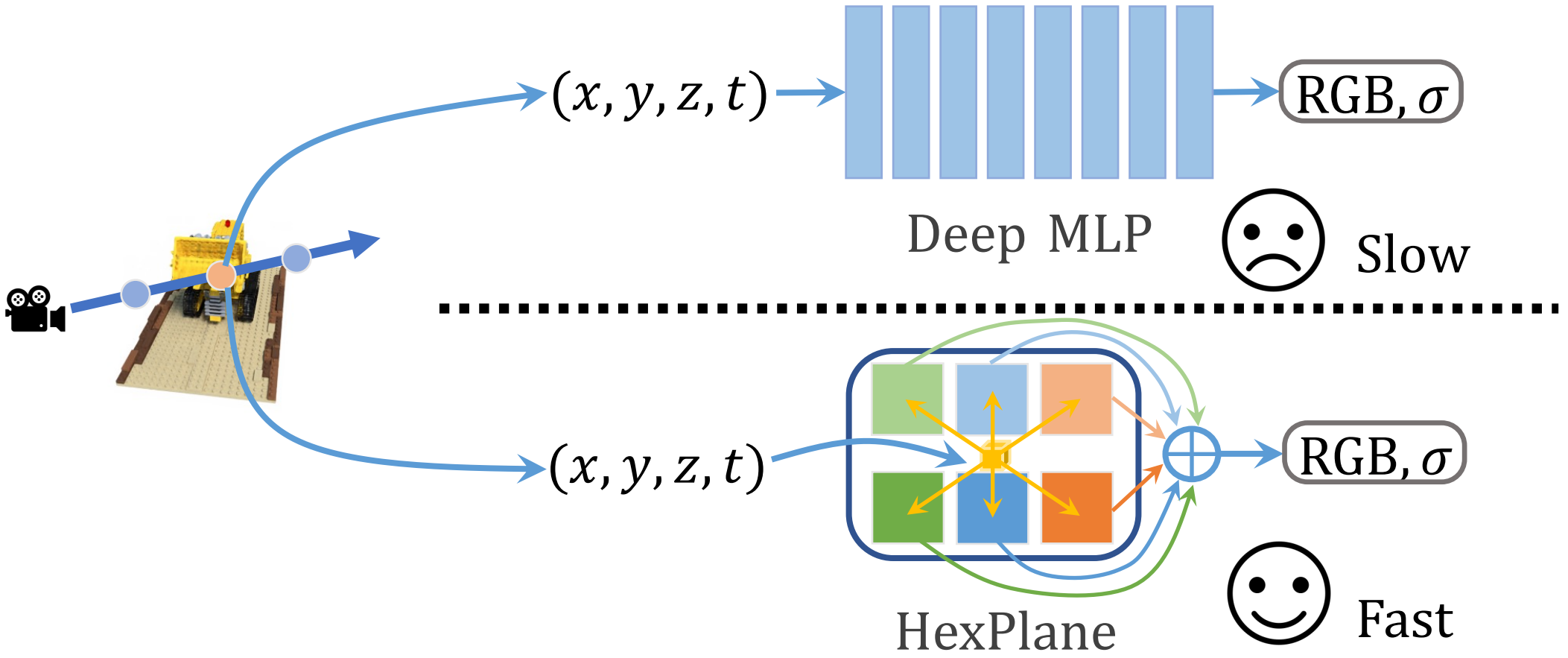
HexPlane: A Fast Representation for Dynamic Scenes

Ang Cao, Justin Johnson
University of Michigan
TUE-AM-013

HexPlane gives promising synthesis results with over 100x acceleration

HexPlane: Motivation



HexPlane: Features

- **Fast speed** (more than 100x) during training and inference.
- **Powerful** representation ability for dynamic scenes.
- **Disentangling speeds and performance.**
- **Compact model size** to represent dense 4D grids.
- Inherent feature sharing is **robust** to sparse observations.
- **General representation** for 4D field with minimal assumptions.

