

# Example-based Facade Texture Synthesis

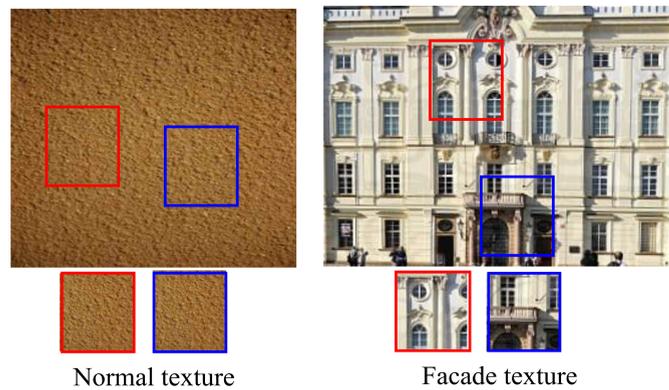
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## Why facade synthesis?

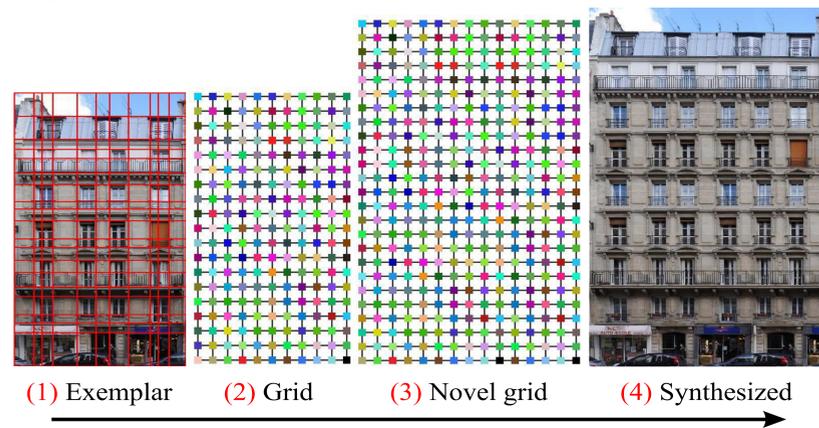
- ▶ Automatic creation of photo-realistic city models
- ▶ Occlusion completion of facade images

## Why a specific method for facades?

- ▶ Facade textures are neither **local** nor **stationary**, but contain semantic **components** and follow architectural **rules**

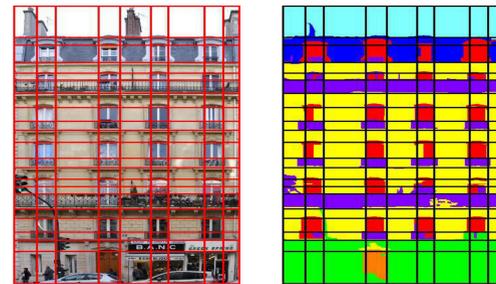


## How?



- (1) Exemplar's Irregular Rectangular Lattice
- (2) Exemplar's grid representation with its tile indices as labels
- (3) Inferred labels (exemplar's tile indices) for a novel grid
- (4) A synthesized facade by assembling the inferred tiles

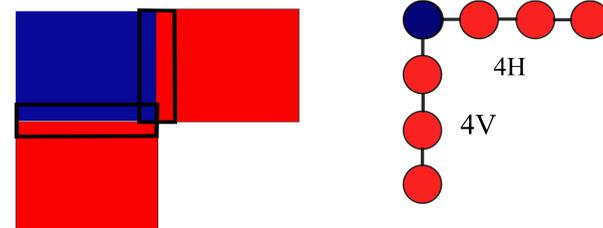
## Automatic Lattice Parsing (1)



- ▶ Automatic facade labeling into 7 semantic classes
- ▶ Greedy parsing guided by **semantic edge** like [1] and **spatial regularity**

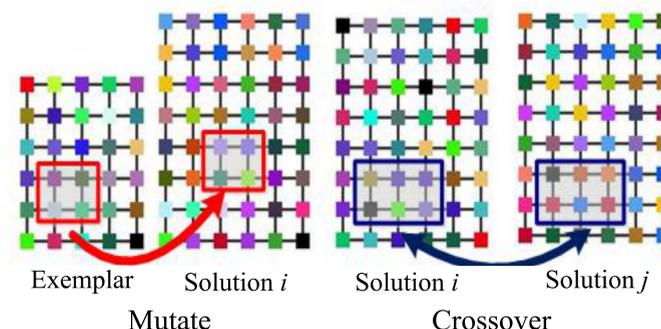
## Genetic algorithm (3)

- ▶ Two constraints: **Photo Consistency (PC)** and **Structural Consistency (SC)** to avoid artifacts at pixel level and structural level

