



SIGGRAPH 2025

The Premier Conference & Exhibition on
Computer Graphics & Interactive Techniques

BUILDINGBLOCK: A HYBRID APPROACH FOR STRUCTURED BUILDING GENERATION

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BACKGROUND: 3D ASSET GENERATION



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text



image



3D Asset Generation Model



Assets



Virtual Reality



Games

BACKGROUND: 3D ASSET GENERATION



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text



image



3D Asset Generation Model



Assets



Virtual Reality



Games

BACKGROUND: EXISTING WORK



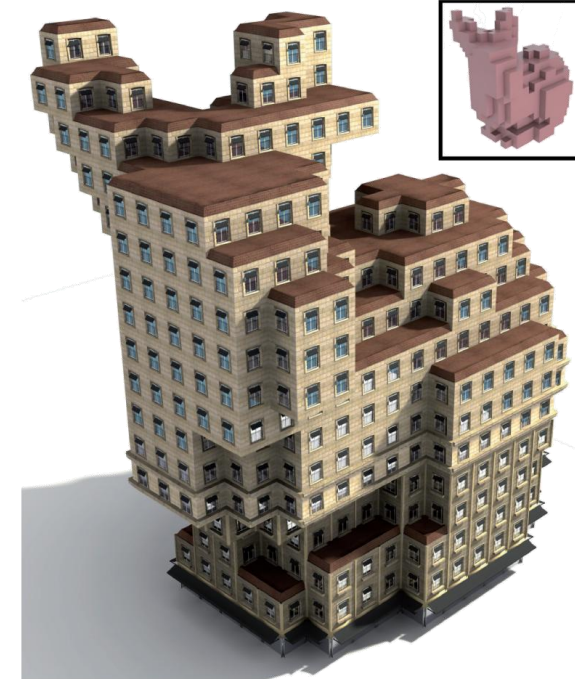
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Procedural Generation for Architecture[Alkaim 2015]



Procedural modeling of buildings[Müller P, et al. 2006]



Metropolis procedural modeling[JO Talton,et al. 2011]

1. Hierarchical architectural structure
2. Distinct and sharp edges
3. Realistic materials and clear semantics

1. Elements not vary enough.
2. Often relies on rules, lacking creativity.
3. Cannot be controlled by natural language.

BACKGROUND: EXISTING WORK

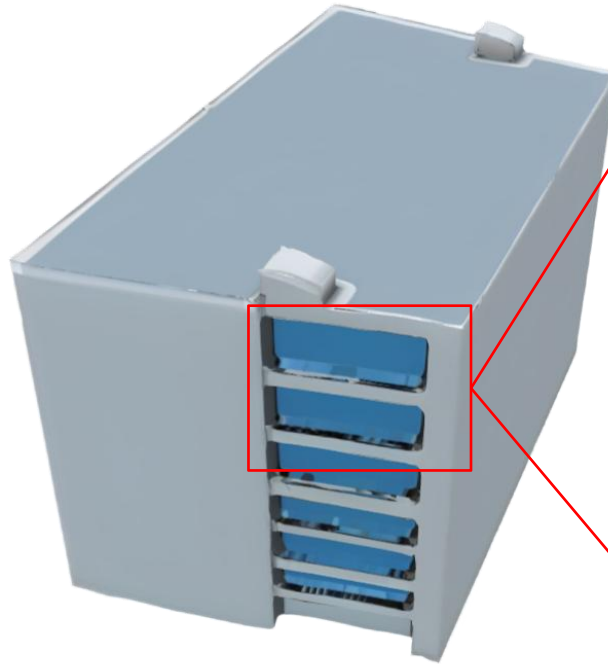


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Meshy [Hu 2024]

- 1.Strong controllability
- 2.Can generate diverse results
- 3.Automatically learns from data



Rodin Gen-1.5 [Zhang et al. 2024]