Thank you

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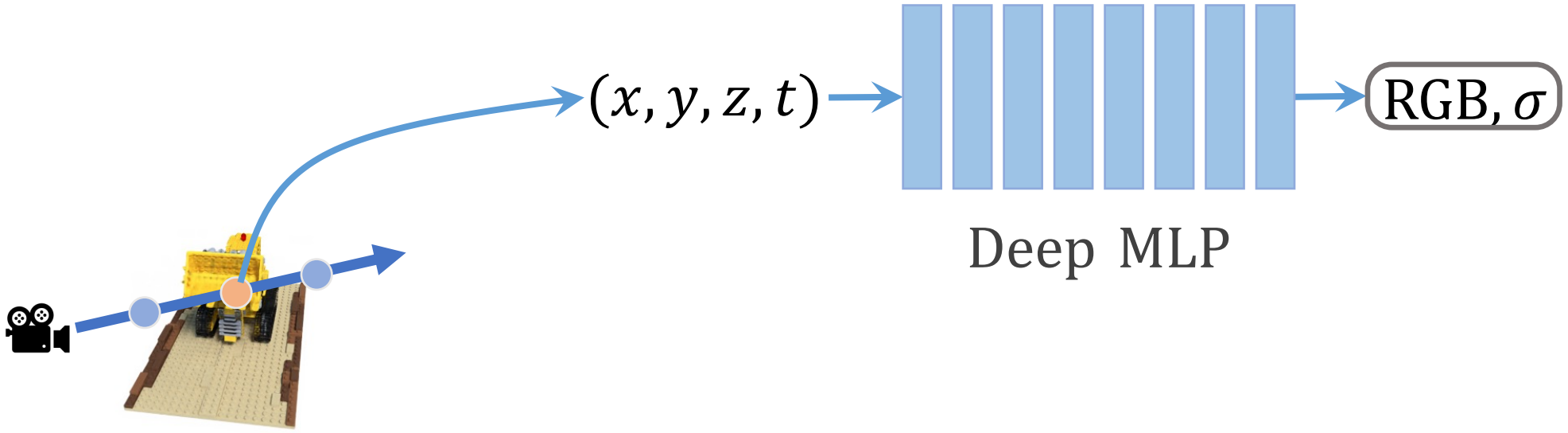

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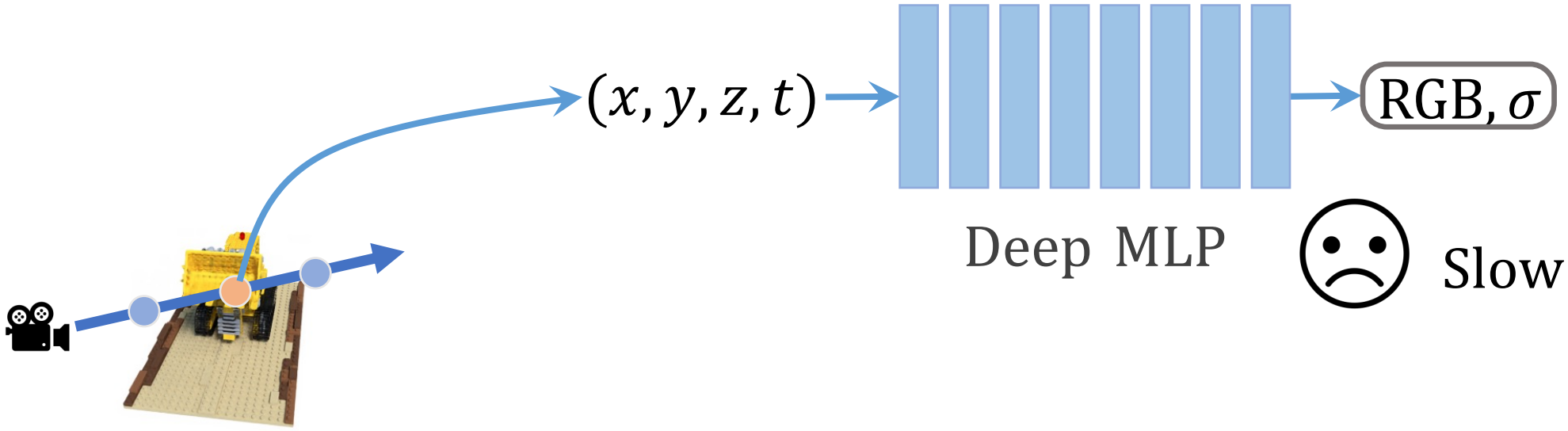

