

# AHMGaussian: Automatic Hybrid-Material Simulation with Gaussians

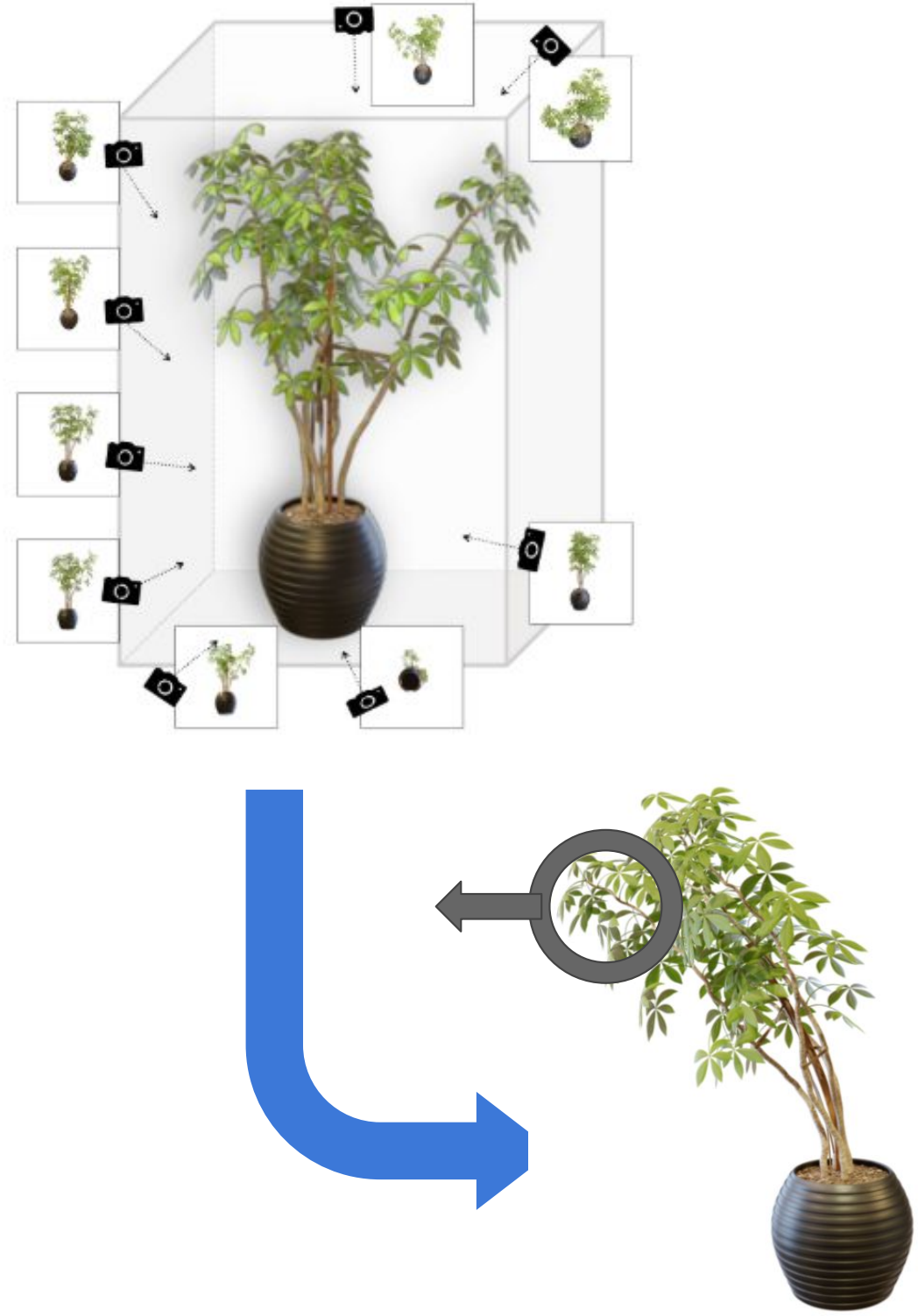
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National Taiwan University