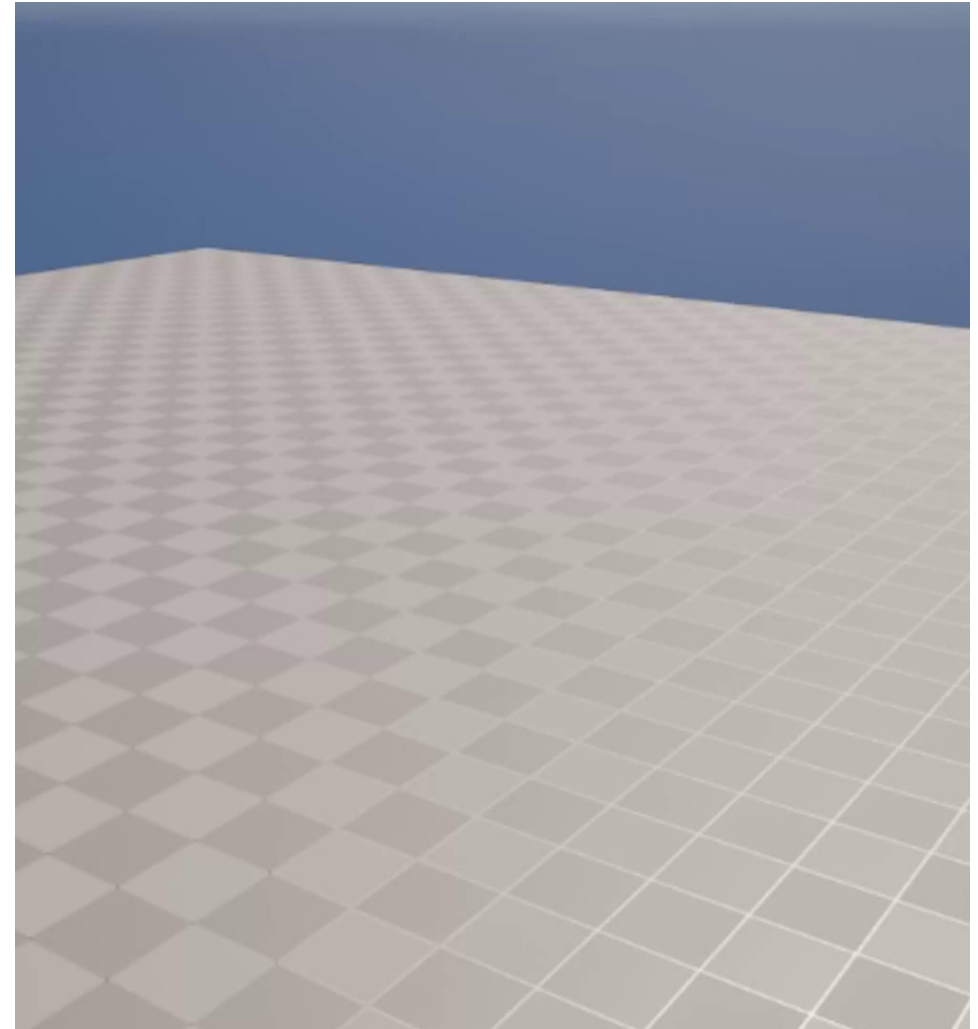
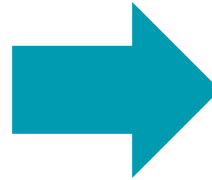


1. The unclear edges of component.
2. Lack of clear semantics & physical properties.
3. Components are non-movable, lacking interactivity.

BACKGROUND: MOTIVATION



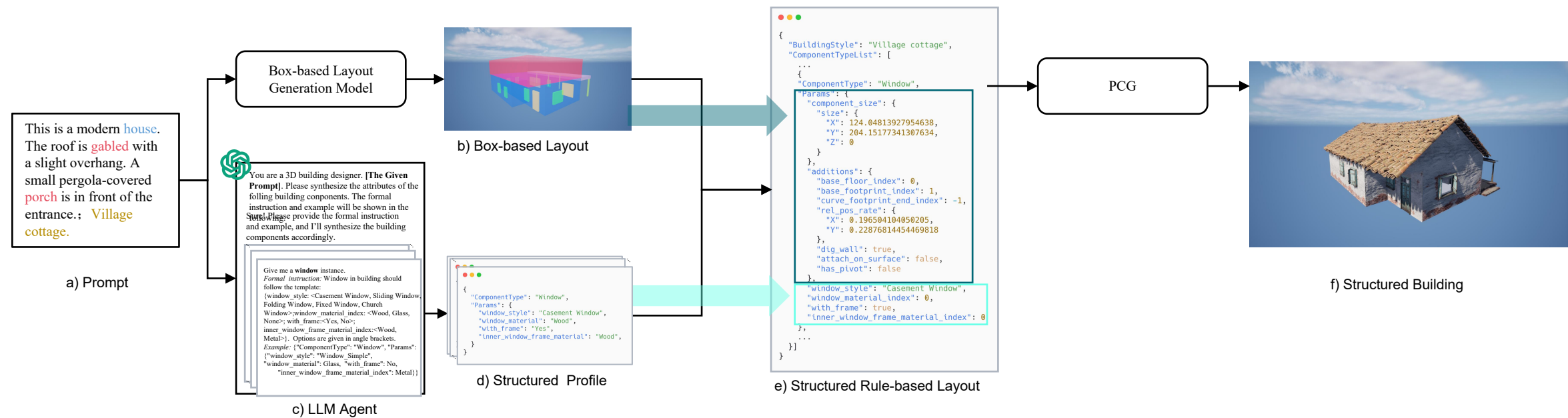
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BUILDINGBLOCK: PIPELINE