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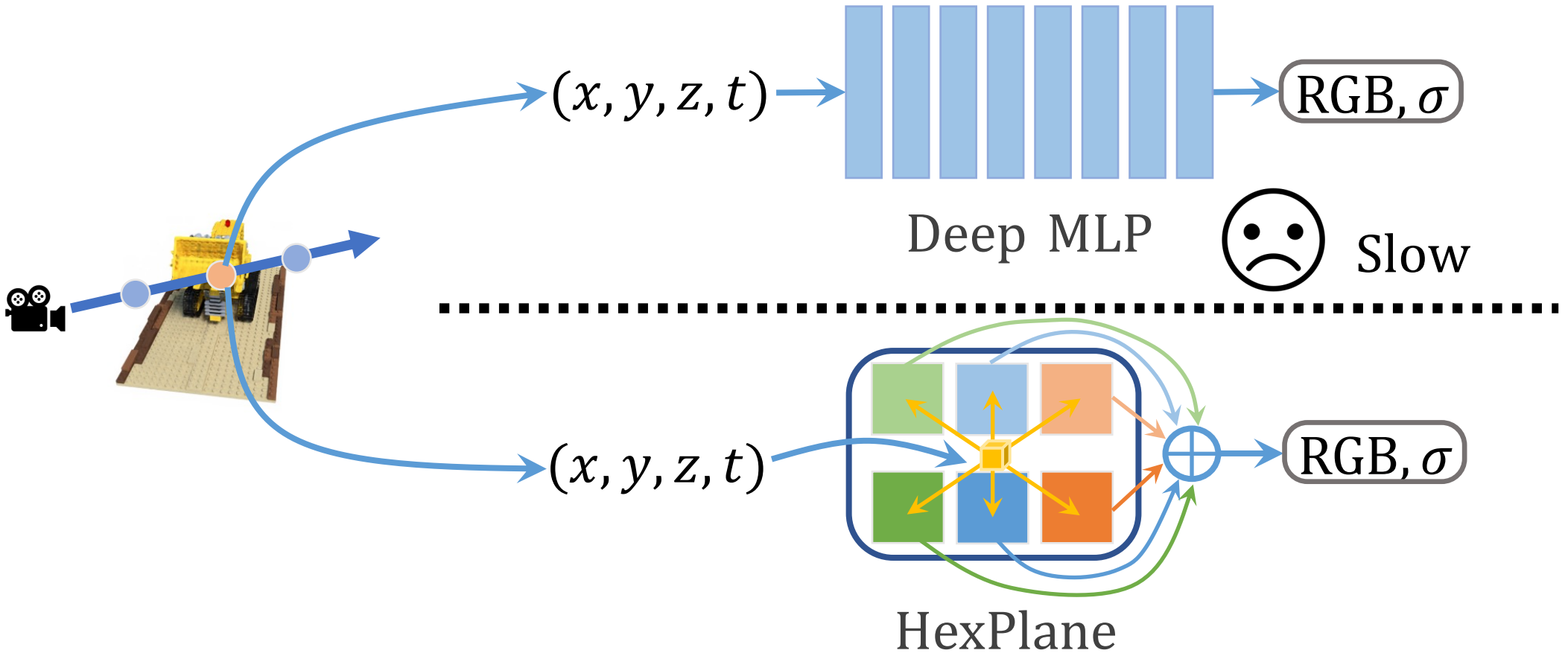