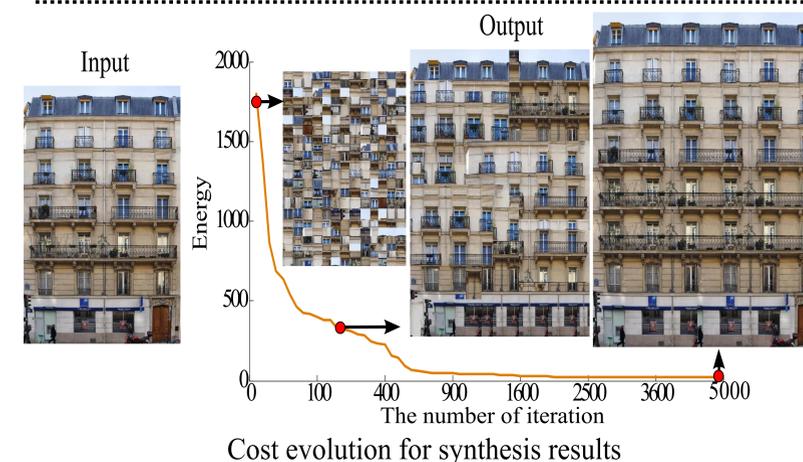
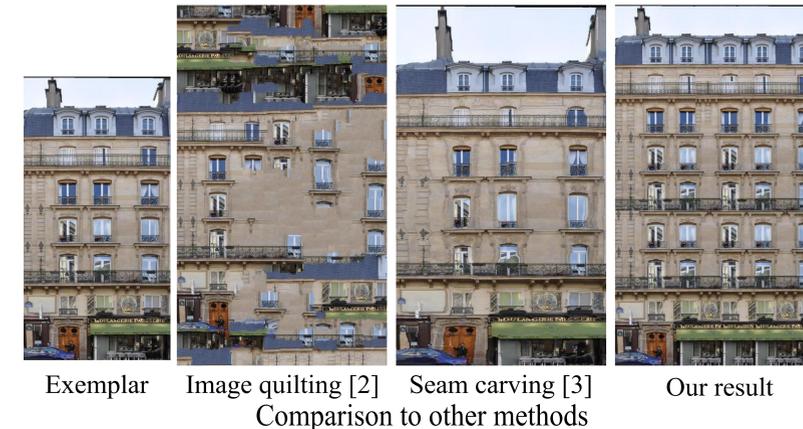


PC: assembled patches should be similar to some patches of the exemplar  
 SC: assembled structures should be similar to some structures of the exemplar

- ▶ Two adapted operators: **Mutate** and **Crossover** to search the optimal solution

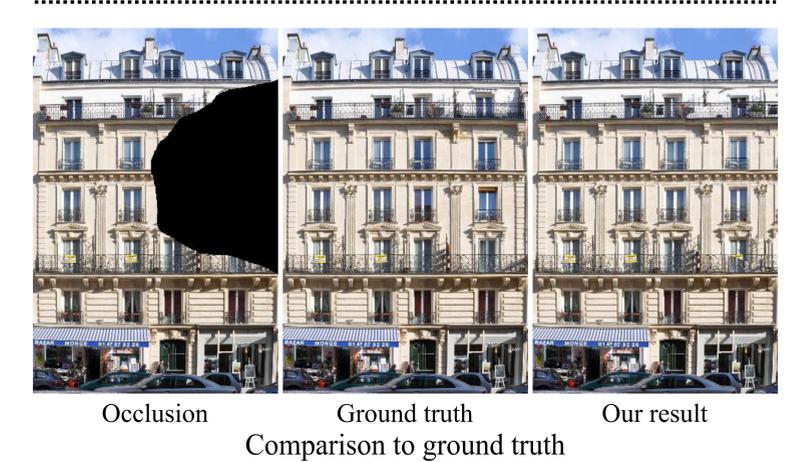
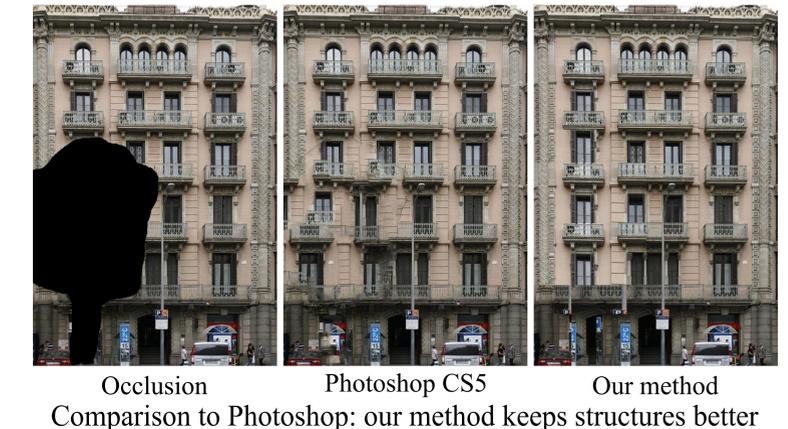


## Synthesis Results



Synthesis results of our method: top (exemplars), bottom (synthesized)

## Inpainting Results



## Conclusion

- ▶ The method works well for different styles of facades
- ▶ The method takes 6-10 mins for each facade
- ▶ Data and more results are available at [www.vision.ee.ethz.ch/~daid/FacadeSyn](http://www.vision.ee.ethz.ch/~daid/FacadeSyn)



## References

- [1] H. Riemenschneider, U. Krispel, W. Thaller, M. Donoser, S. Havemann, D. Fellner, and H. Bischof. Irregular lattices for complex shape grammar facade parsing. In CVPR, 2012.
- [2] A. A. Efros and W. T. Freeman. Image quilting for texture synthesis and transfer. In SIGGRAPH, 2001.
- [3] S. Avidan and A. Shamir. Seam carving for content-aware image resizing. In SIGGRAPH, 2007.