Slide



Github



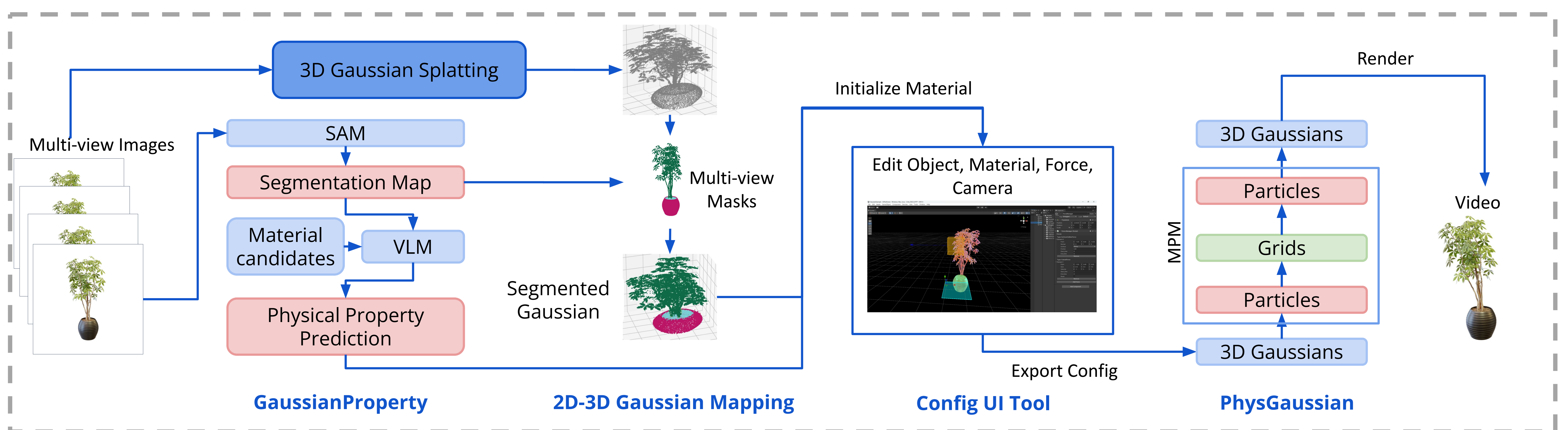
## Motivation

- Generate **physics-informed 3D objects** from images
- Key goal: support diverse materials
- Base method: **PhysGaussian**
- Address limitations:
  - Manual physics parameter setup
  - No visual UI for tuning
  - Weak hybrid material support

## Contribution

- **Auto Material Recognition** - Recognize. Assign. Simulate.
- **Config UI Tool** - Visualize. Adjust. Export.
- **Blob-Level Hybrid Materials**
- **More Material Types**

## Pipeline



## Method Details

### GaussianProperty

- Segment object parts in 2D images using SAM
- Predict material type (from material candidates) and physical properties for each part using VLM (Qwen-VL)
- Output part-wise material and property annotations

### 2D-3D Gaussian Mapping

- Project 3D Gaussians to 2D segmentation masks
- Recognize the material from projected mask region
- Aggregate votes from multi-view masks
- Assign material type and physical parameters

