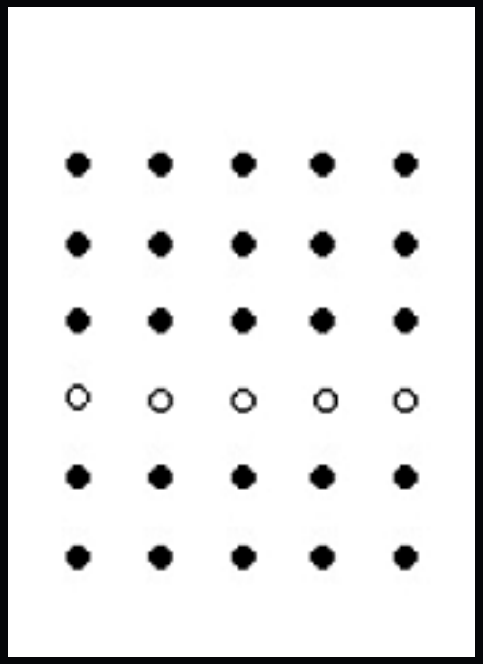
What is Gestalt ?

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



Conjoining Gestalts

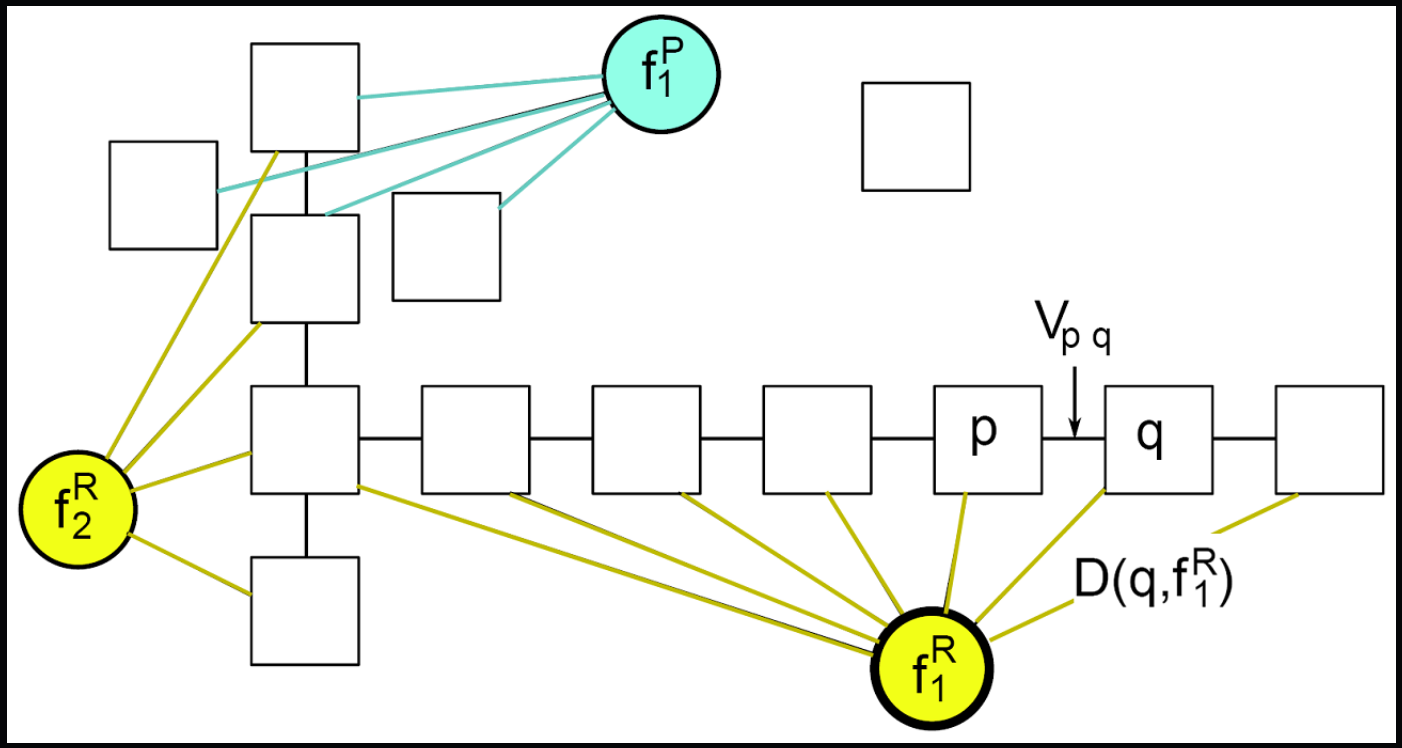
Interactions between different Gestalt principles.
The same scene might have different interpretations



[Kanizsa 1980]

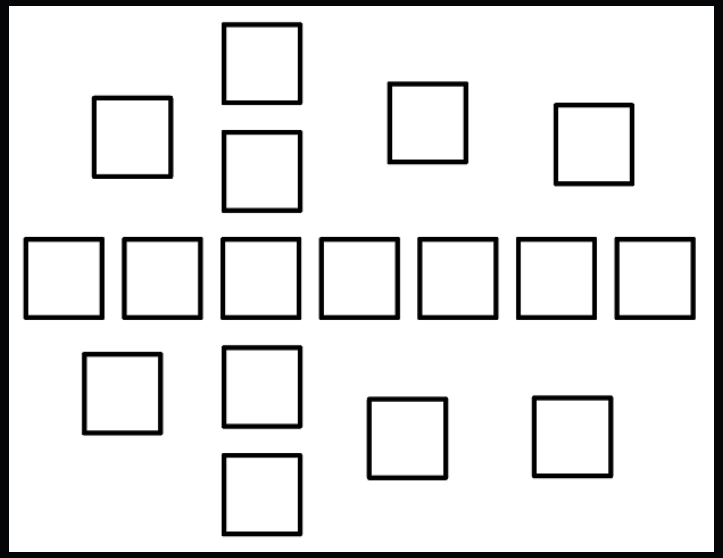
Modeling Conjoining Gestalts

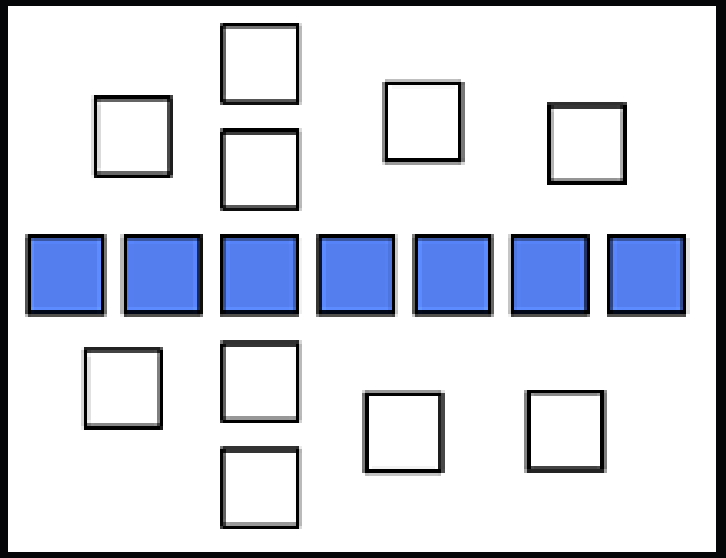
- **Contribution**
  - Computational model
  - Abstraction of architectural drawings