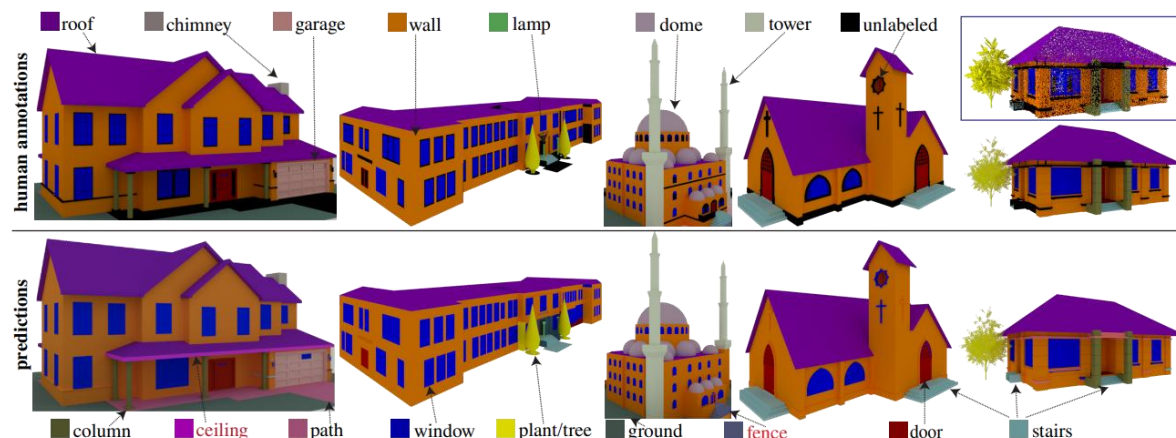
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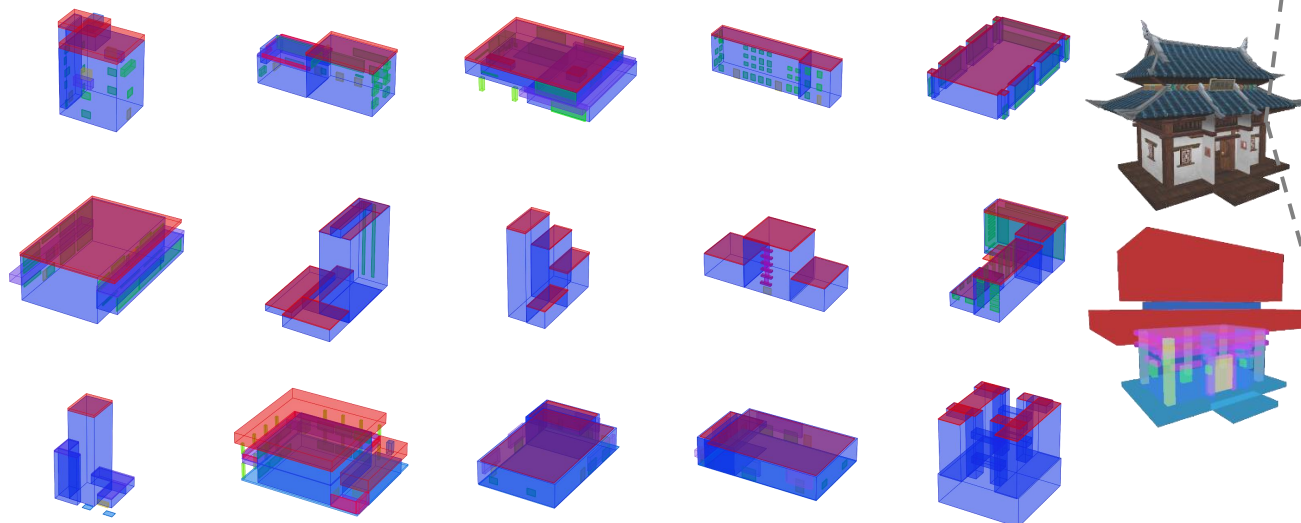
BUILDINGBLOCK: DATA PREPARATION



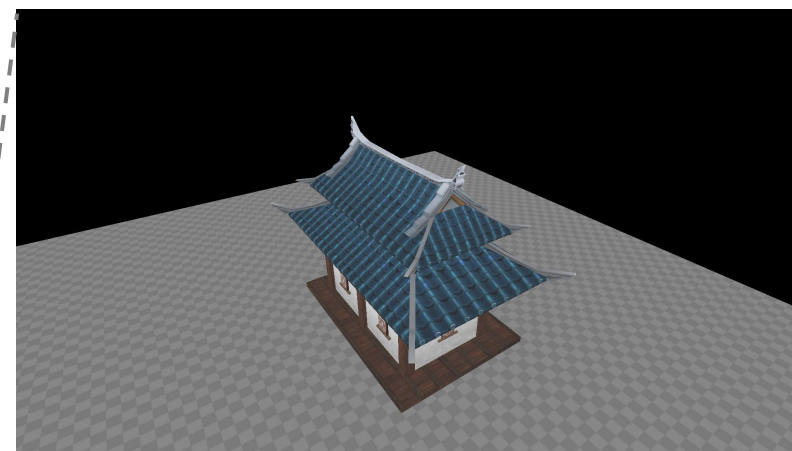
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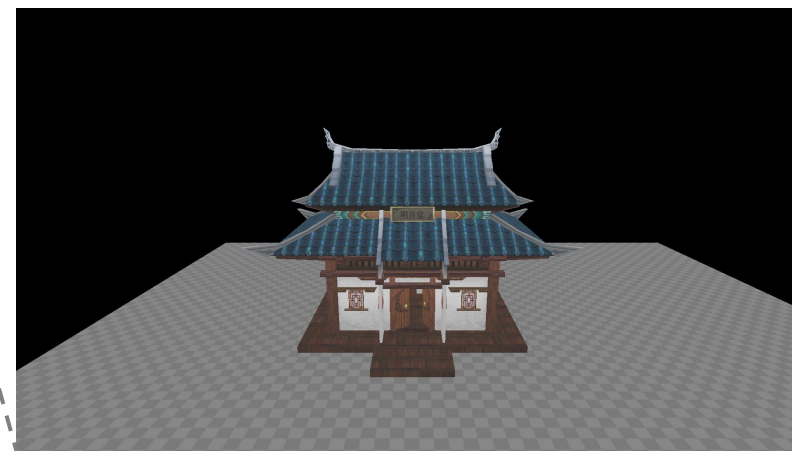
BuildingNet[P Selvaraju, et al. 2021]