### Config UI Tool

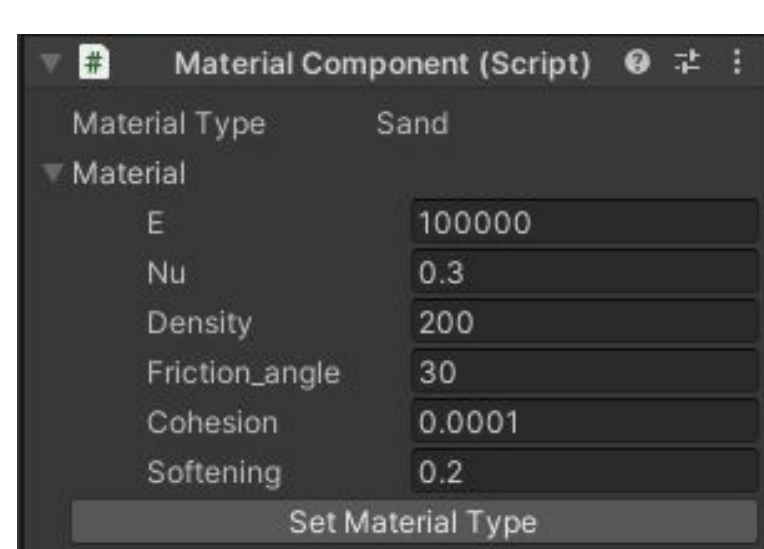
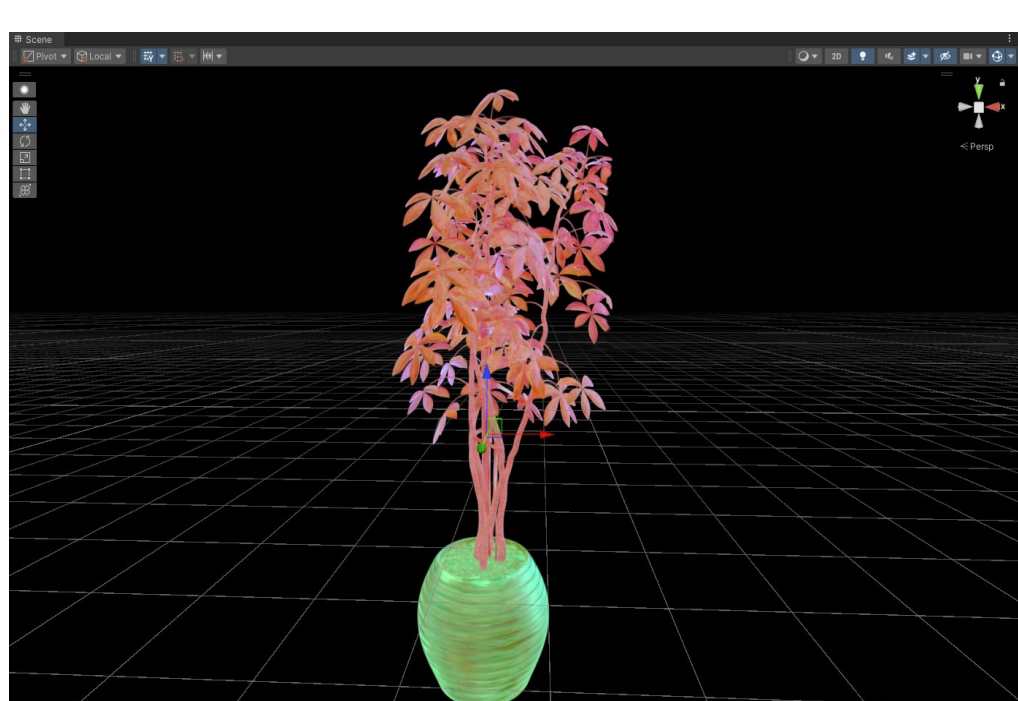
- Load multiple Gaussians & config files
- Visual edit of object, material, force, camera
- Export updated files for simulation

