NVIDIA | **JOHNS HOPKINS UNIVERSITY**

Zhaoshuo Li   Thomas Müller   Alex Evans
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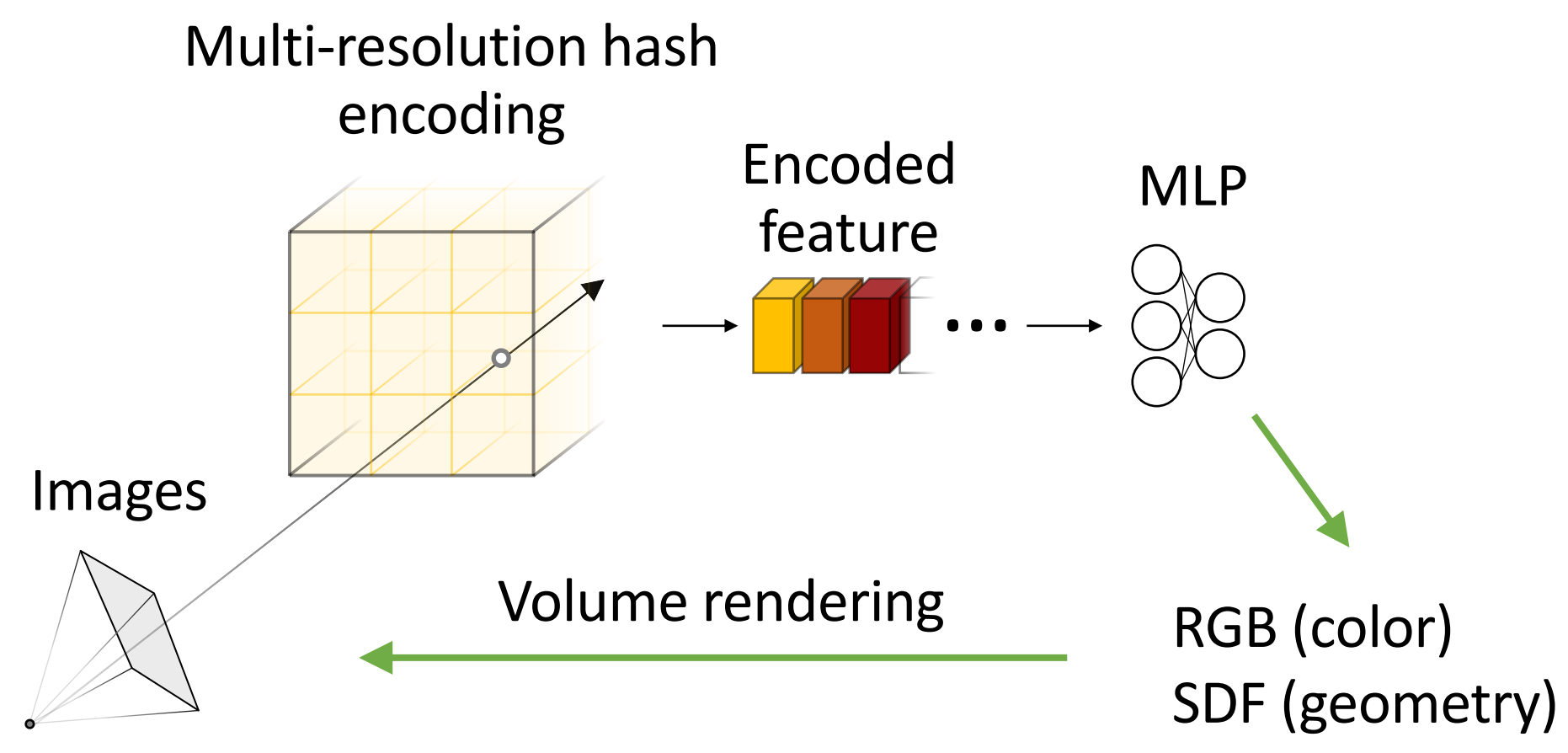Ming-Yu Liu   Chen-Hsuan Lin
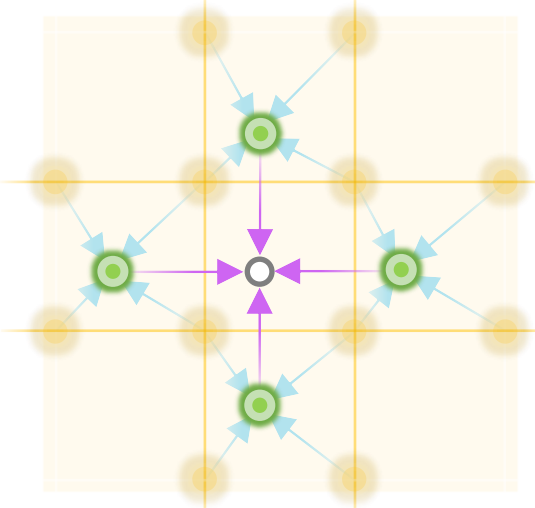
Neuralangelo: High-Fidelity Neural Surface Reconstruction