This is
a The roof
features two
tiers...



...a central
door flanked
by two square
windows...

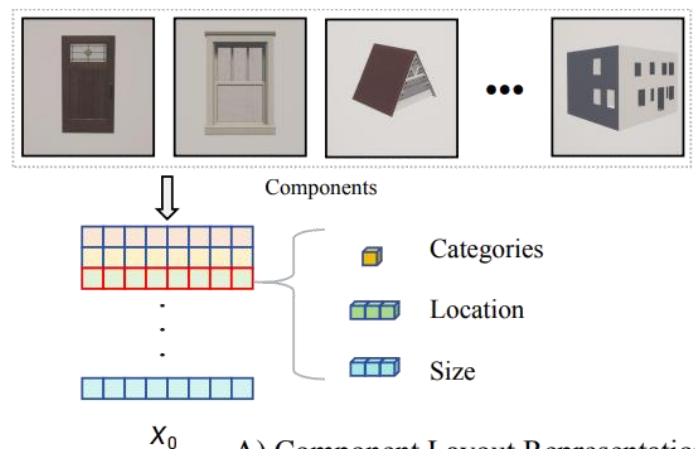


8 views in total

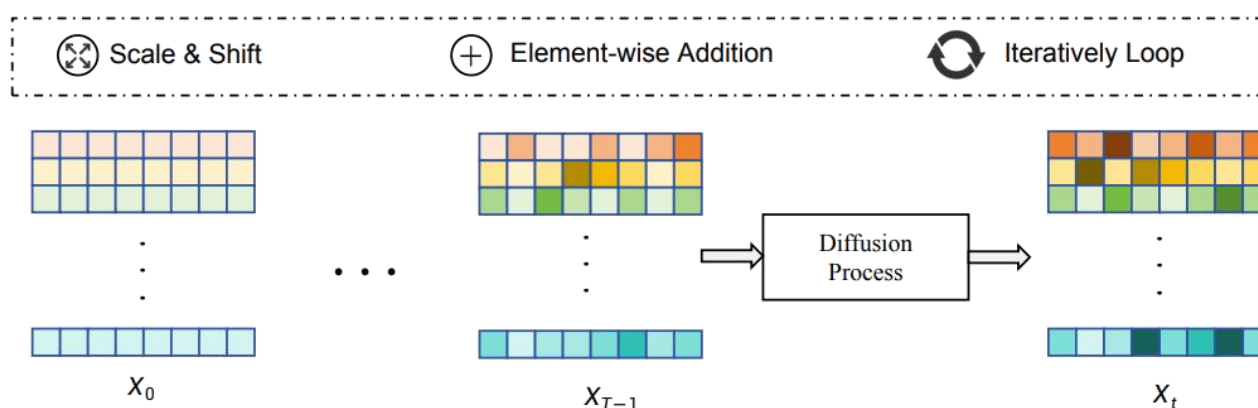
BUILDINGBLOCK: LAYOUT GENERATION MODEL



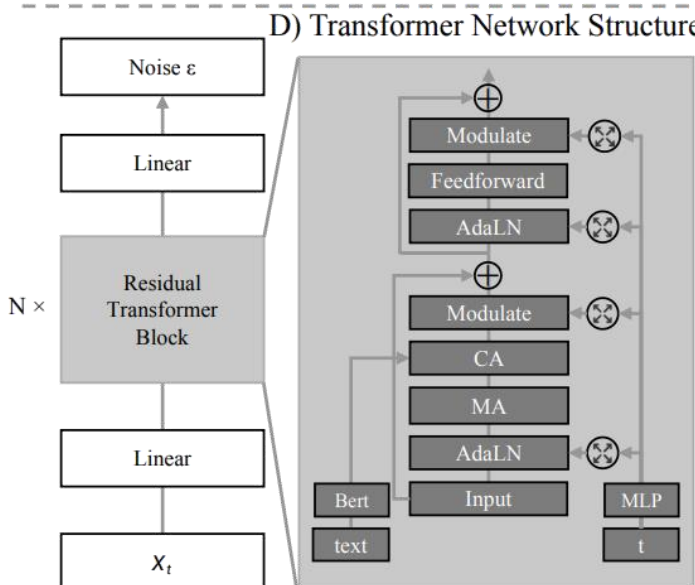
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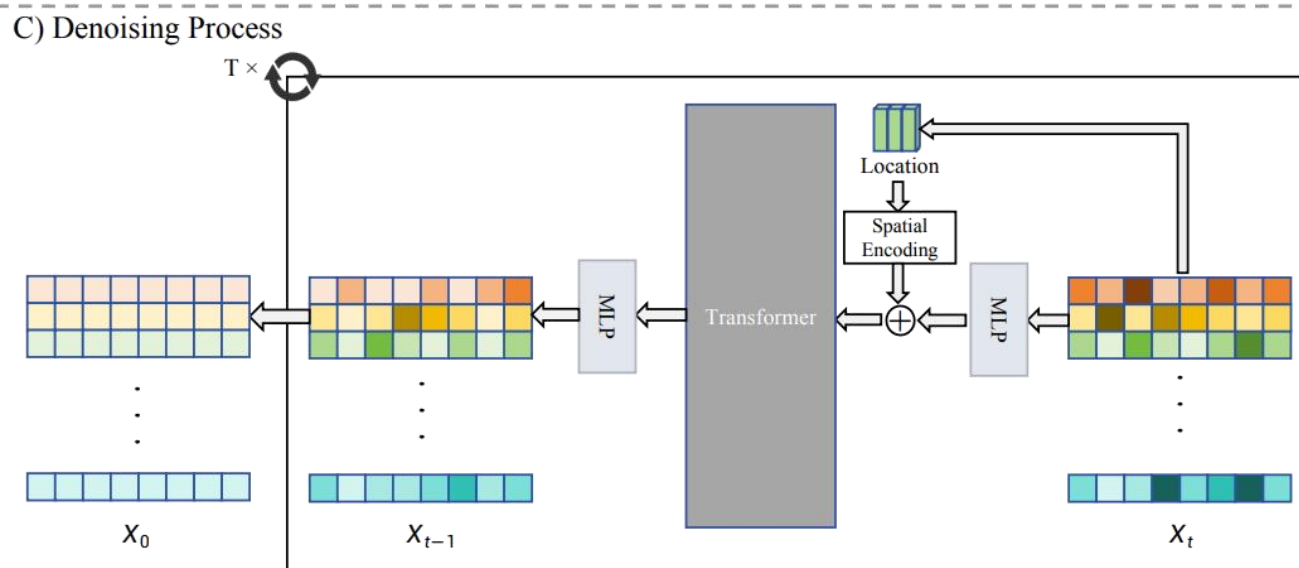
A) Component Layout Representation