The Gestalts we consider

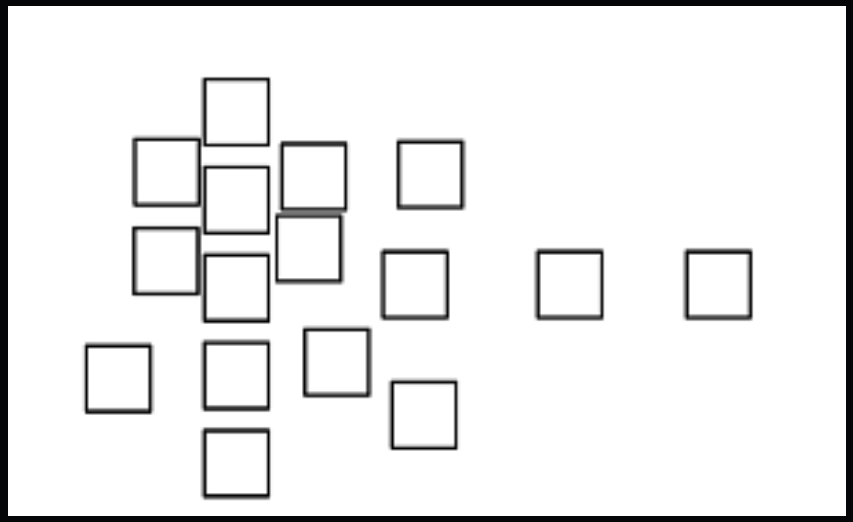
- **Regularity**

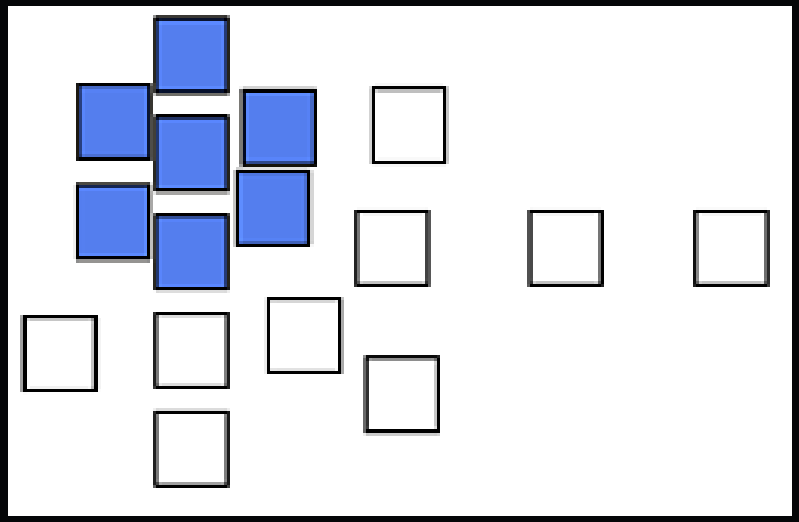




The Gestalts we consider

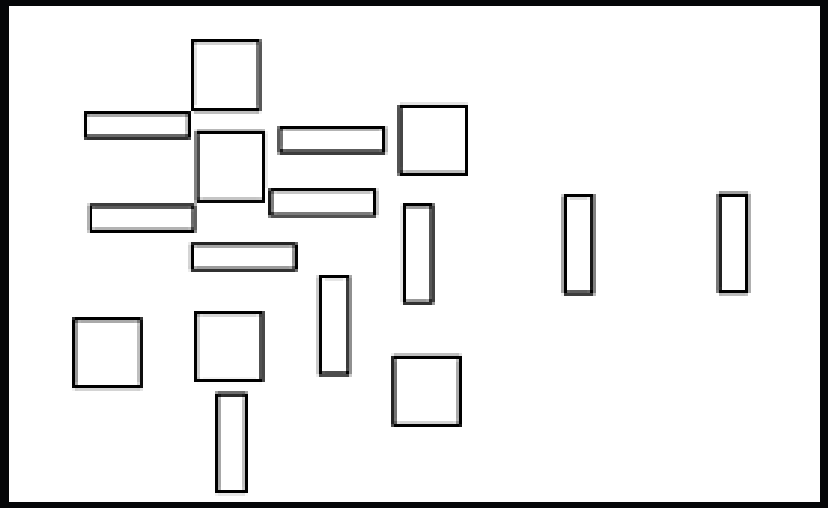
- **Proximity**

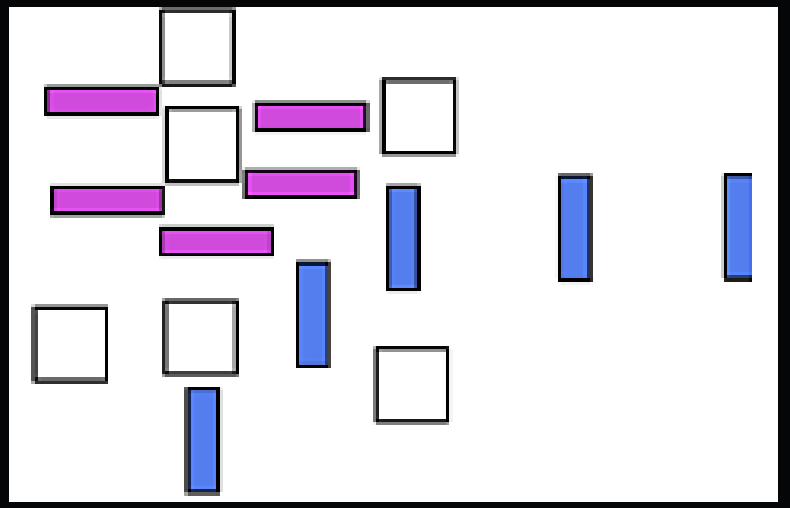




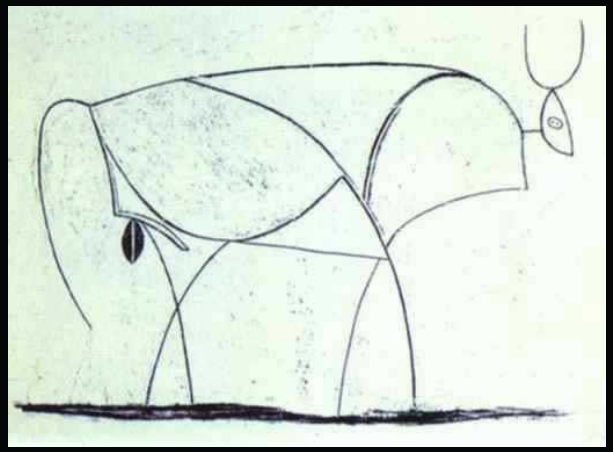
The Gestalts we consider

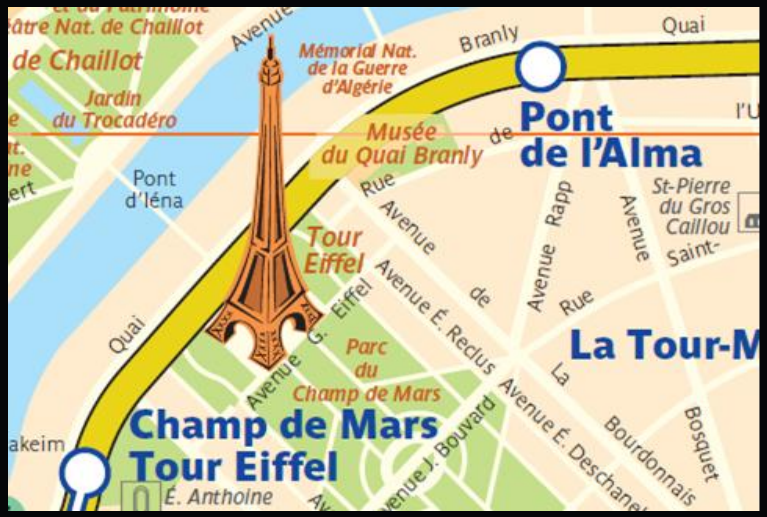
- **Similarity**





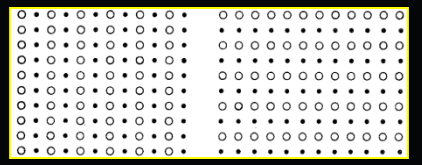
Abstraction

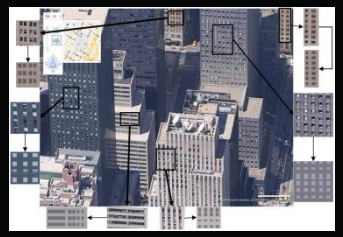




Related Work

- 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]



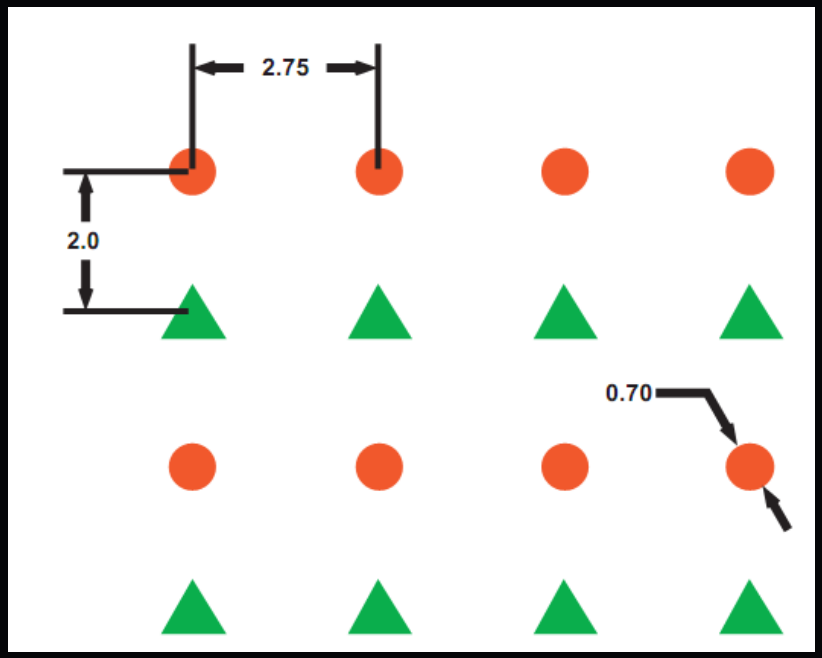


Related Work

Quantification and interaction of two Gestalt principles:

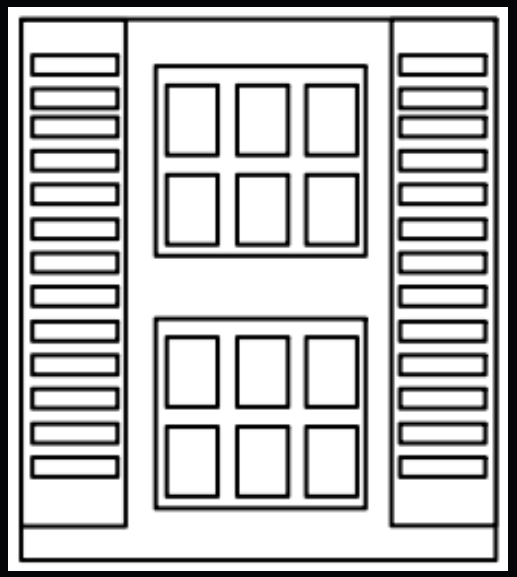
Similarity VS. Proximity

[Kubovy and van den Berg 2008]