Neuralangelo is a framework for high-fidelity 3D surface reconstruction from RGB video sequences. Using ubiquitous mobile devices, we enable users to create digital twins of both object-centric and large-scale real-world scenes with detailed 3D geometry.

METHOD

Multi-resolution hash encoding

Encoded feature → MLP

Images

Volume rendering

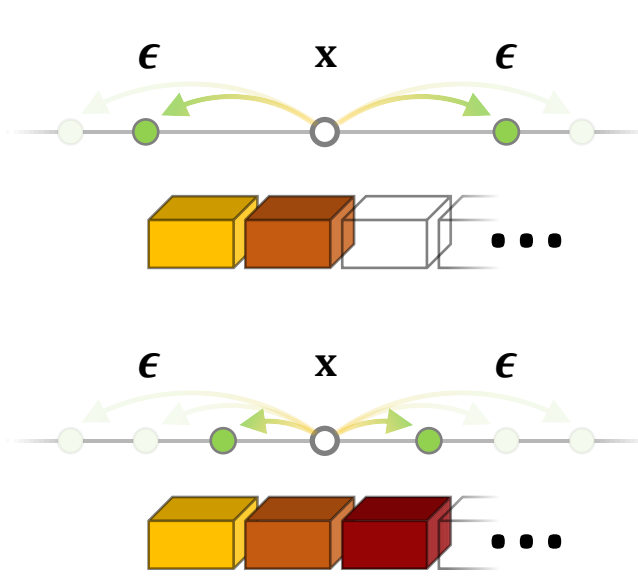RGB (color)
SDF (geometry)