B) Diffusion Forward



D) Transformer Network Structure

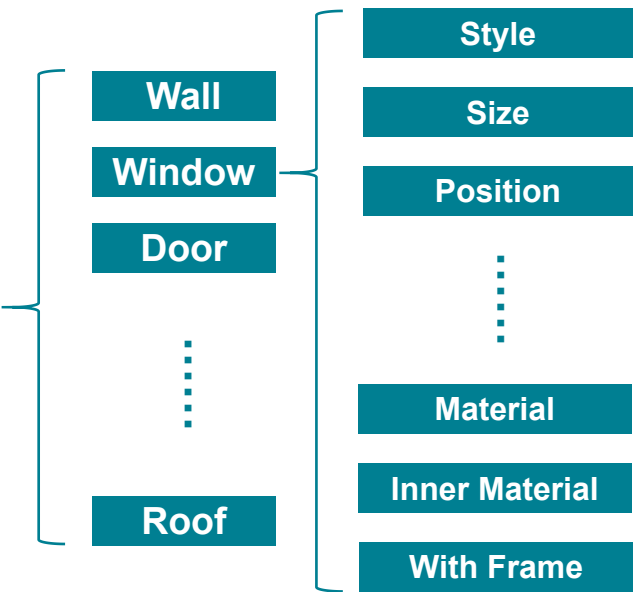
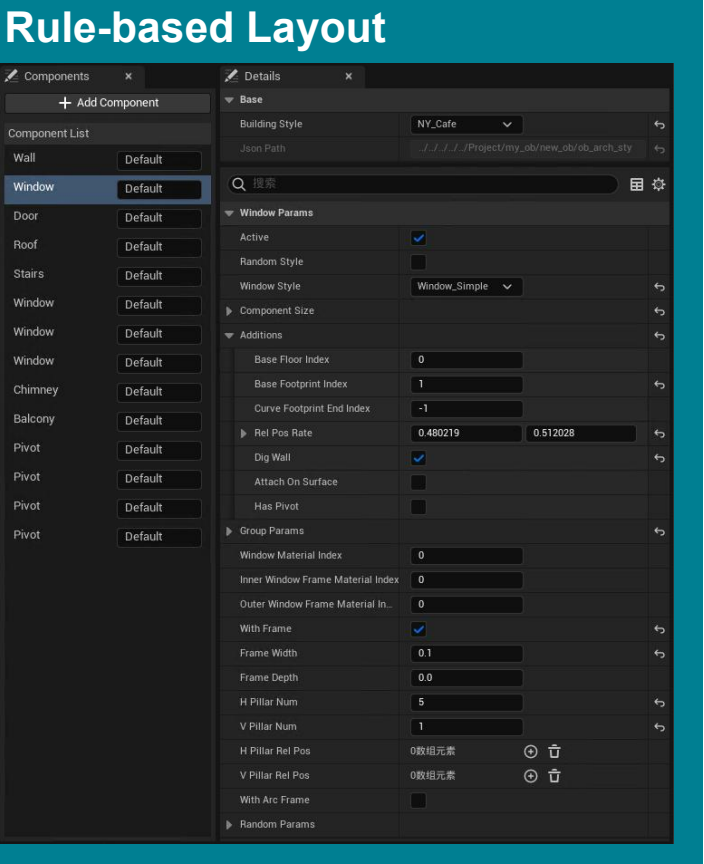
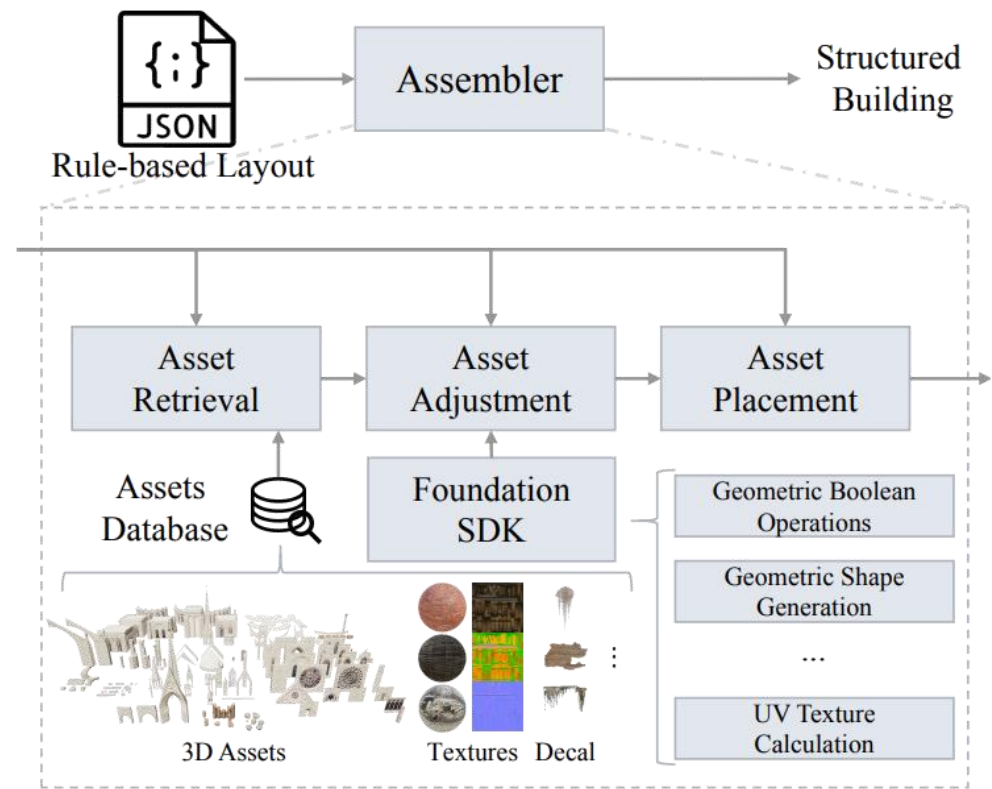


C) Denoising Process

BUILDINGBLOCK: BUILDING GENERATION MODEL



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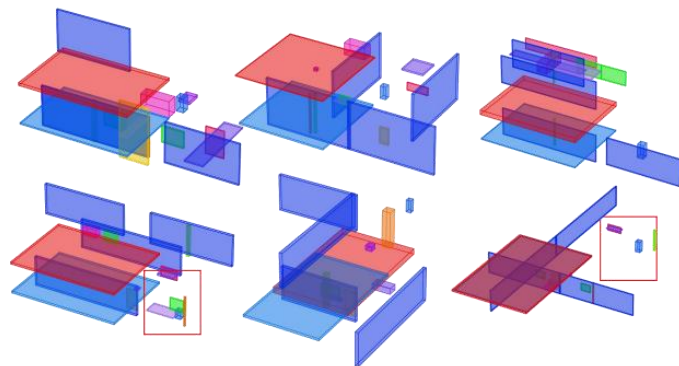