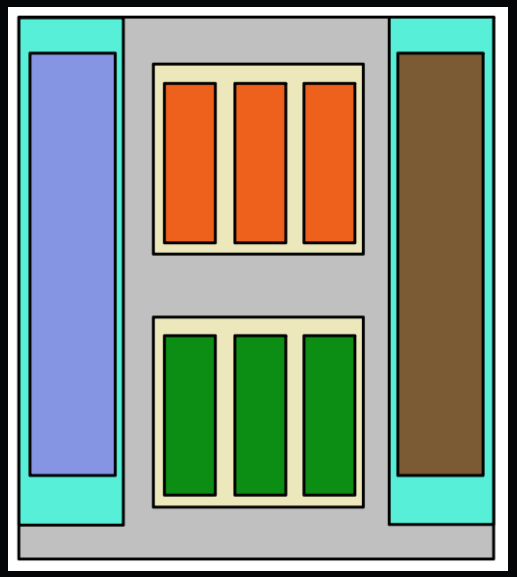


Ambiguities in Conjoining Gestalts

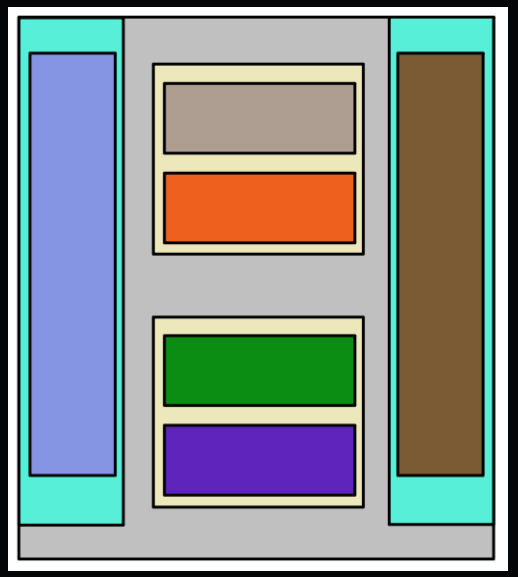
Different interpretations



input

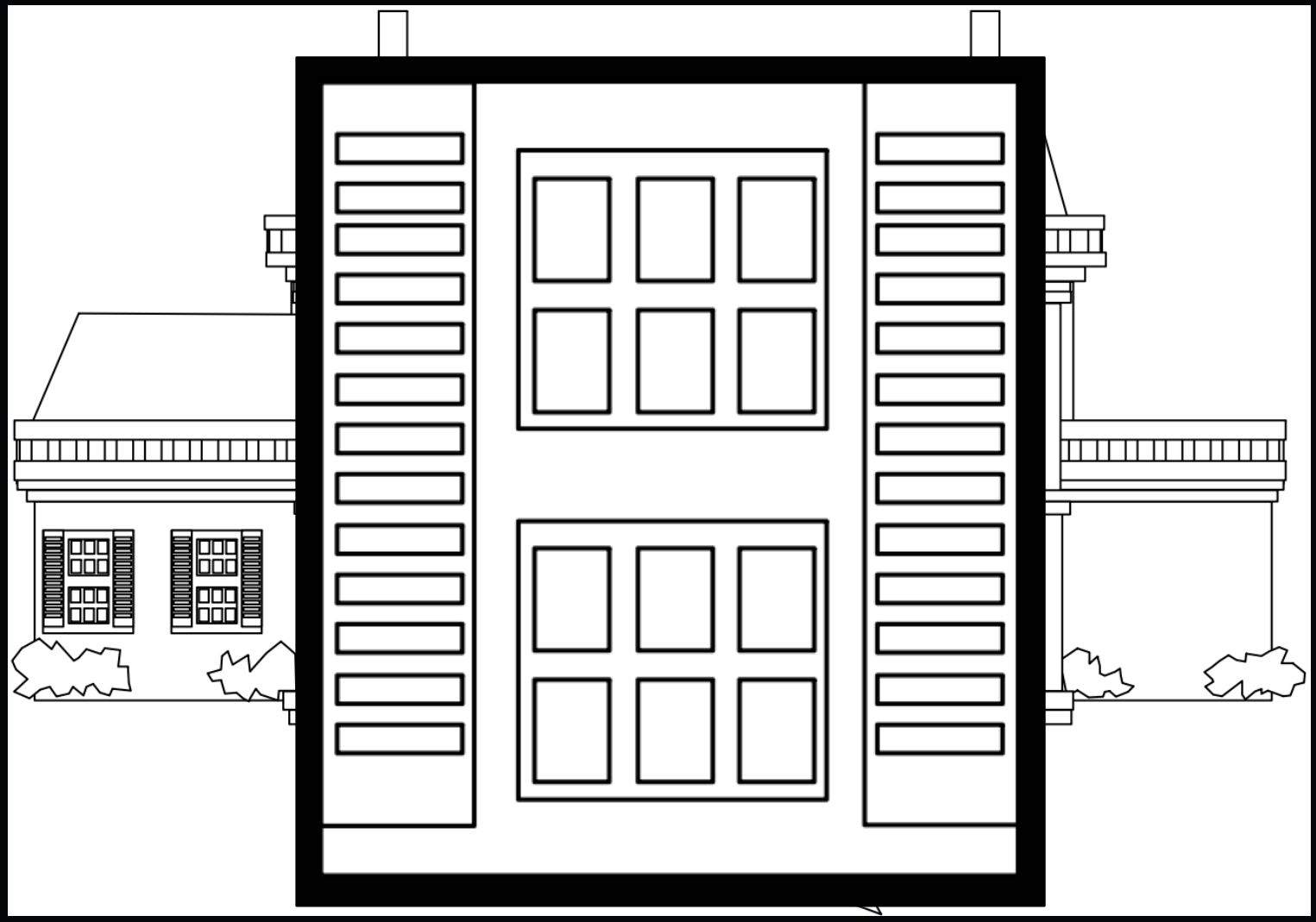


vertical regularity

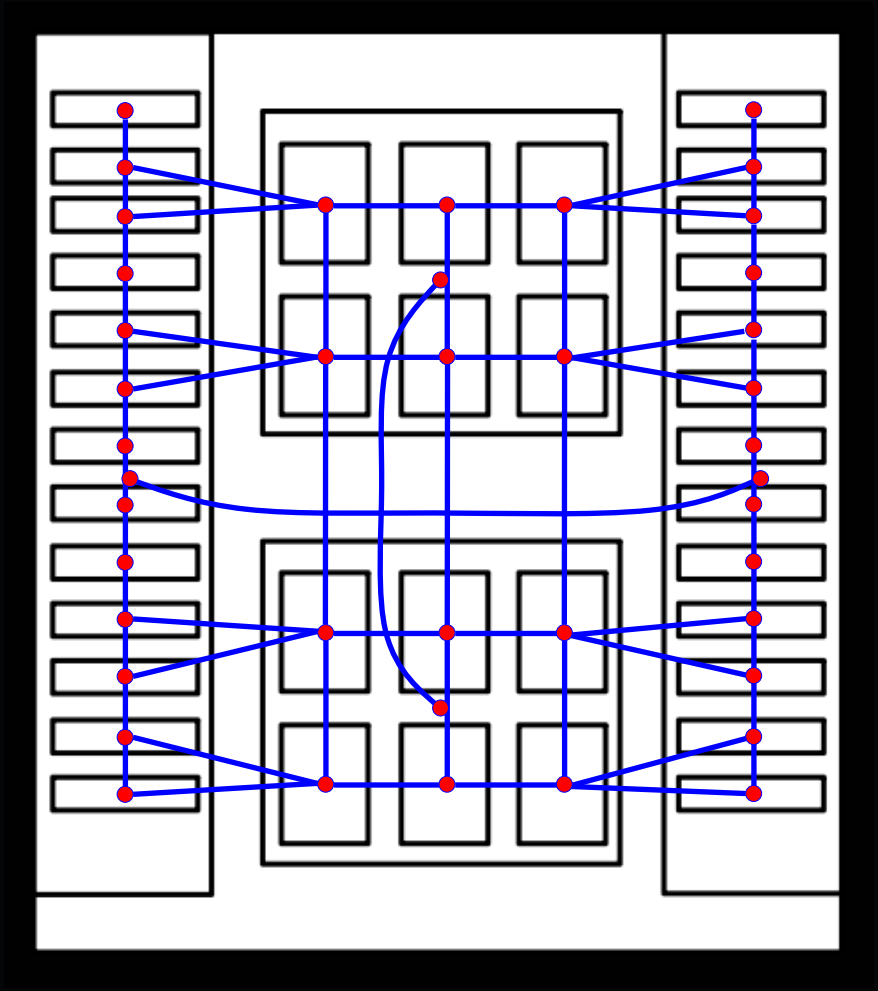


horizontal regularity

Proximity Graph Structure

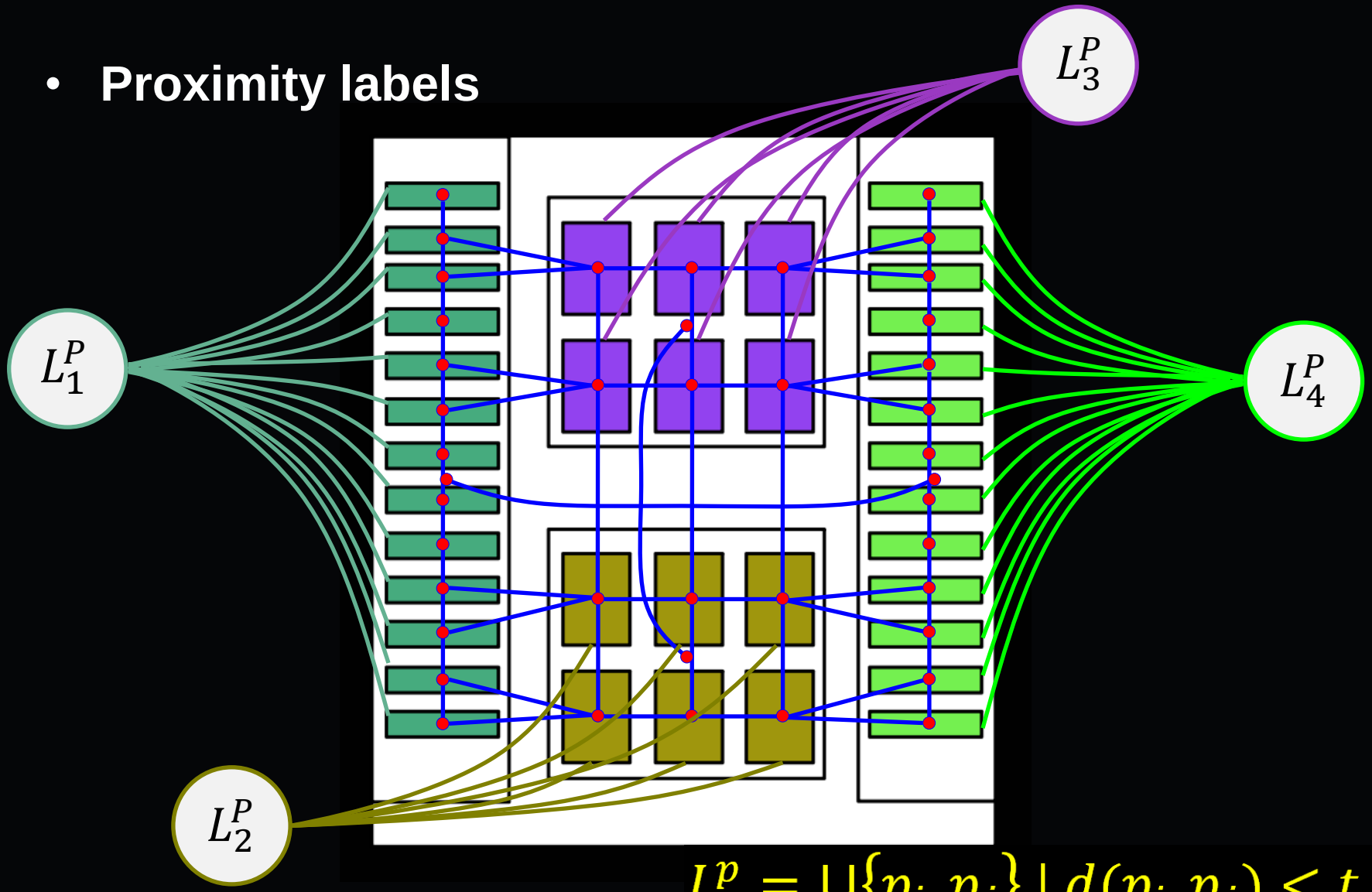


Proximity Graph Structure



Optimization via Graph Cut