### PhysGaussian

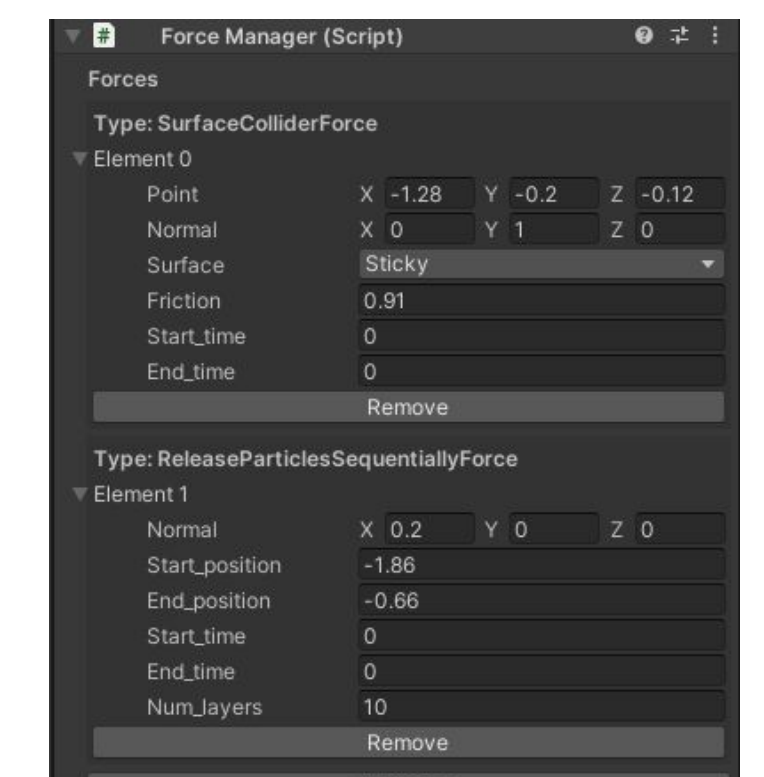
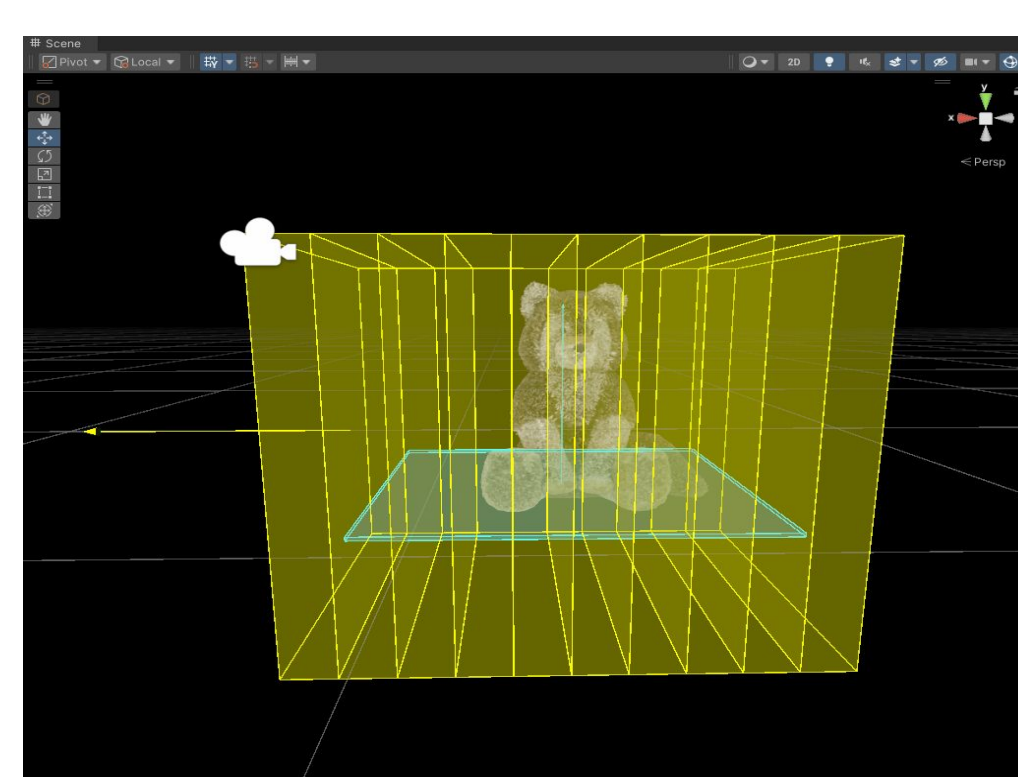
- Updates Gaussians via MPM (Particle → Grid → Particle)
- Our Improvements
  - More Materials(Soil, Liquid)
  - Full-parameter hybrid material

