

3D Rendering with OSM2World

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SotM 2021

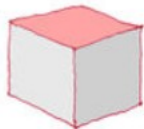
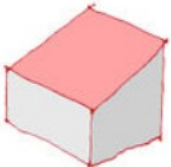
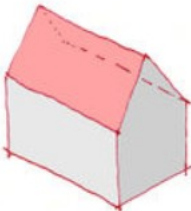
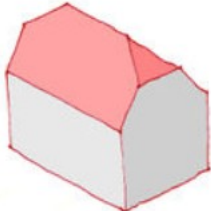
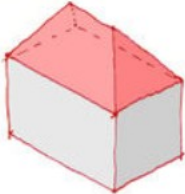
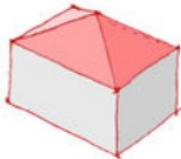

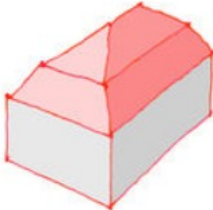
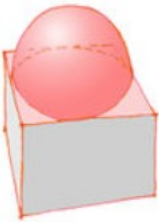

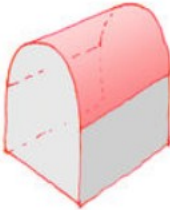
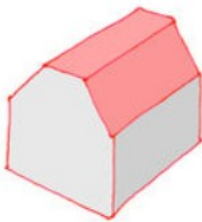
OSM2World

- Creates 3D models from OSM data
- Exports to ...
 - model files (OBJ, glTF)
 - PNG images, including 2D map tiles
 - interactive scenes with OpenGL/WebGL

<http://osm2world.org>



Simple 3D Buildings (S3DB)

					
flat	skillion	gabled	half-hipped	hipped	pyramidal
					
gambrel	mansard	dome	onion	round	saltbox

Many other features

- Roads and lanes
- Railways, waterways, urban furniture, vegetation, power lines, sports, barriers, parking spaces, airports, ...
- See 2018 presentation “3D Beyond Buildings”
- List of tags: taginfo.osm.org/projects/osm2world