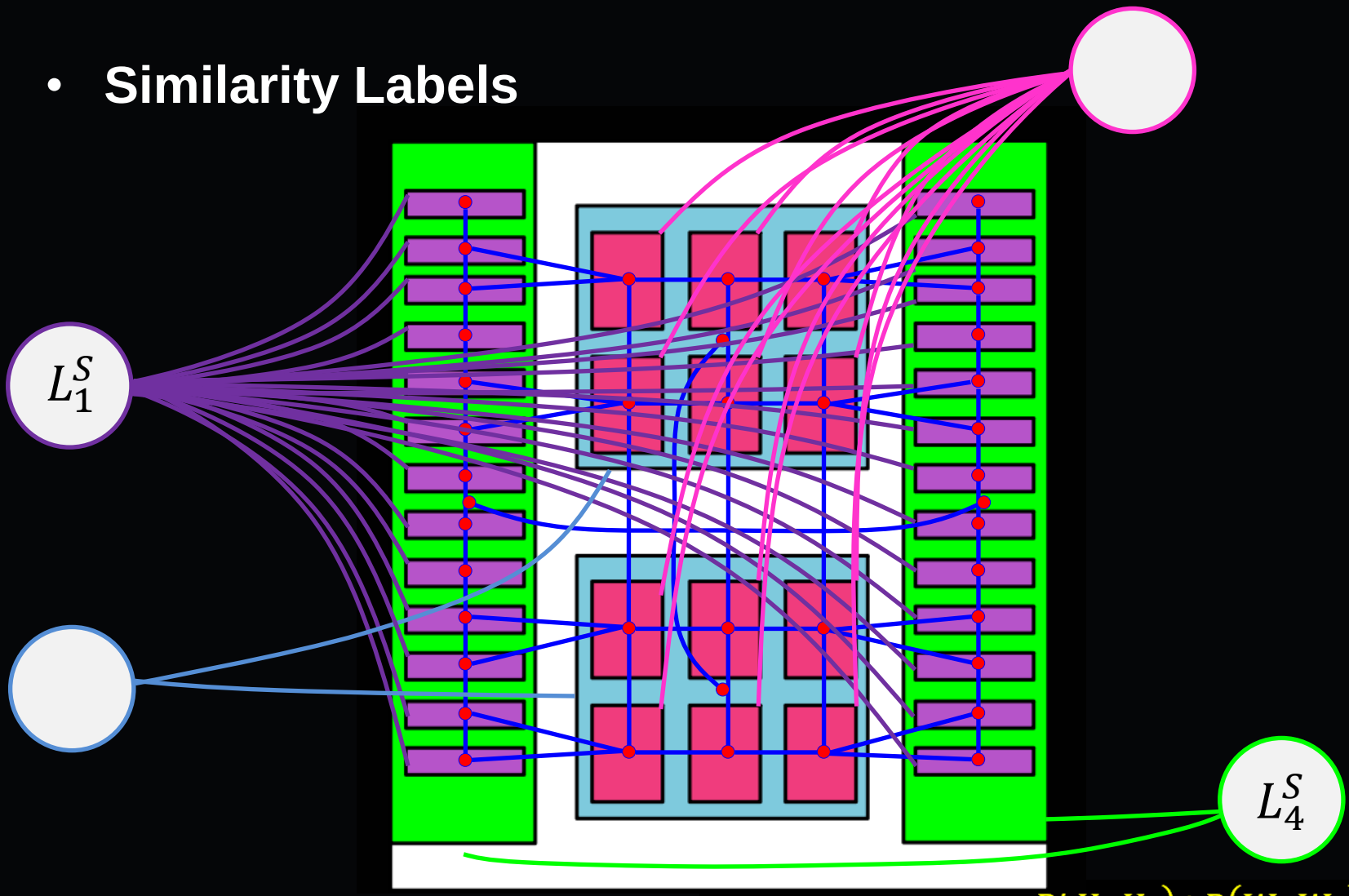
- **Proximity labels**



$$L^p = \mathrm{U}\{p_i, p_j\} \mid d(p_i, p_j) < t_p$$

Optimization via Graph Cut

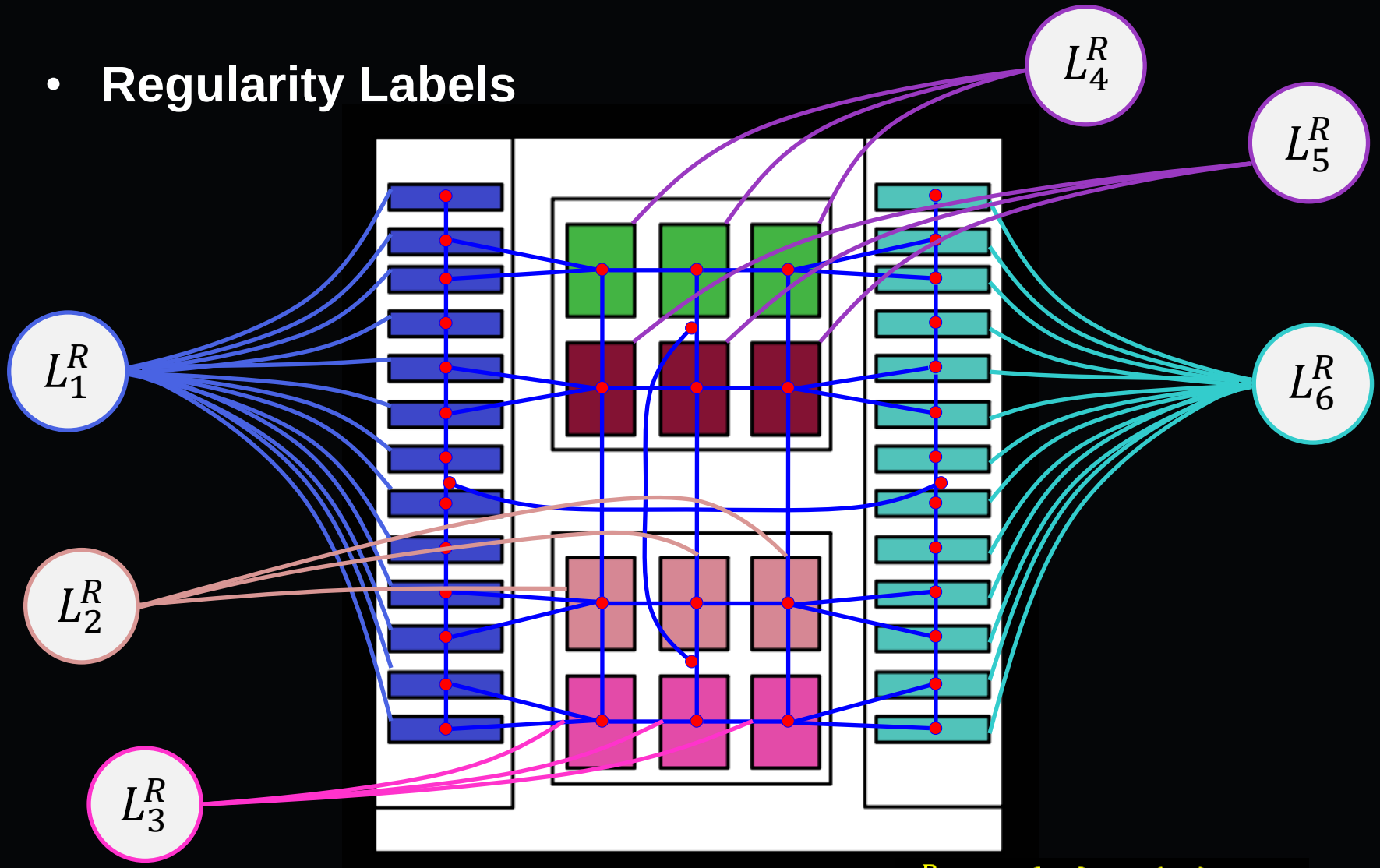
- **Similarity Labels**



$$L^s = \cup\{p_i, p_j\} \mid \frac{R(H_i,H_j)+R(W_i,W_j)}{2} > t_s$$

Optimization via Graph Cut

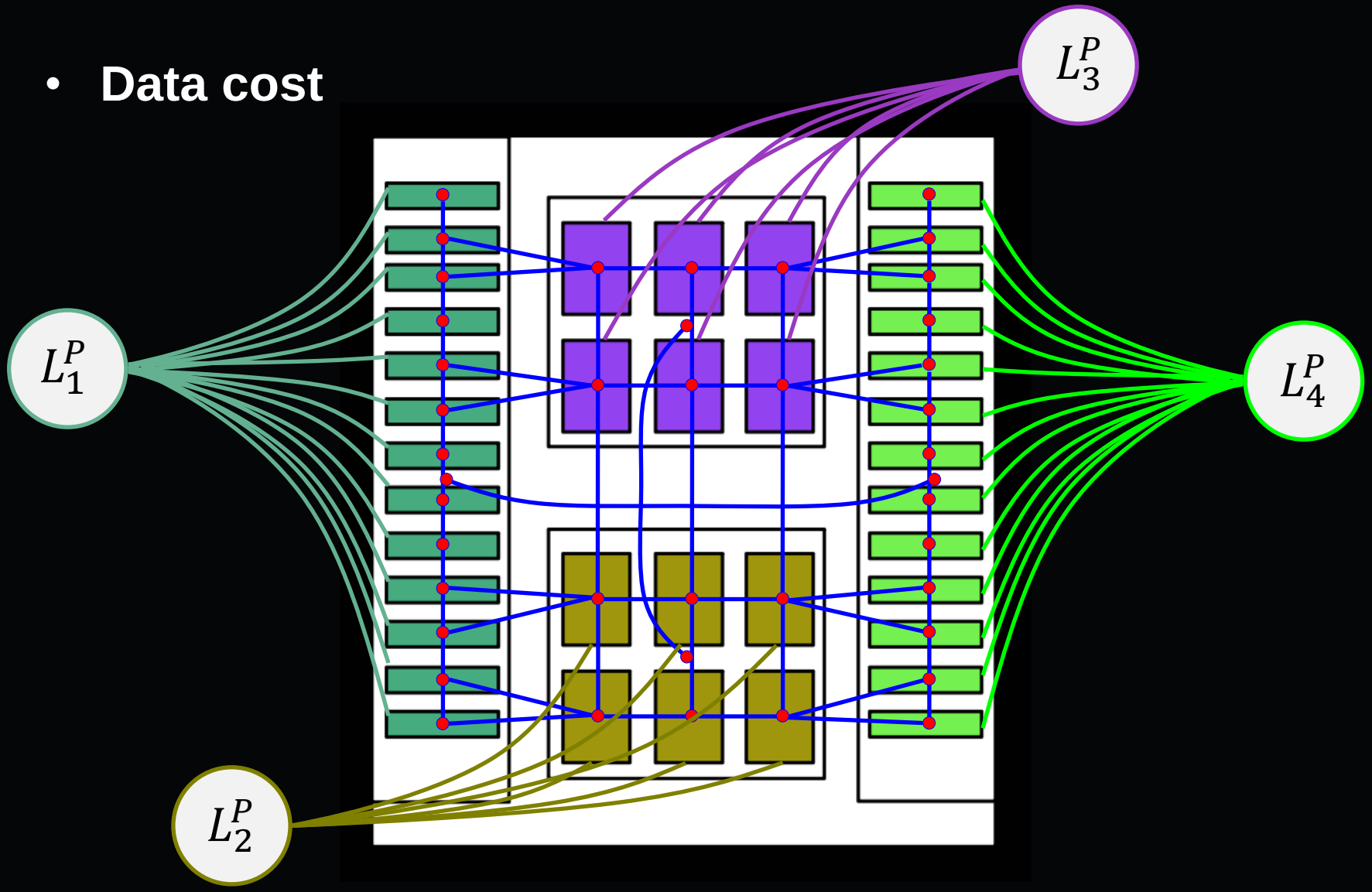
- **Regularity Labels**



$$L^R = \cup\{p_i\} \mid \xi(p_i) > t_r$$

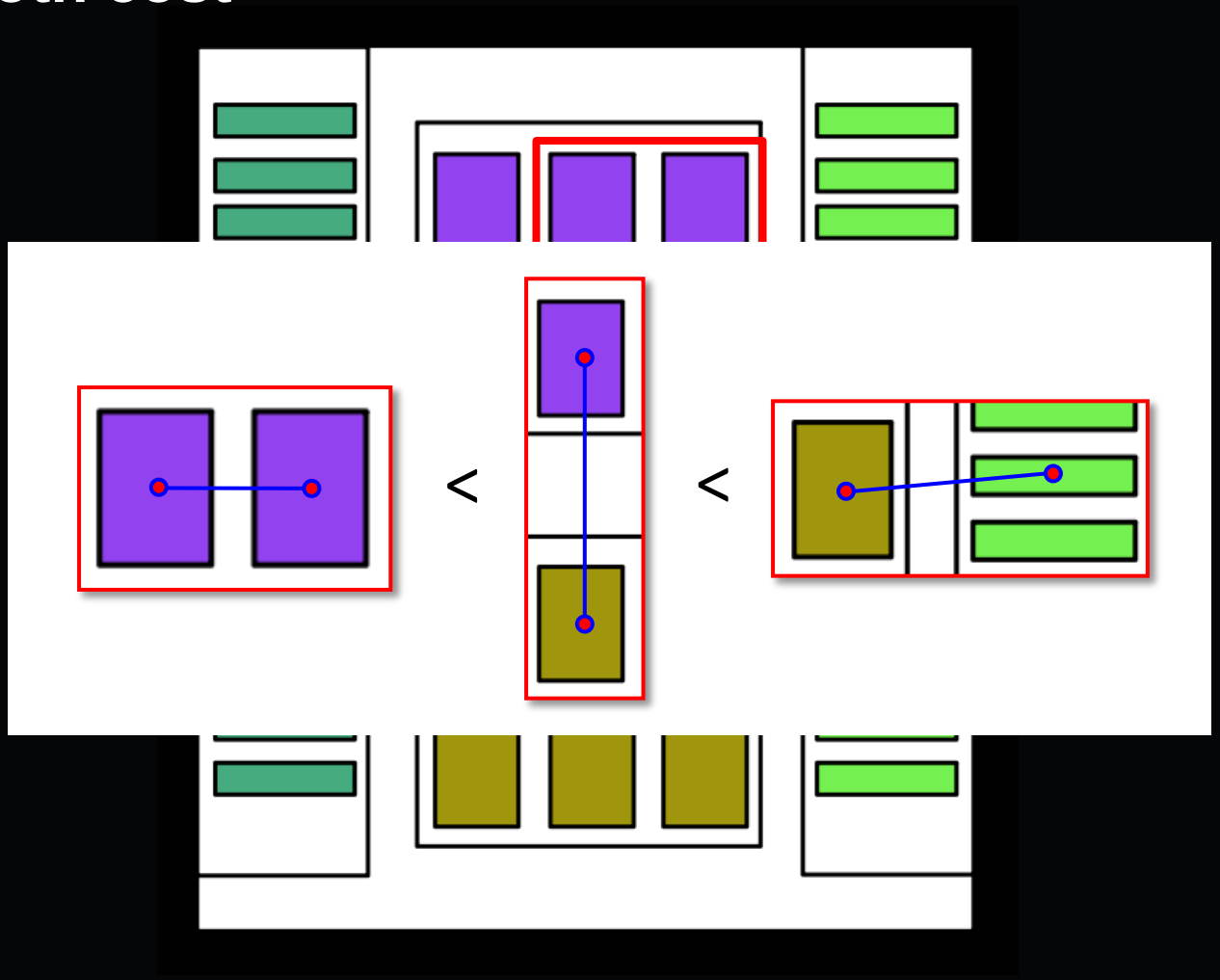