KET INGREDIENTS

Numerical gradients for higher-order derivatives
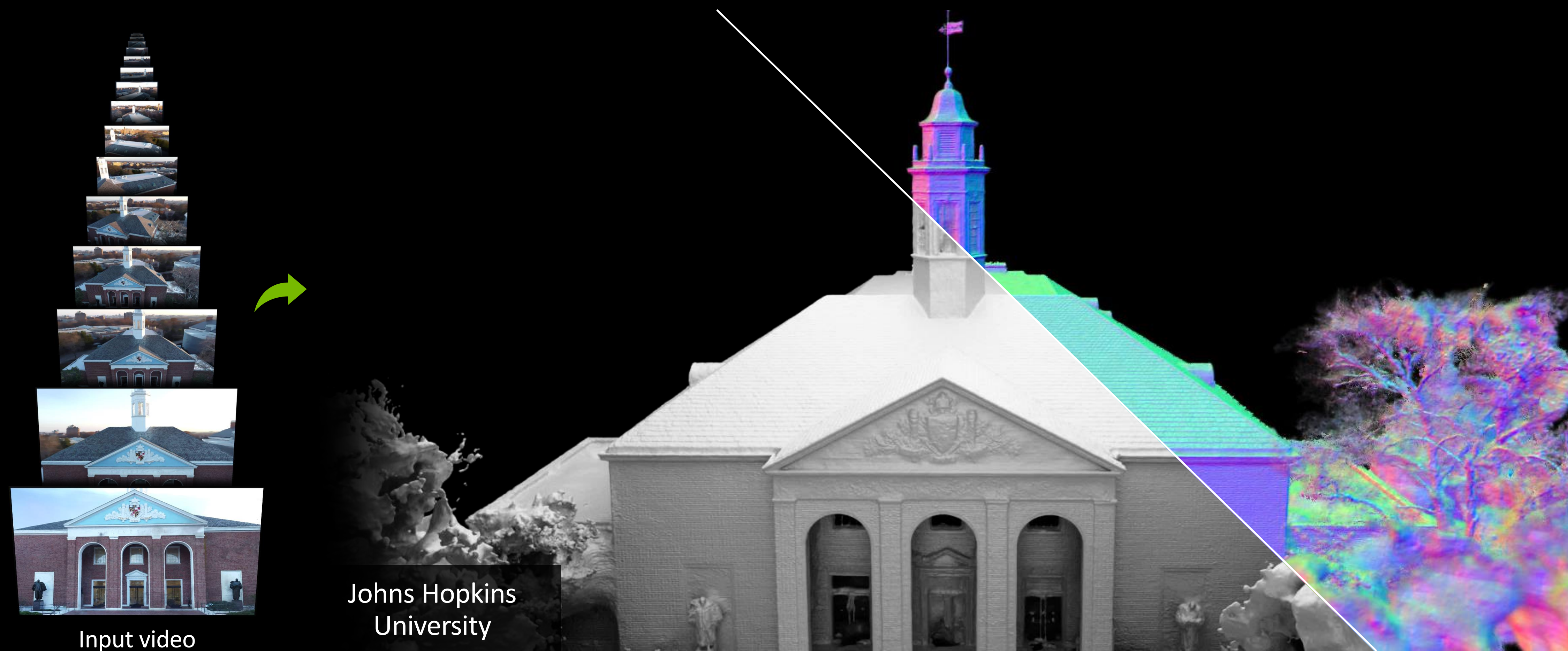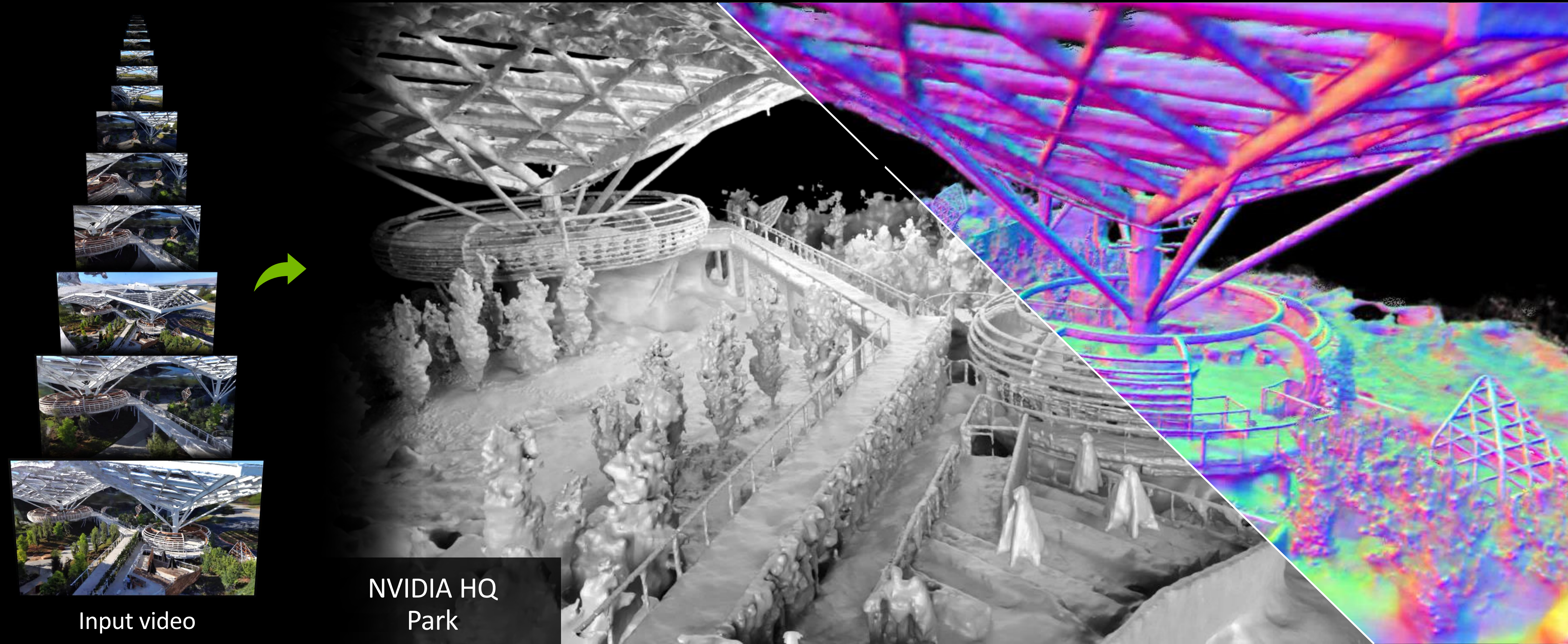
Trilinear sampling + Finite differences