## UI

### Material Editing

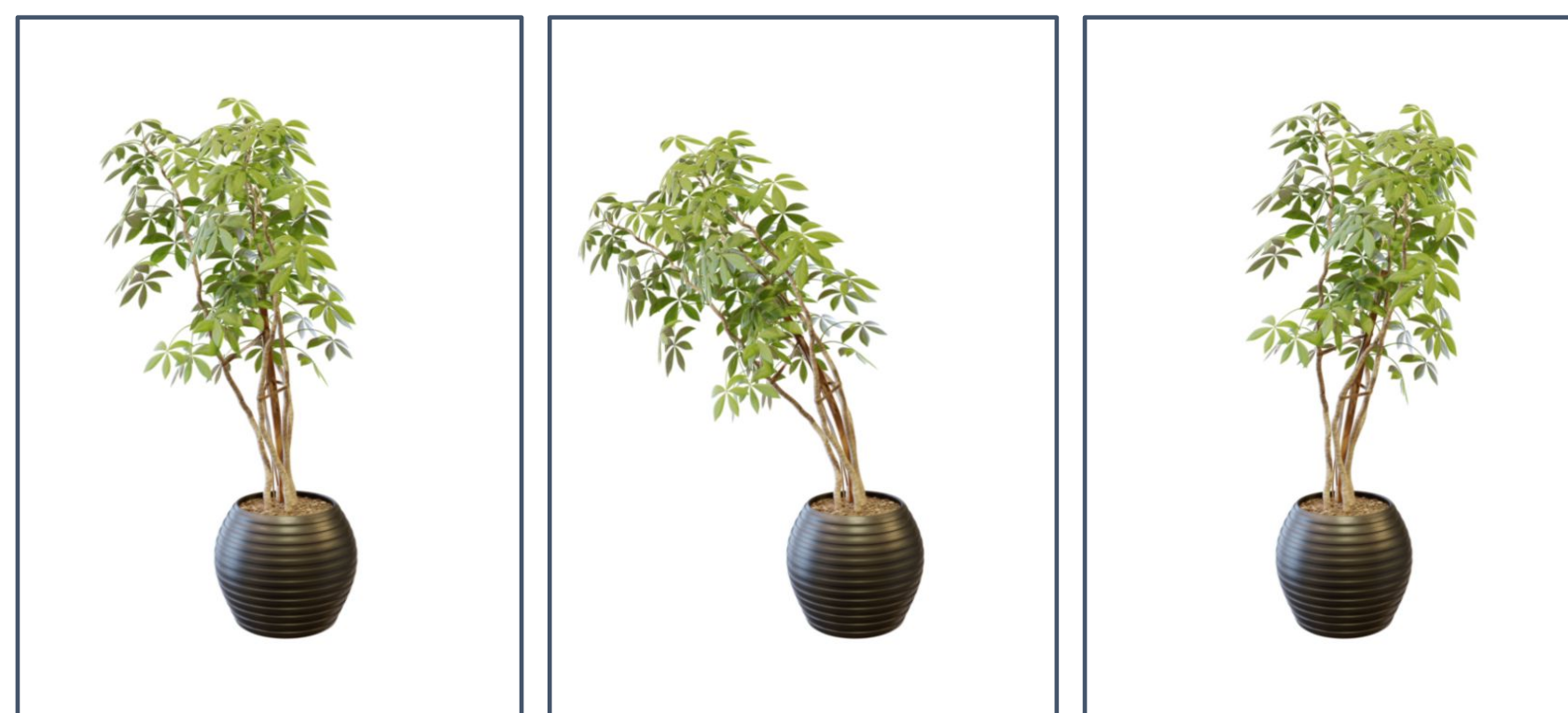


### Force Editing



## Result

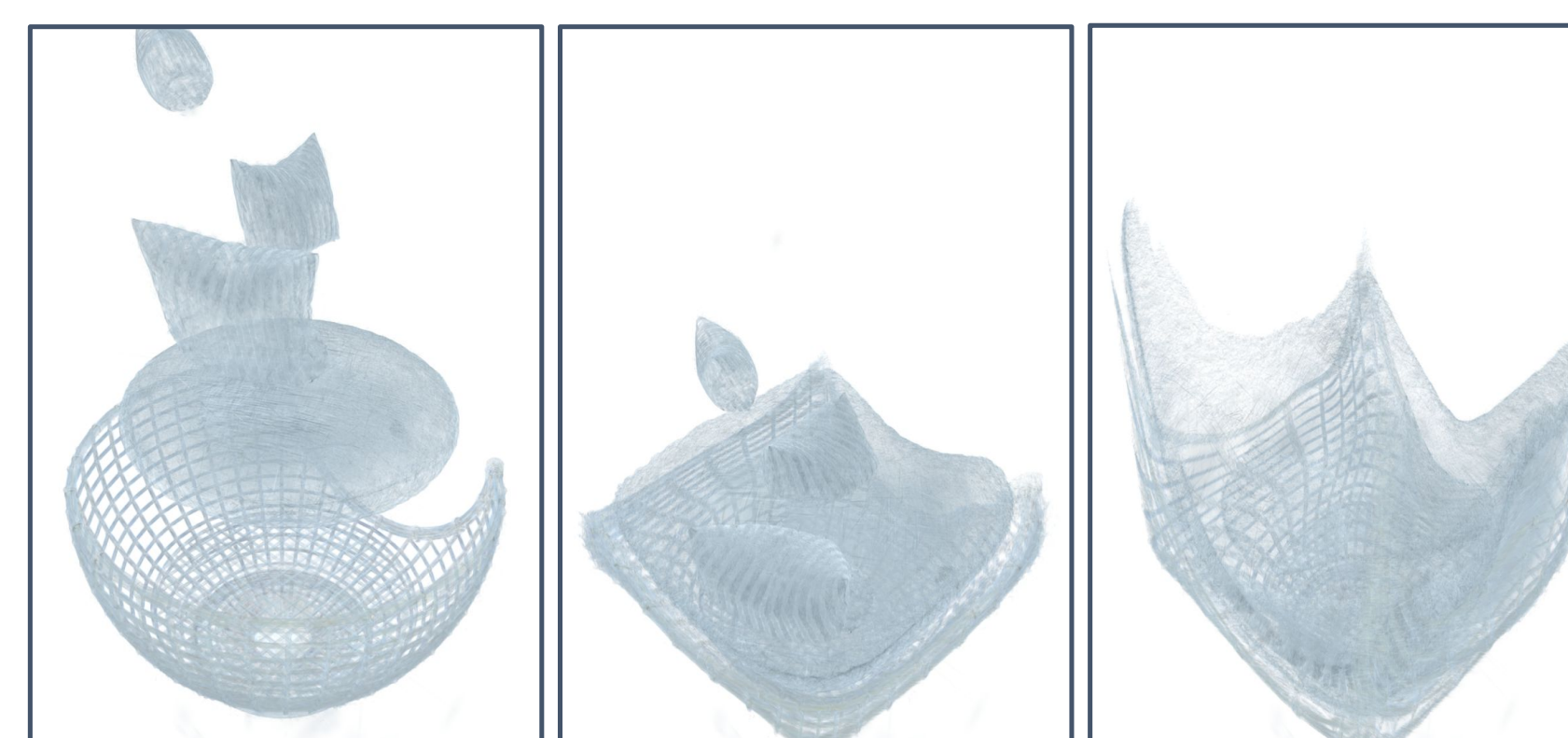
### Auto Material Recognition



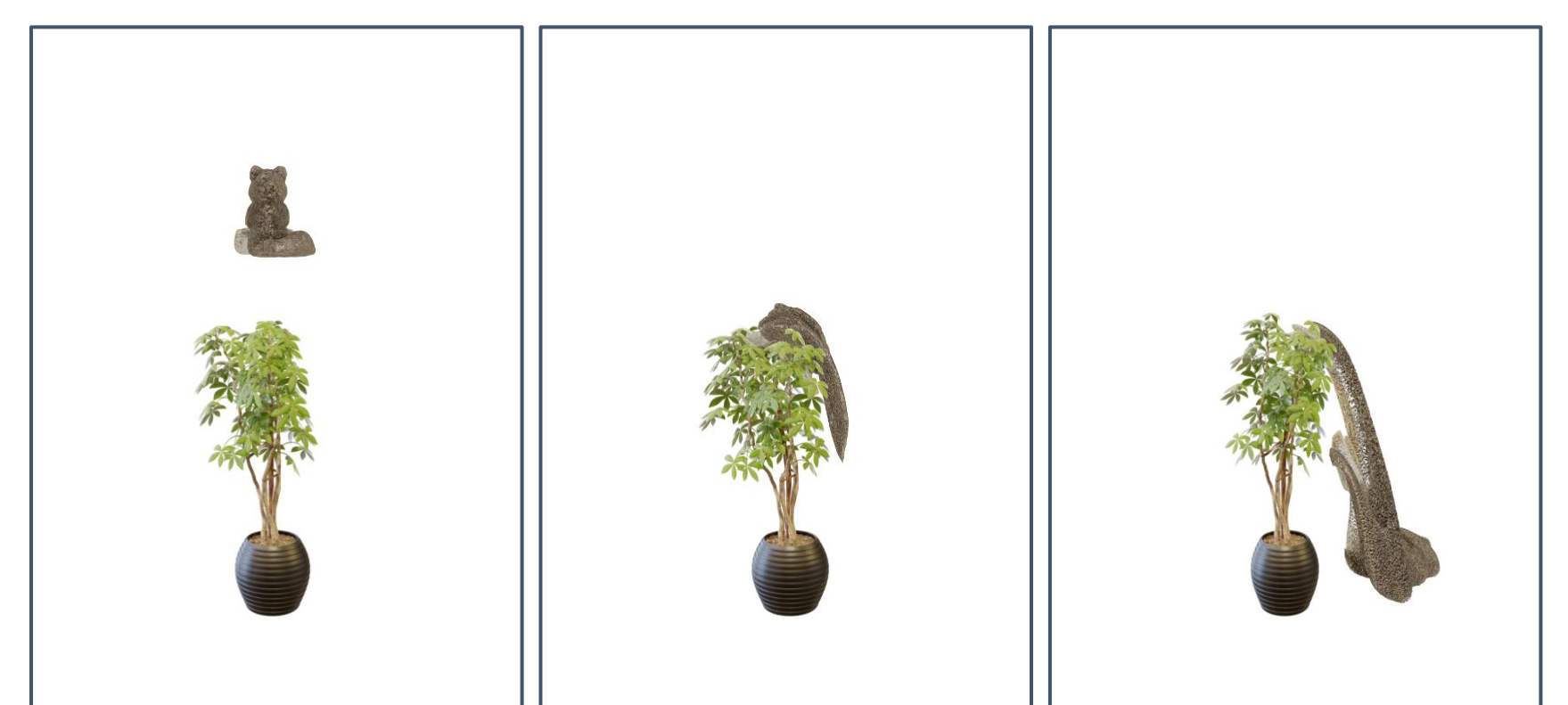