Optimization via Graph Cut

- Data cost



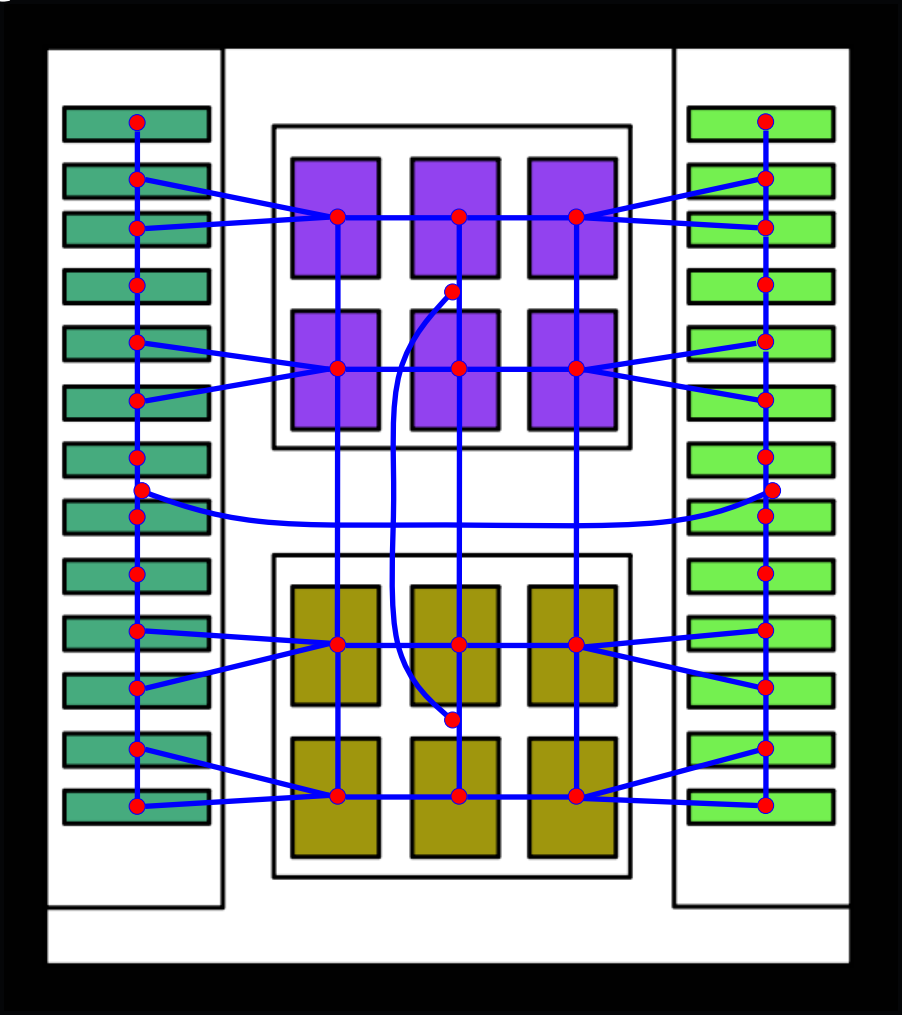
Optimization via Graph Cut

- Smooth cost



Optimization via Graph Cut

- Label cost



Optimization via Graph Cut

Overall energy function

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

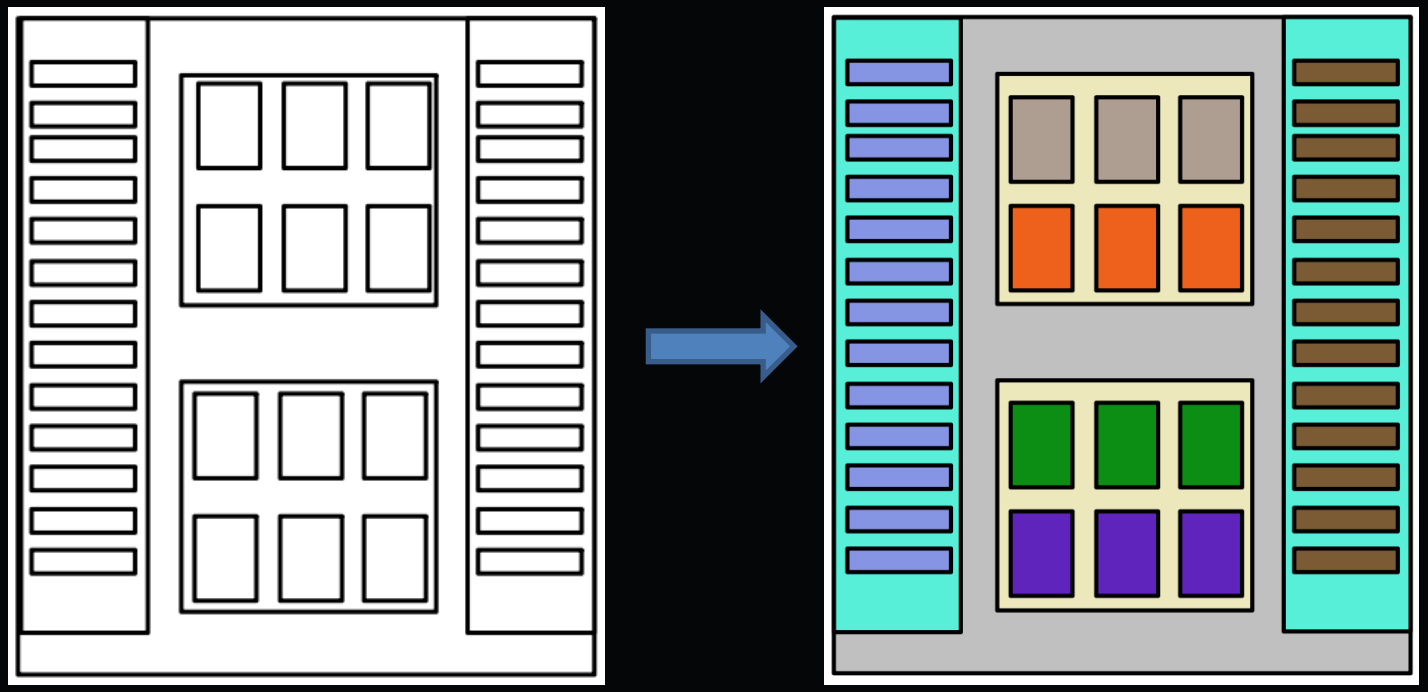
Data cost | Smooth cost | Label cost

Multi-label normalized graph-cut

[Delong et al. 2010]