Feature Spotlights





Feature Spotlights

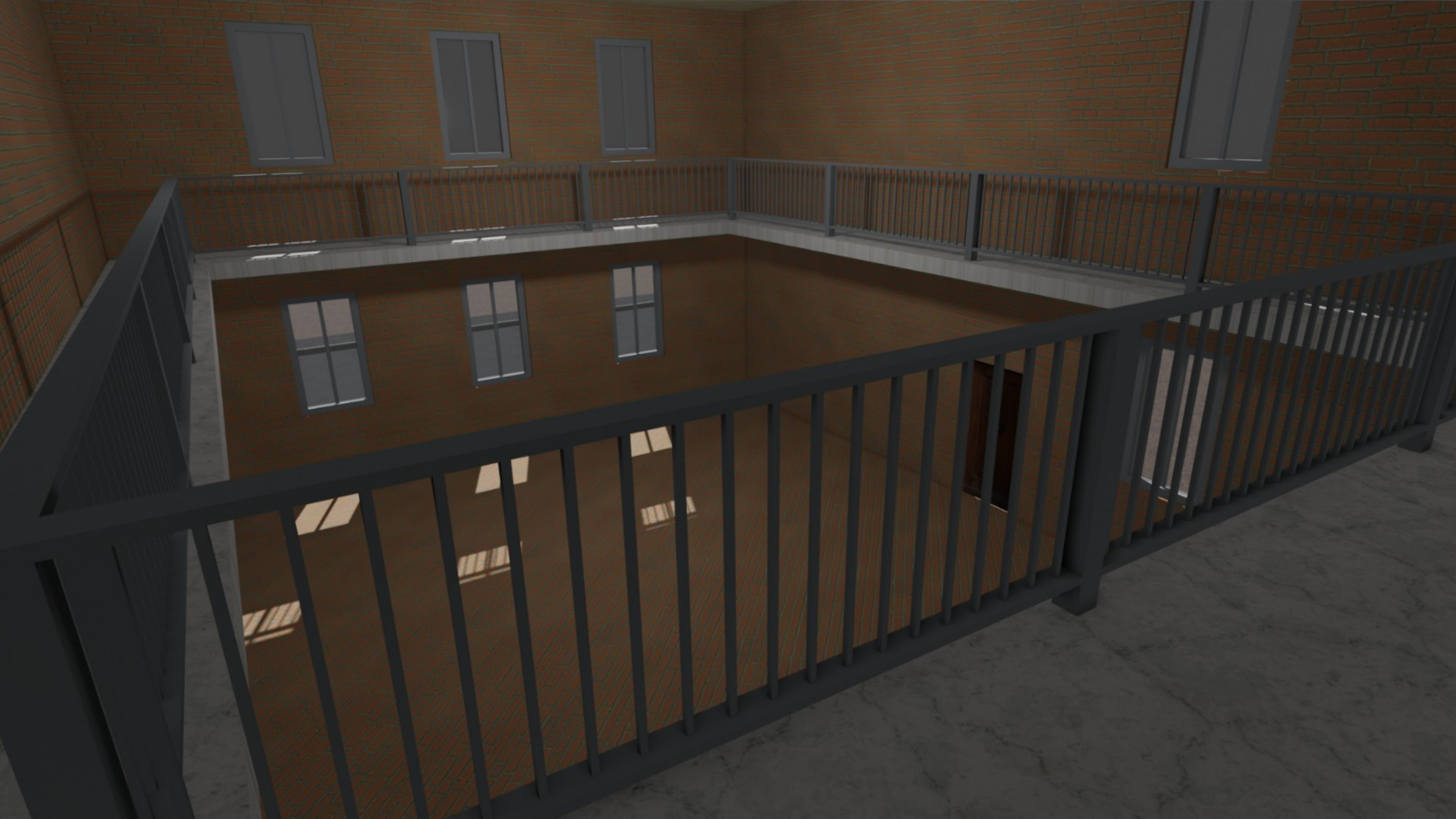
Simple Indoor Tagging

Simple Indoor Tagging

- Standard for indoor mapping
- Designed to be compatible with S3DB
- Has elements for rooms, areas, walls
- Almost any feature can appear indoors

Indoor in OSM2World

- GSoC 2020 contributions by Daniel Weaver
- Combine:
 - Simple 3D Buildings (outside of buildings)
 - Simple Indoor Tagging (inside of buildings)
- Goal: Seamless 3D world



Open tagging challenges

- Interaction of SIT with building:part mapping
- Indoor features outside buildings (e.g. stations)
- Height differences within a level
- Balconies, etc.

Feature Spotlights

Attachment connectors



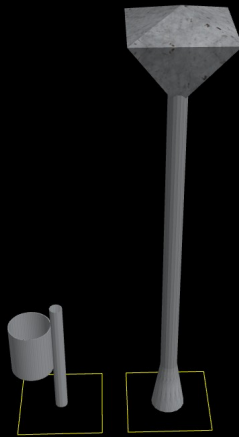
Attachment connectors



amenity=waste_basket

highway=street_lamp

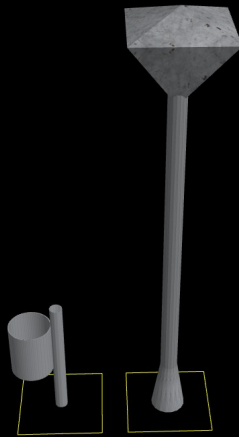
Attachment connectors



amenity=waste_basket

highway=street_lamp

Attachment connectors



support=street_lamp
amenity=waste_basket

highway=street_lamp

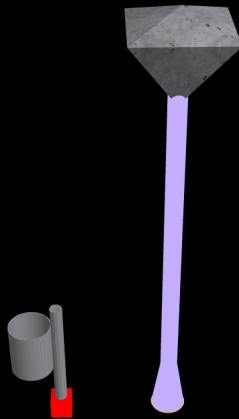
Attachment connectors



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amenity=waste_basket

highway=street_lamp

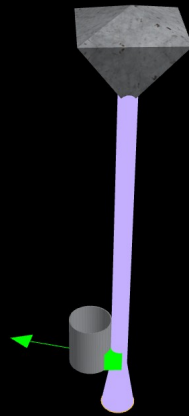
Attachment connectors



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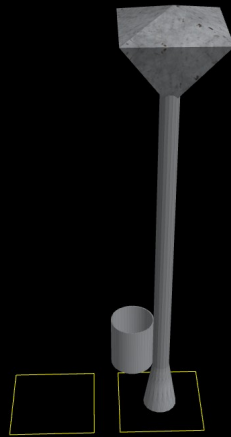
Attachment connectors