BUILDINGBLOCK: LAYOUT GENERATION

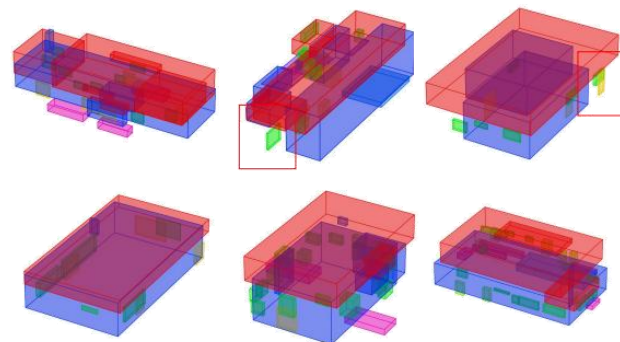


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LayoutGPT



DiffuScene



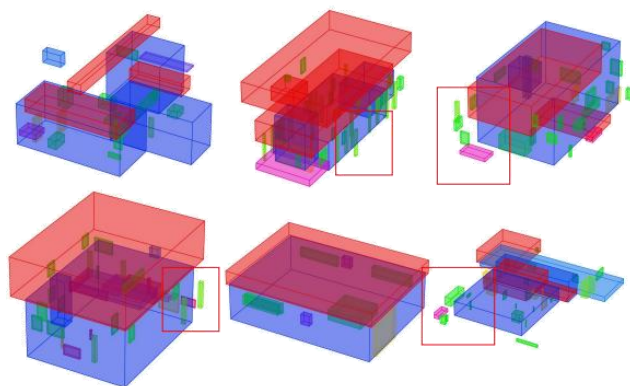
Legend

- Accessory
- Window
- Balcony
- Chimney
- Door
- Stair
- Pillar
- Awning
- Railing
- Pipe
- Roof
- Floor
- Wall

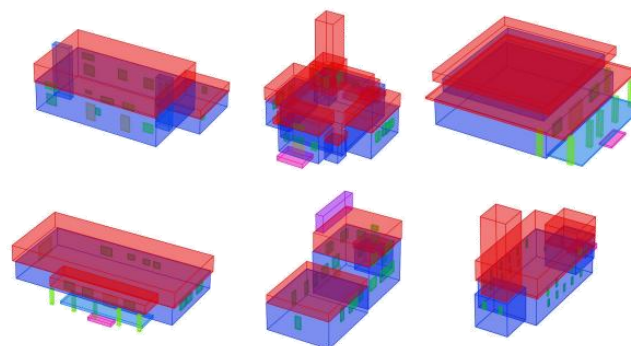
(a) Building layout generation.

Method	FID↓	KID↓
LayoutGPT*	94.60	10.05
ATISS	30.93	3.34
DiffuScene	20.95	1.95
Ours	6.00	0.30

ATISS



Ours



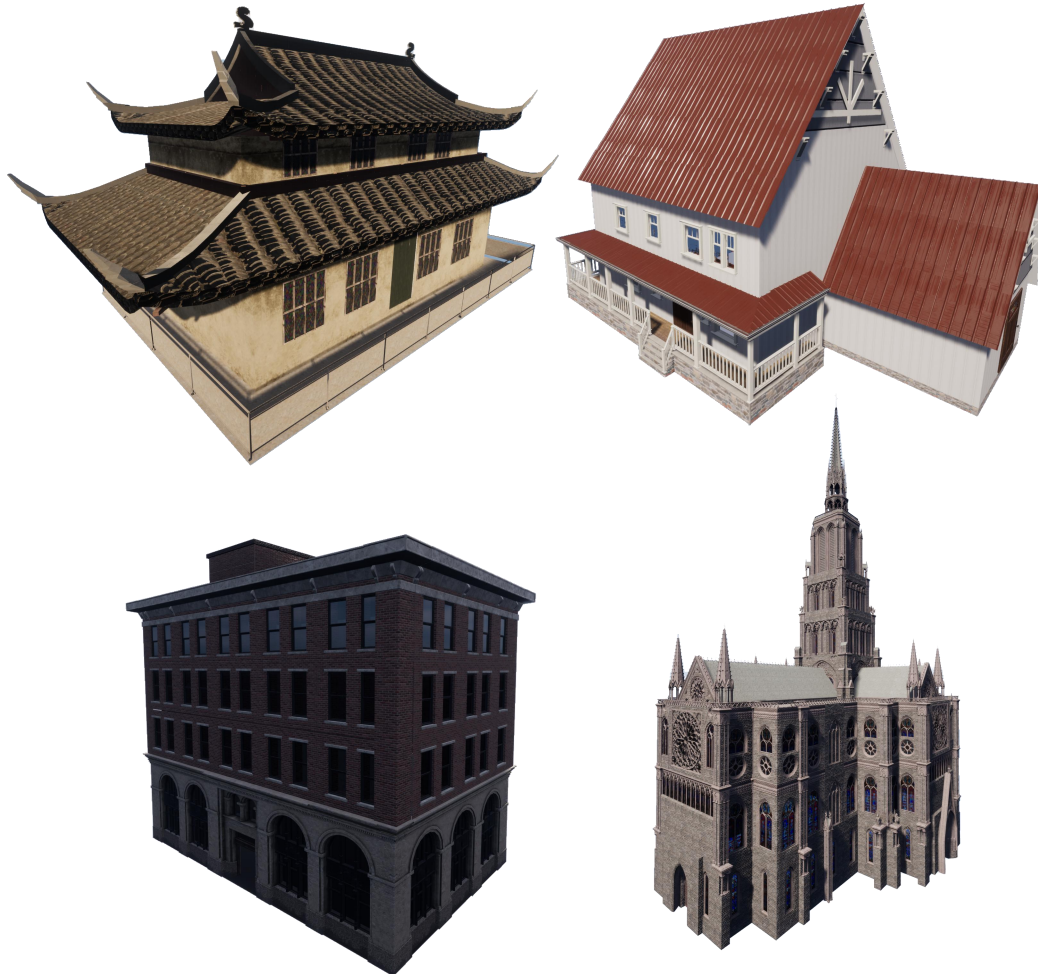
(b) Indoor layout generation.