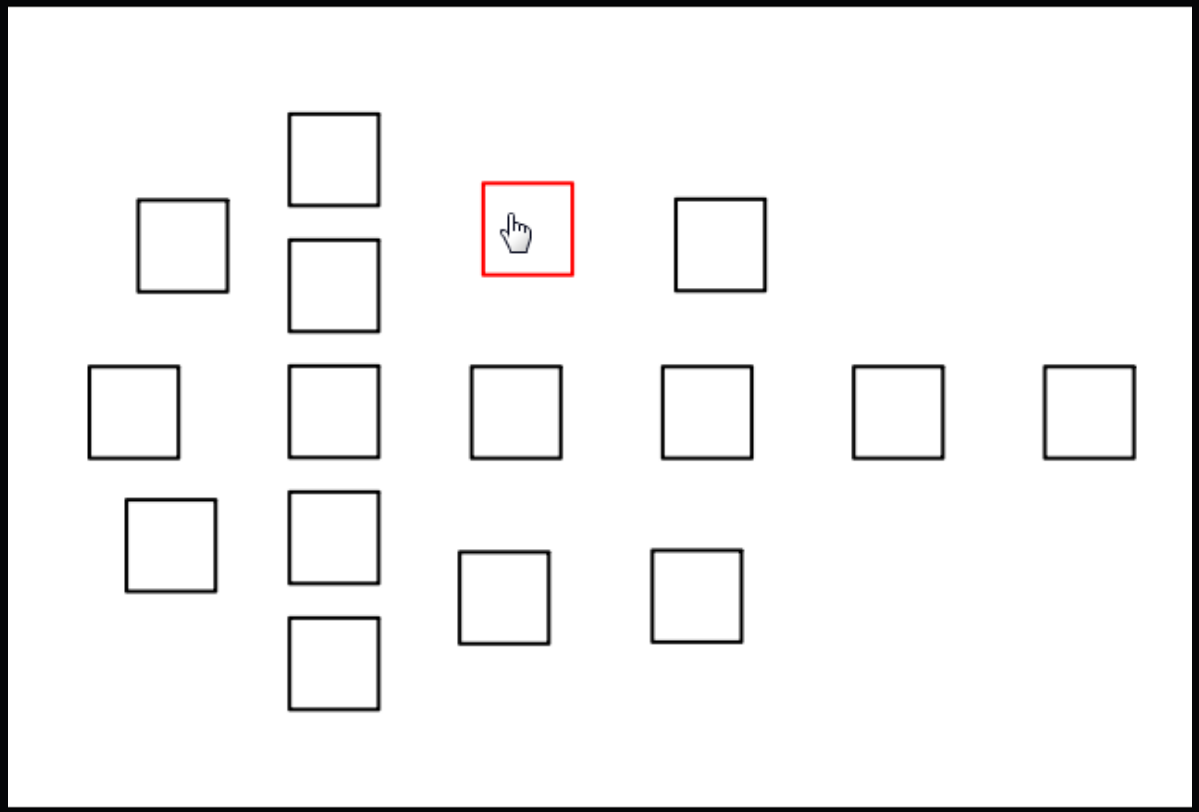
Optimization via Graph Cut

Groupings complying with Gestalt principles



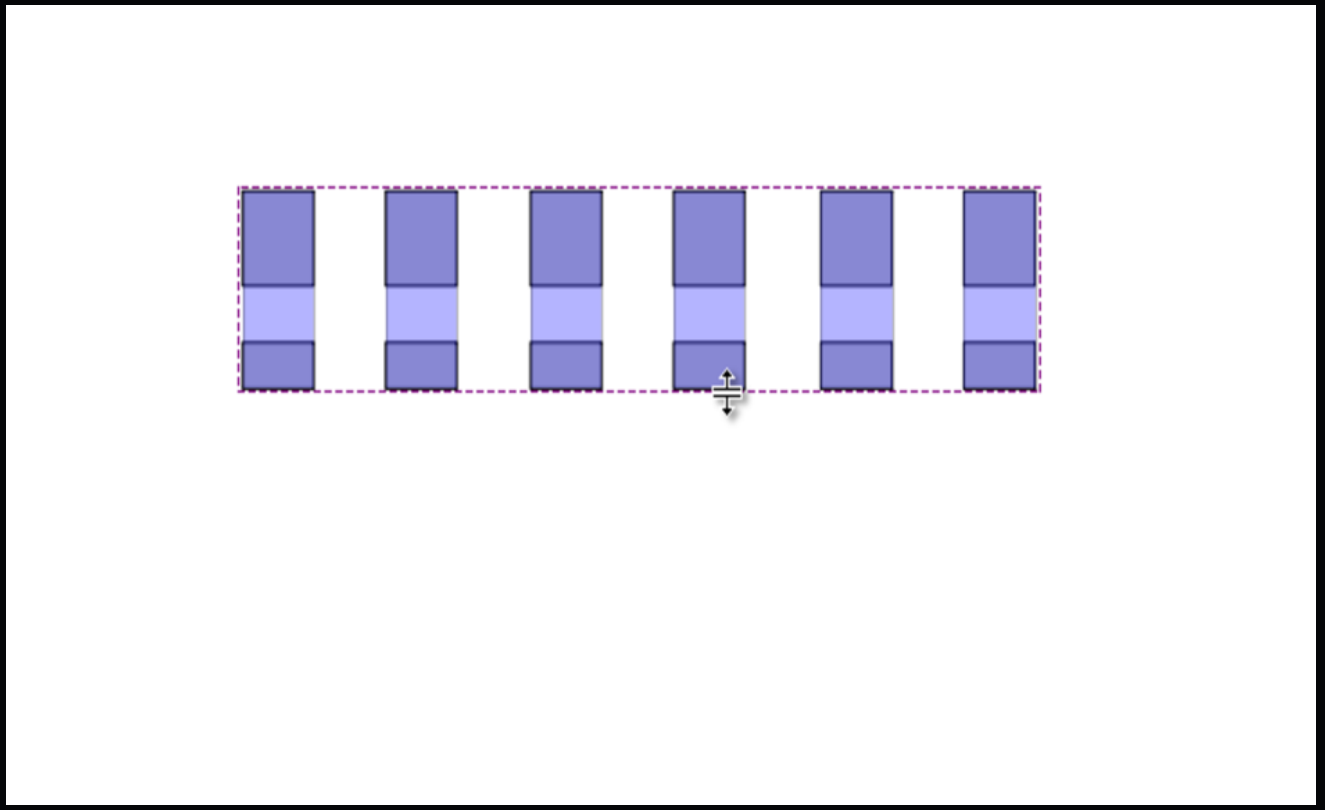
Computation Results

Regularity VS. Proximity



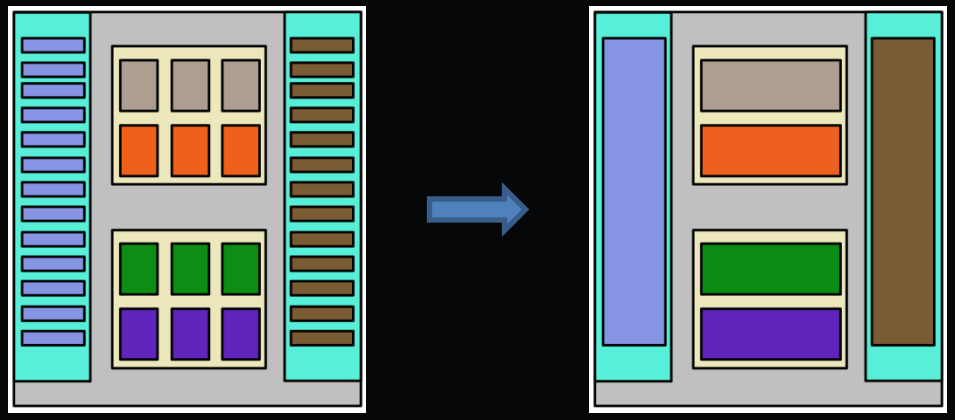
Computation Results

Similarity VS. Proximity

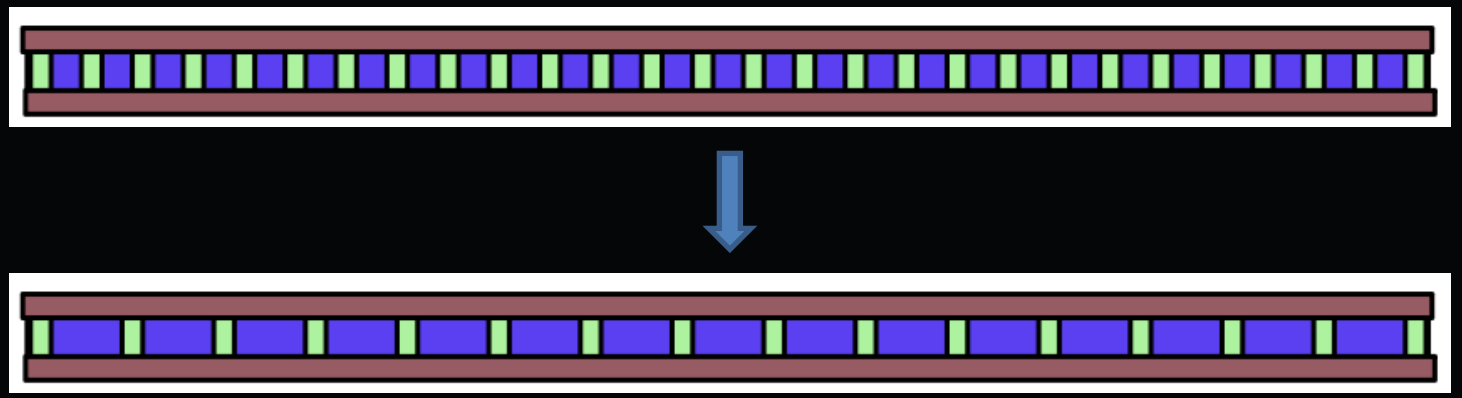


Visual Abstraction