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Attachment connectors

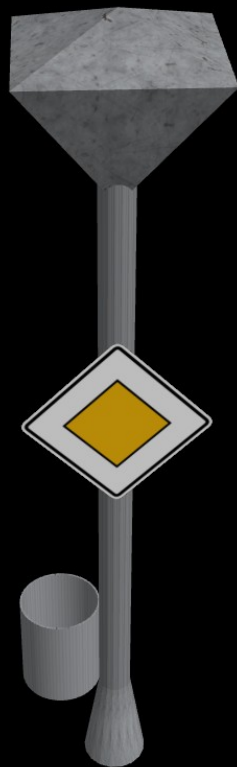


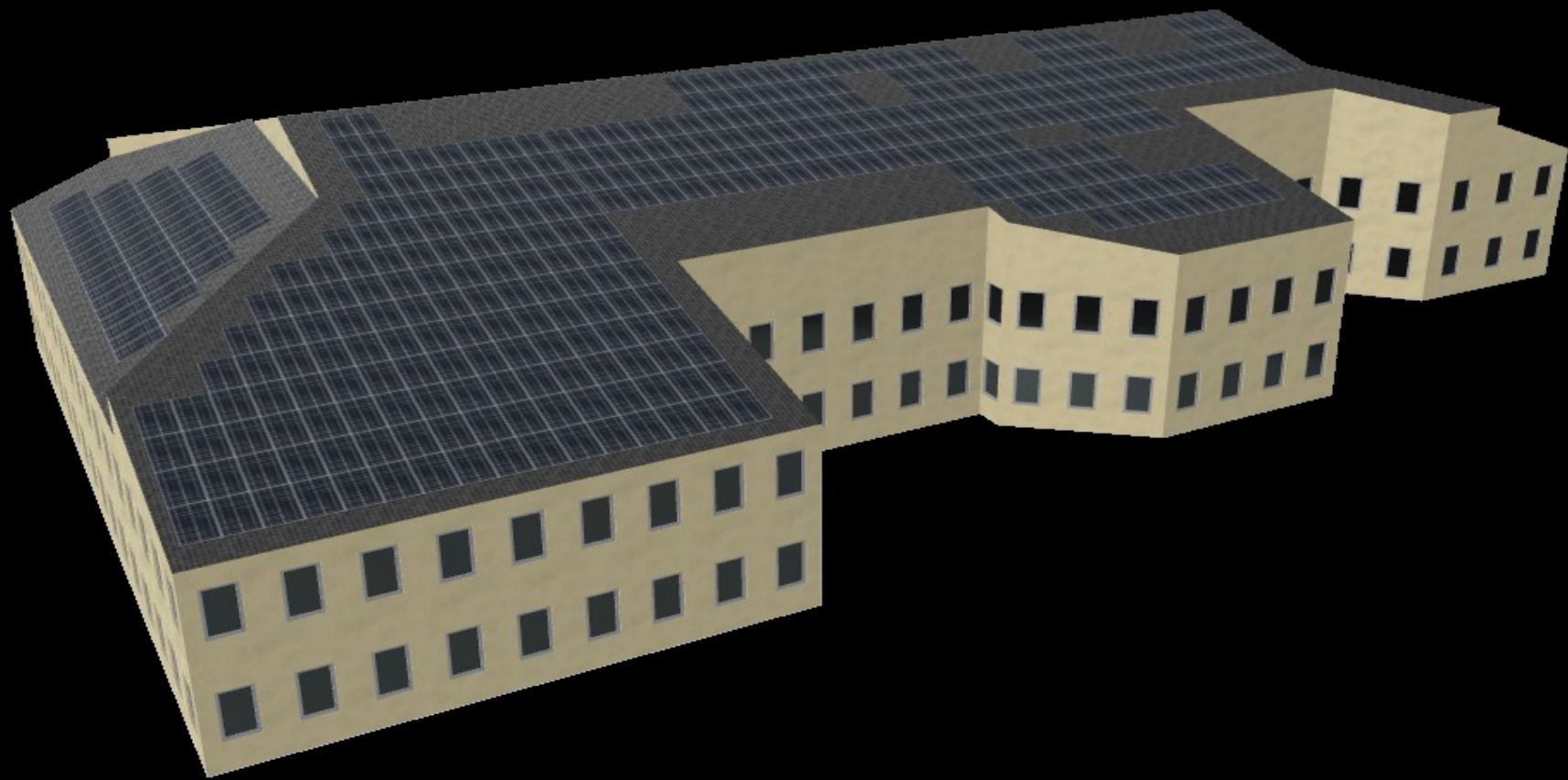
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amenity=waste_basket