### Soil



### Water



### Hybrid Material





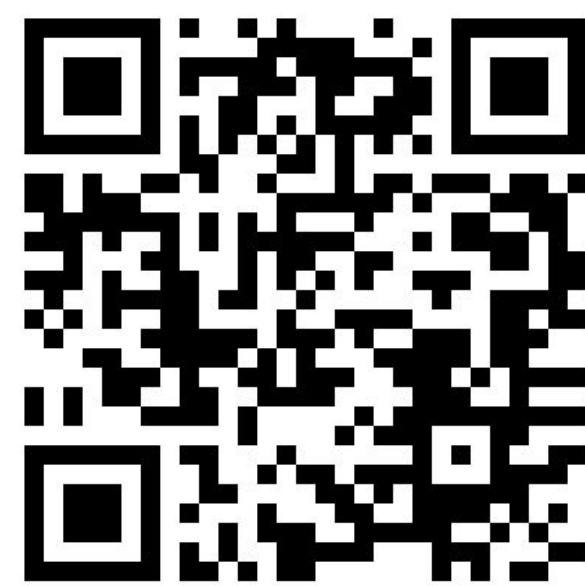
Demo Slide:



[https://docs.google.com/presentation/d/1gjedvNE1udn0L3VdsSN2xTb\\_lumgZI-k02QYN25TPkM/edit?usp=sharing](https://docs.google.com/presentation/d/1gjedvNE1udn0L3VdsSN2xTb_lumgZI-k02QYN25TPkM/edit?usp=sharing)

Reference:

GaussianProperty:



<https://gaussian-property.github.io/>

PhysGaussian:



<https://xpandora.github.io/PhysGaussian/>

UnityGaussianSplatting



<https://github.com/aras-p/UnityGaussianSplatting>