Embracing

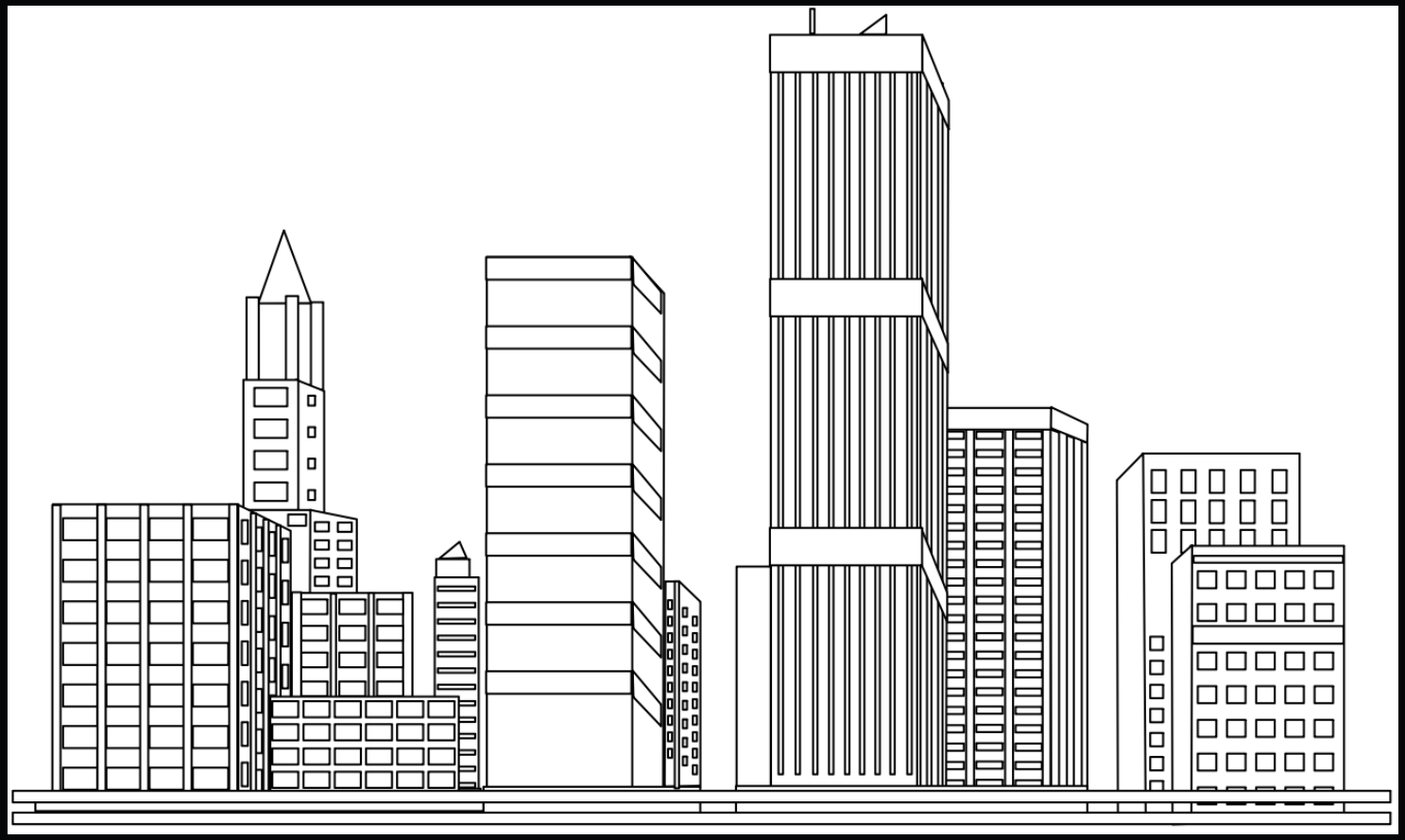


Summarization

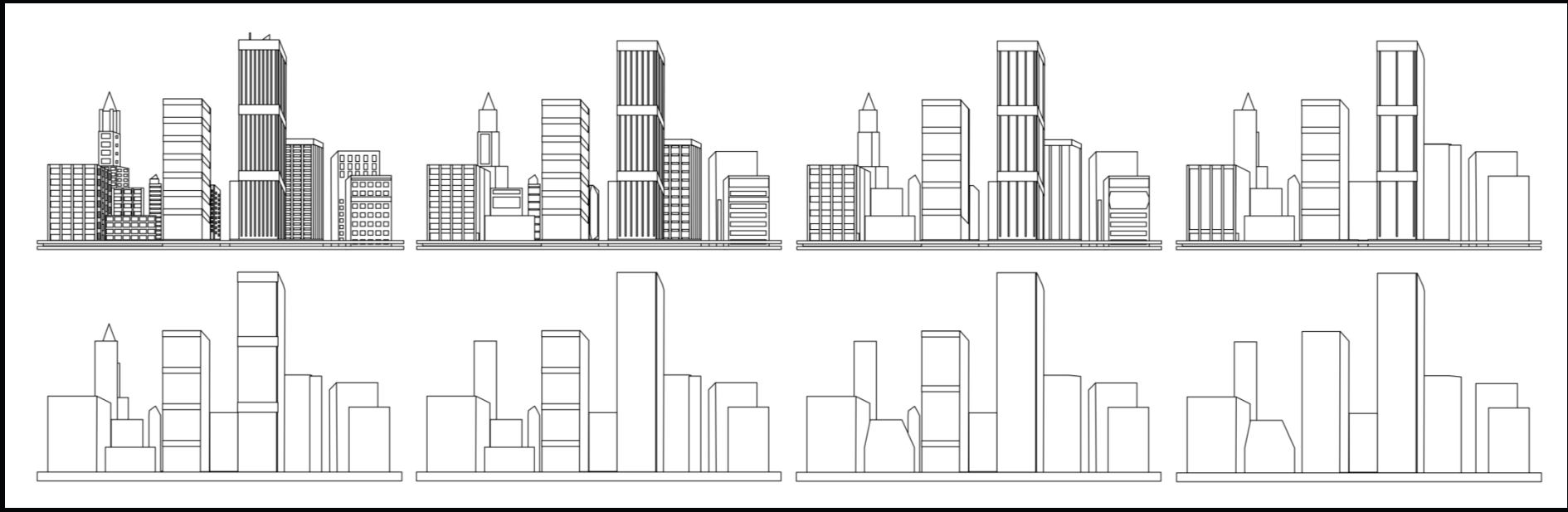


Level of Detail

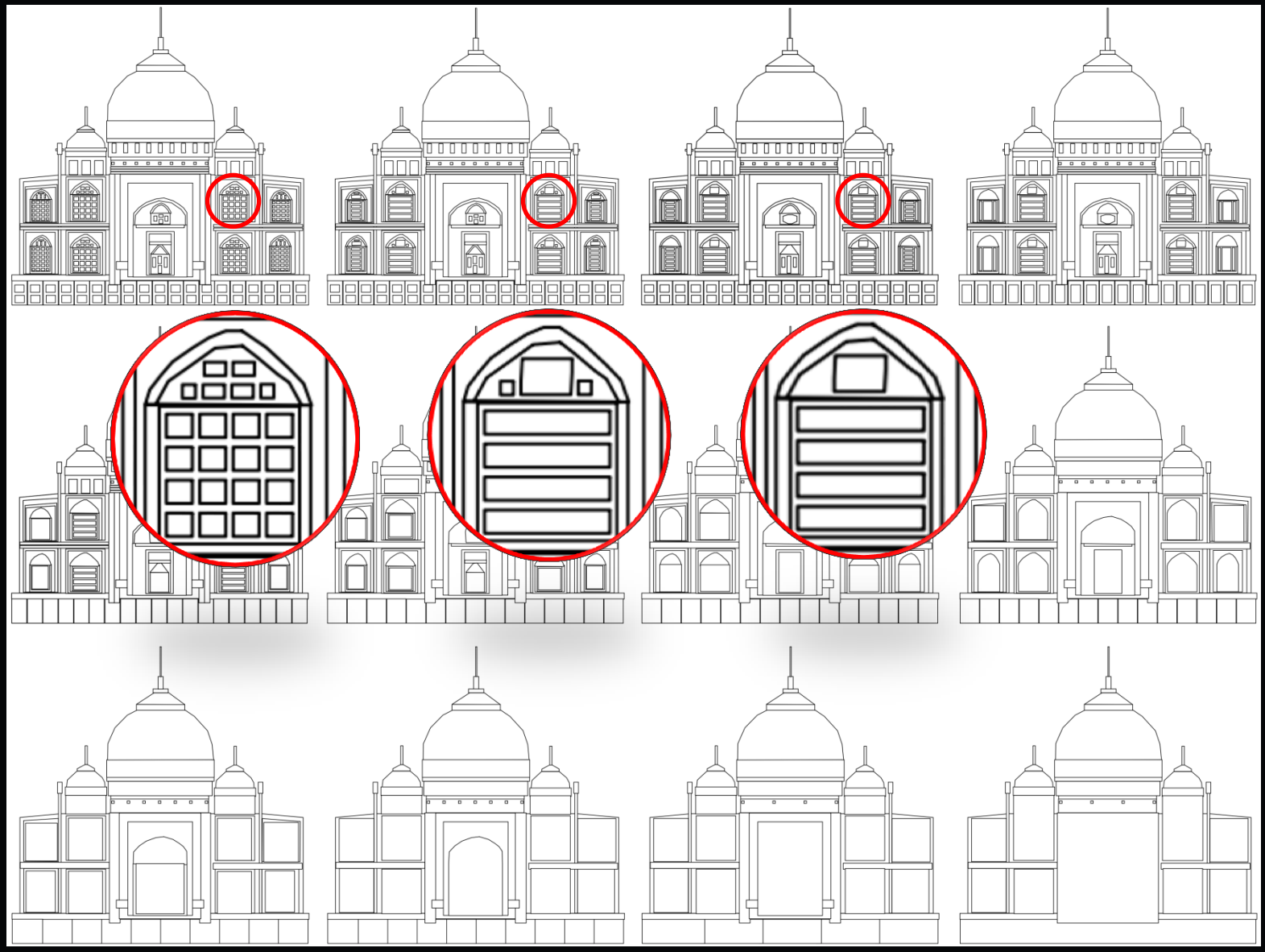
Progressively simplified results



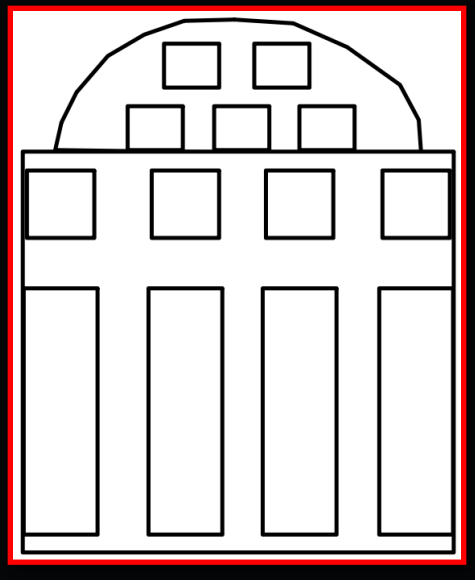
Results

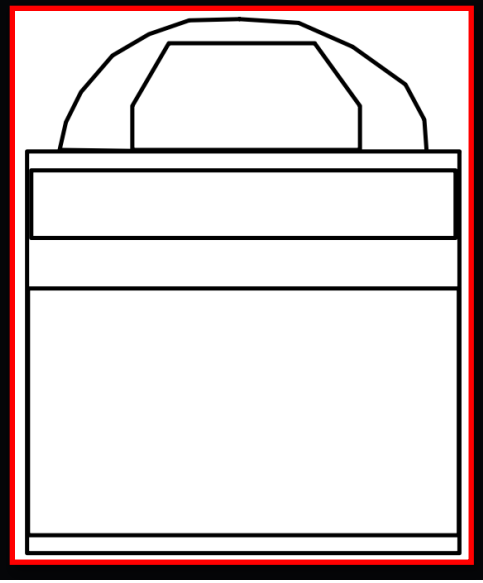


Results

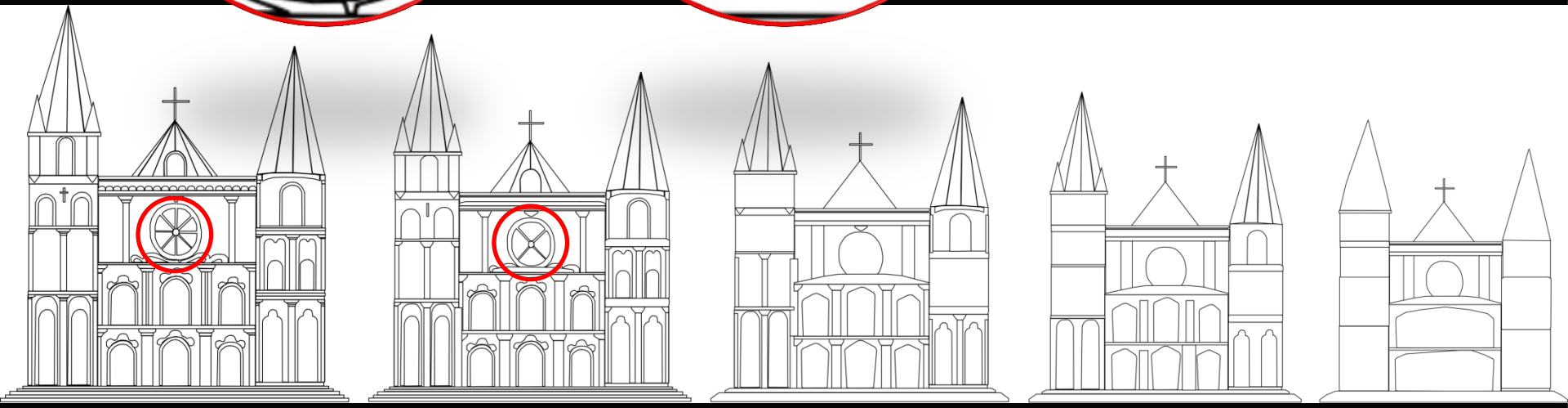