method	FID↓	KID↓
LayoutGPT*	45.13	9.89
ATISS	18.60	1.72
DiffuScene	17.21	0.70
Ours	16.76	0.29

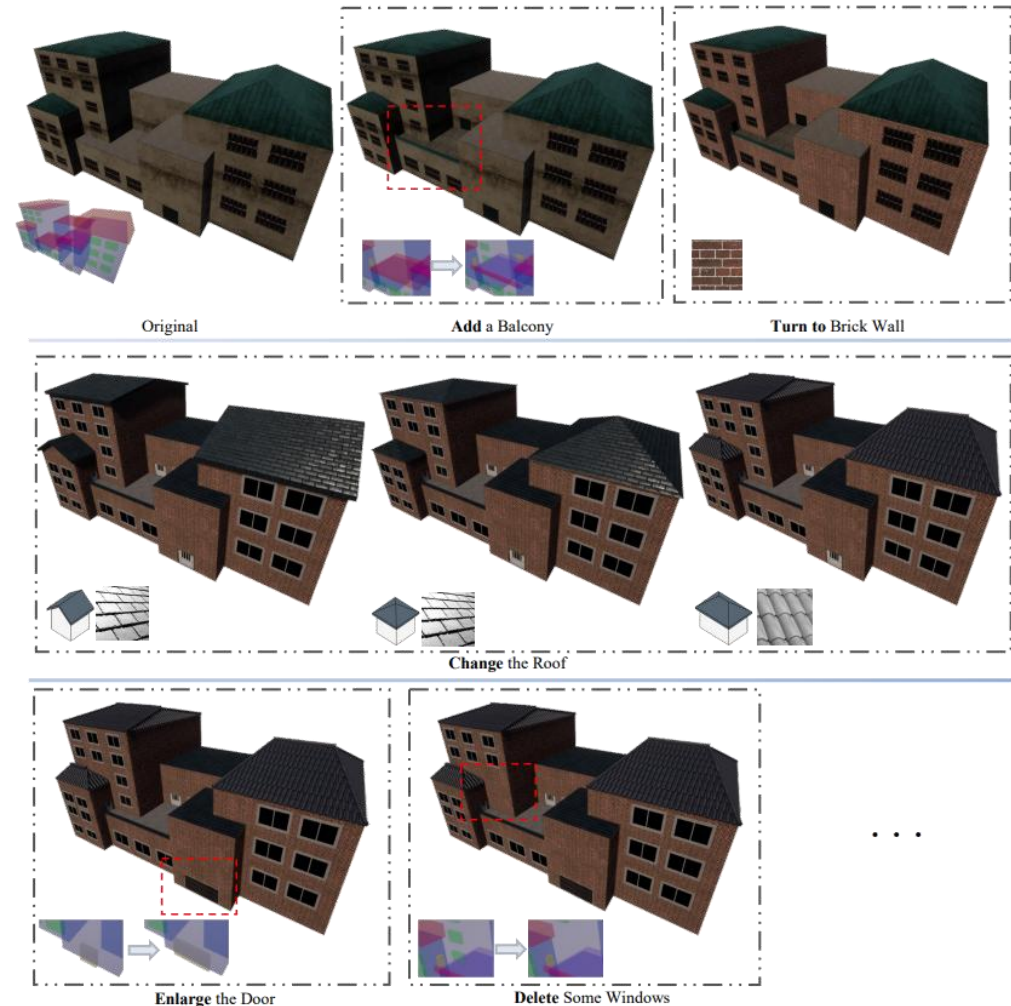
BUILDINGBLOCK: BUILDING GENERATION



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The buildings generated by our method



Editing Process