Coarse-to-fine optimization for progressive level of details

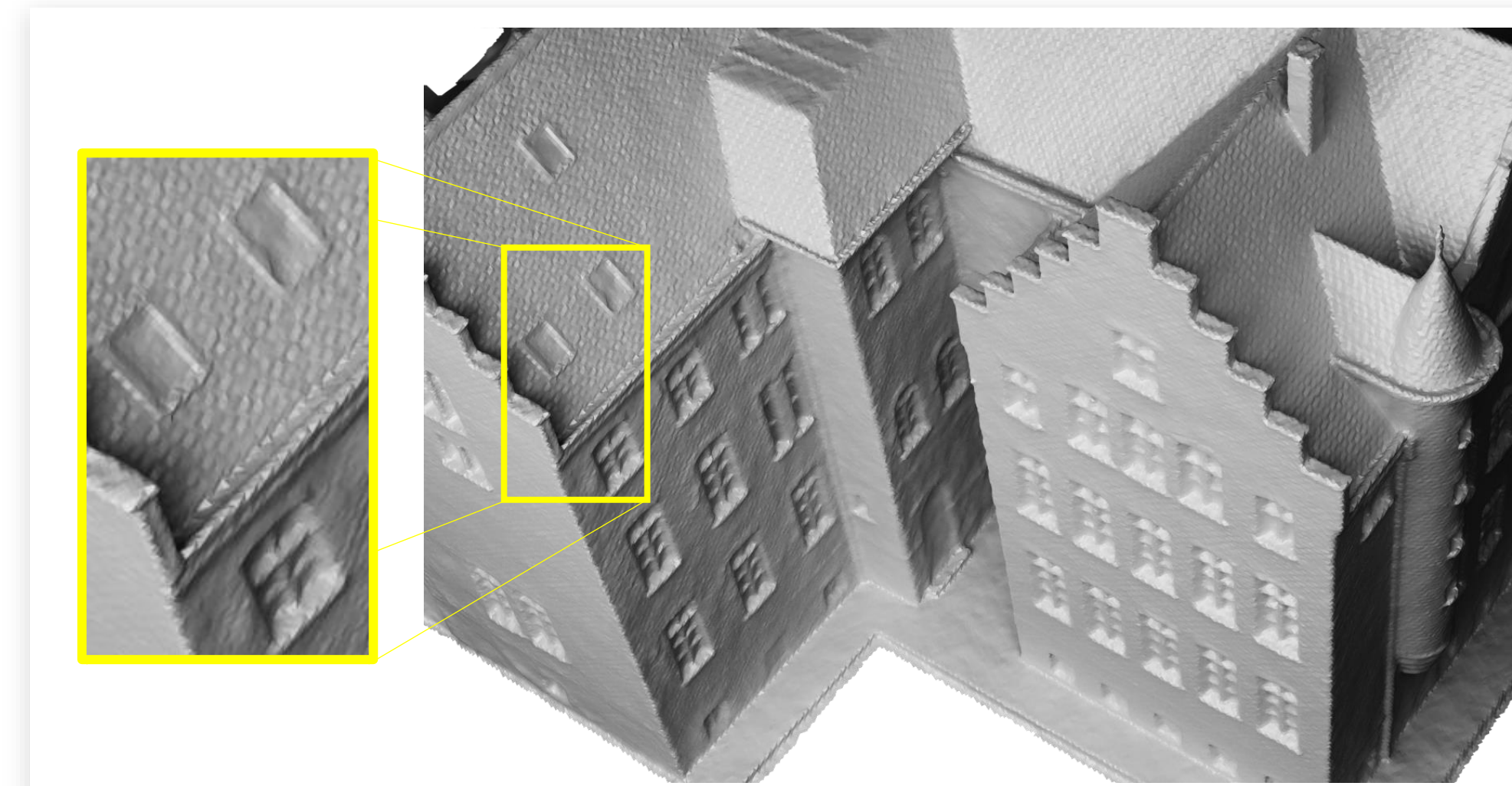Finite steps + Encoded features

Optimization objectives

$\mathcal{L}_{RGB}$: RGB synthesis loss
$\mathcal{L}_{eik}$: Eikonal loss
$\mathcal{L}_{curv}$: Curvature loss

Input video

NVIDIA HQ Park

Input video

Johns Hopkins University

Scan to see project page for details!

TANKS & TEMPLES DATASET

DTU BENCHMARK

COMPARISON WITH BASELINE METHODS

(DTU benchmark)

AG	analytical gradient
AG + P	analytical gradient + coarse-to-fine optimization
NG	numerical gradient
Neuralangelo	numerical gradient + coarse-to-fine optimization