Results

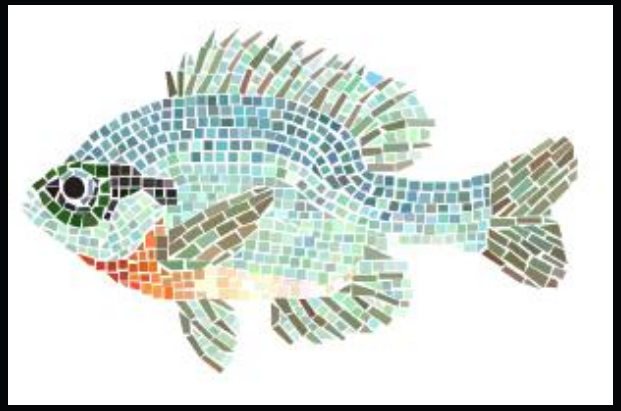


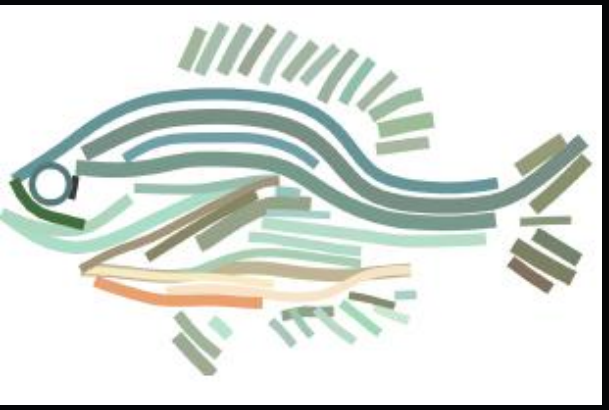


Results

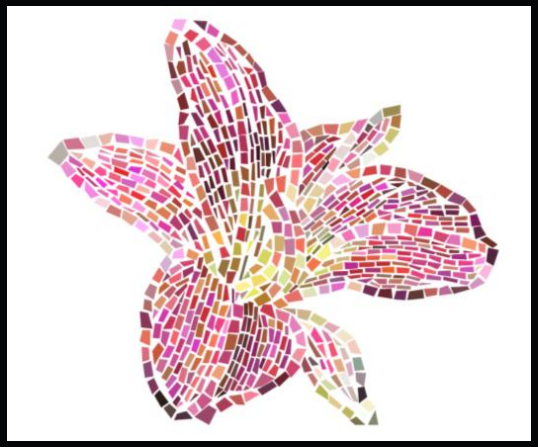


Extension to Mosaics





Extension to Mosaics



Conclusion

- Computational framework
- Abstraction of architectural drawings
- Attempt extension to mosaics

SIGGRAPHASIA2011
HONG KONG

谢谢！