highway=street_lamp

Attachment connectors

- Define:
 - surfaces that objects can attach to
 - connectors that want to attach to surfaces
- Find closest suitable surface for each connector
- Move and rotate objects appropriately
 - general and flexible approach





Other attachment examples

- rooftop parking
- objects on outdoor and indoor walls
- objects on indoor floors
 - may attach to multiple levels, e.g. stairs
- objects on bridges

Feature Spotlights

Physically based rendering



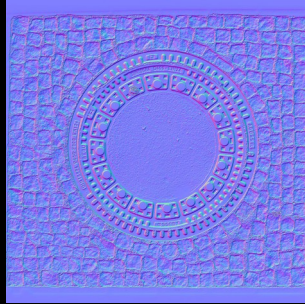
PBR

- “Physically Based Rendering”
- way to calculate light interaction with 3D objects
- based on physics-inspired material properties
e.g. roughness, metalness
- improves visuals, compatibility
- notable: many textures

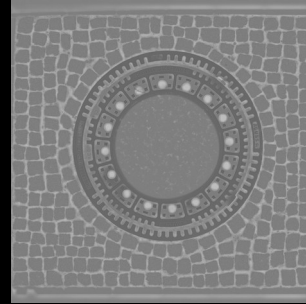
PBR textures



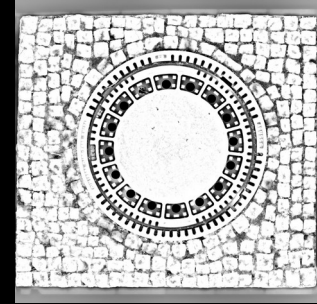
Color



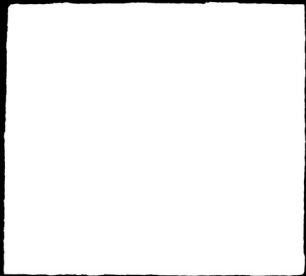
Normal



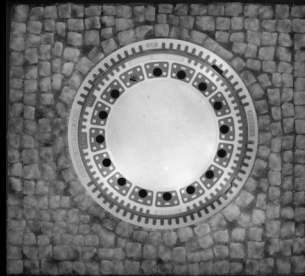
Roughness



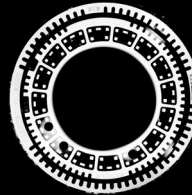
Occlusion



Opacity



Displacement

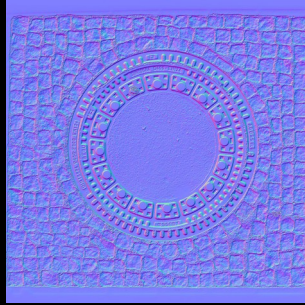


Metalness

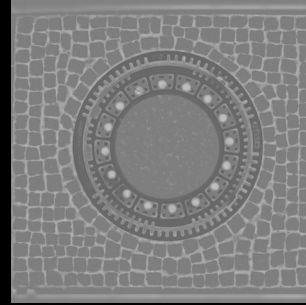
PBR textures



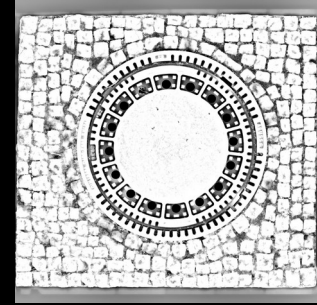
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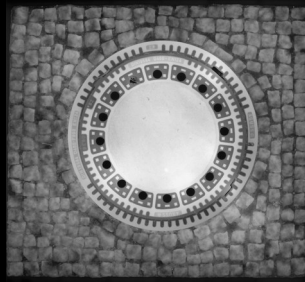
Normal



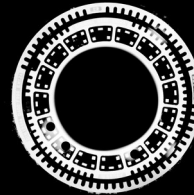
Roughness



Occlusion



Displacement

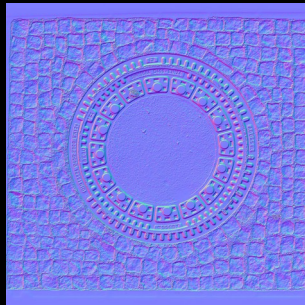


Metalness

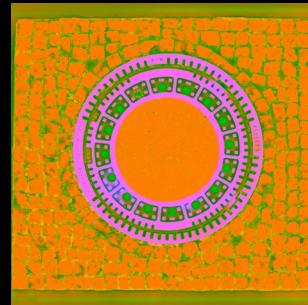
PBR textures



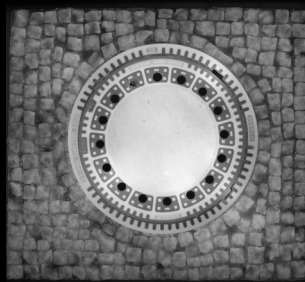
Color



Normal



ORM



Displacement

Texture sources

- Raster images (JPEG, PNG)
 - check out ambientCG.com
- Vector images (SVG)
- Images generated on demand

Texture sources

- Raster images (JPEG, PNG)
 - check out ambientCG.com
- Vector images (SVG)
- Images generated on demand
 - Text textures



Texture sources

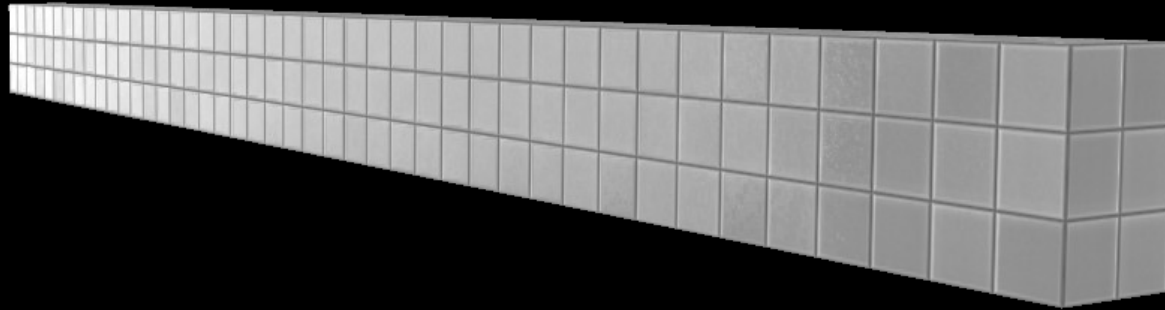
- Raster images (JPEG, PNG)
 - check out ambientCG.com
- Vector images (SVG)
- Images generated on demand
 - Text textures
 - Composite textures



Colorable materials

- color can be multiplied with the texture
- supports common S3DB tagging
 - `building:material = ...`
 - `building:colour = ...`
- allows for random variations

Texture snapping



glTF

- open standard for 3D models, “JPEG of 3D”
- glTF 2.0, with PBR, supported by OSM2World
- self-contained model files







Feature Spotlights
Real-time performance

Real-time performance

Upcoming features:

- Level of Detail
- Instancing
- Texture atlas

Goal: WebGL frontend

Thanks for watching!

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