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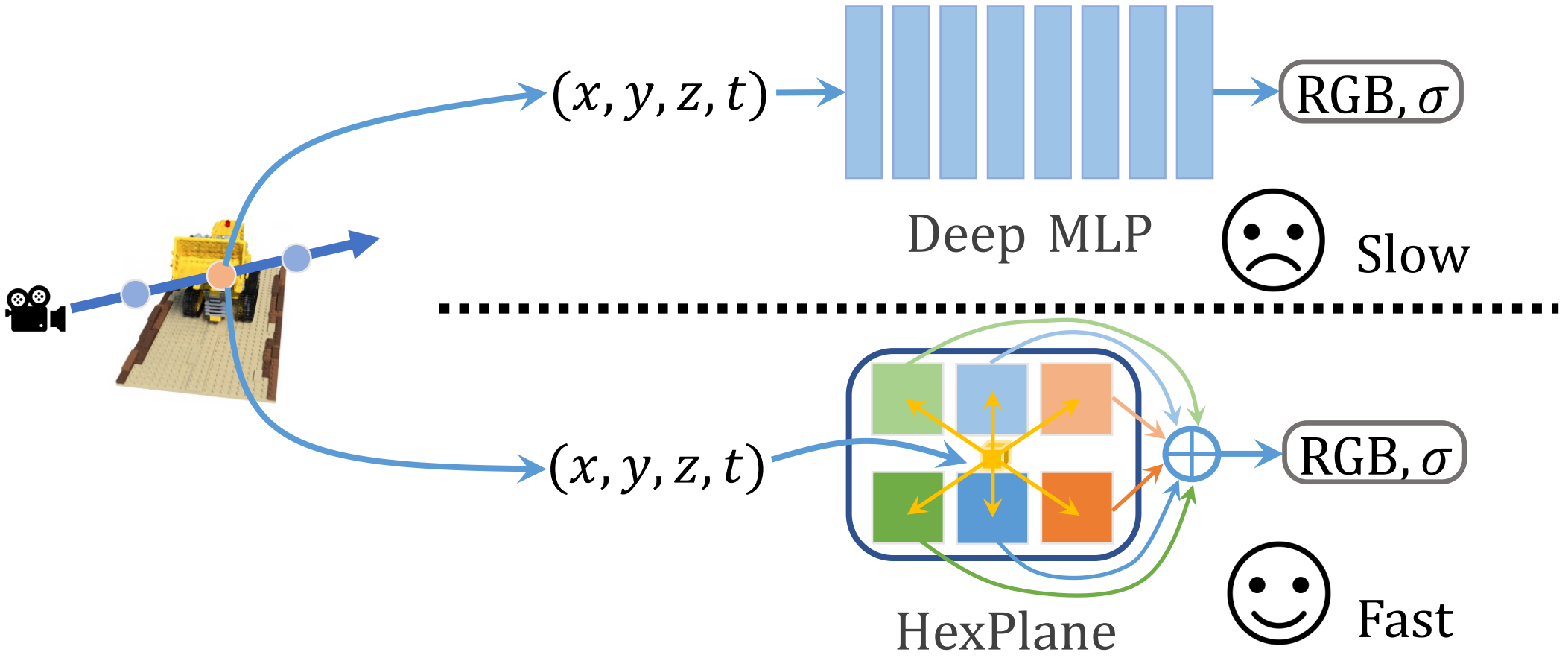
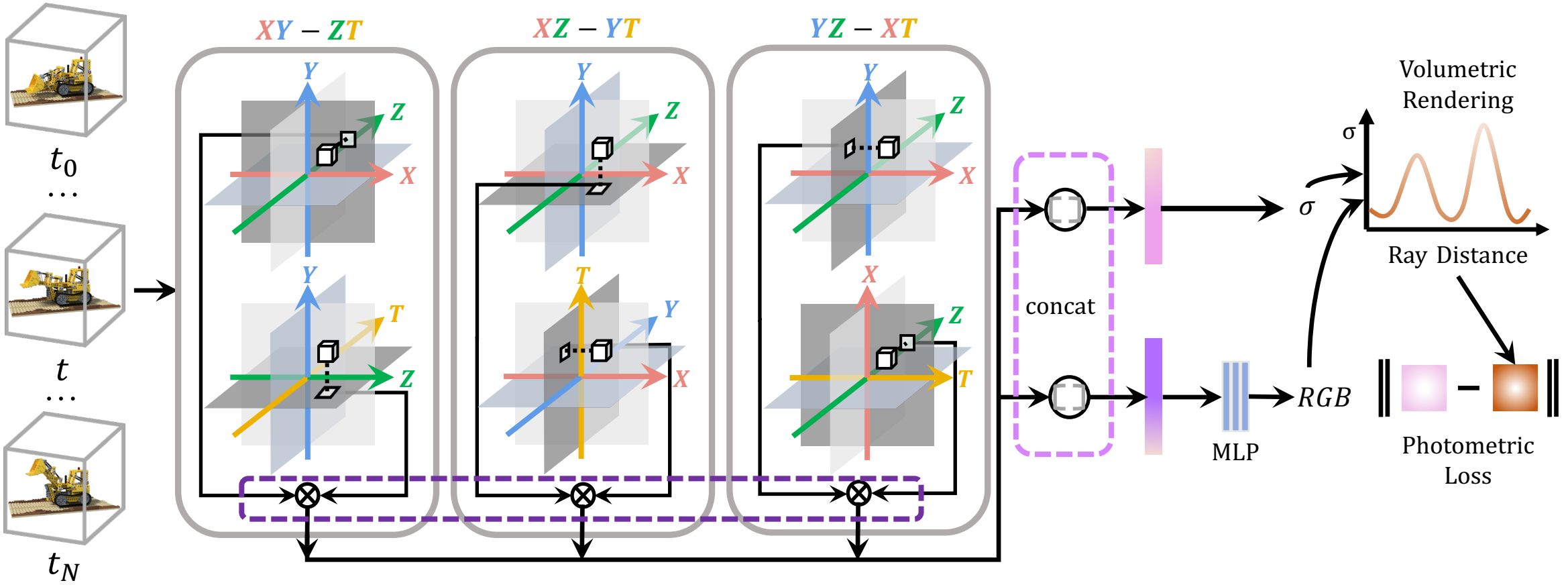
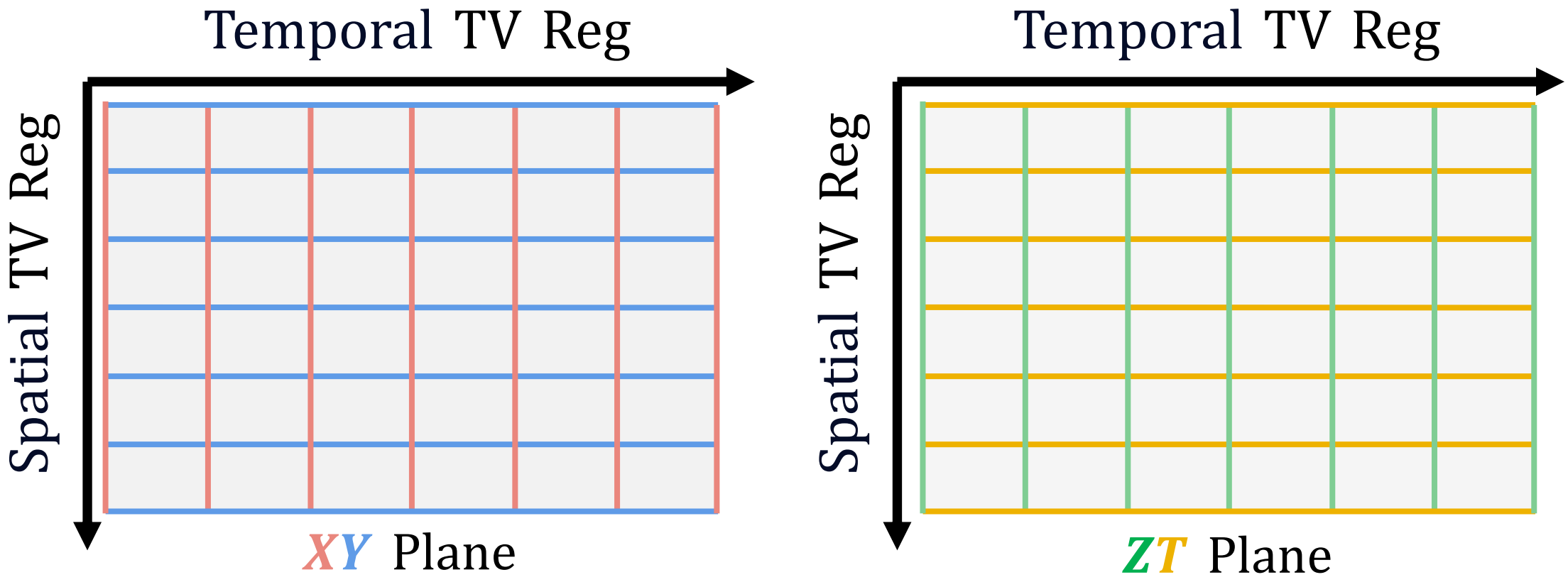


HexPlane: Method



HexPlane: Regularization



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HexPlane: Results

DyNeRF

650K iterations

1344 hours (1x)

HexPlane

650K iterations

12 hours (112x)

DyNeRF

650K iterations

1344 hours (1x)

HexPlane

650K iterations

12 hours (112x)

HexPlane

100K iterations

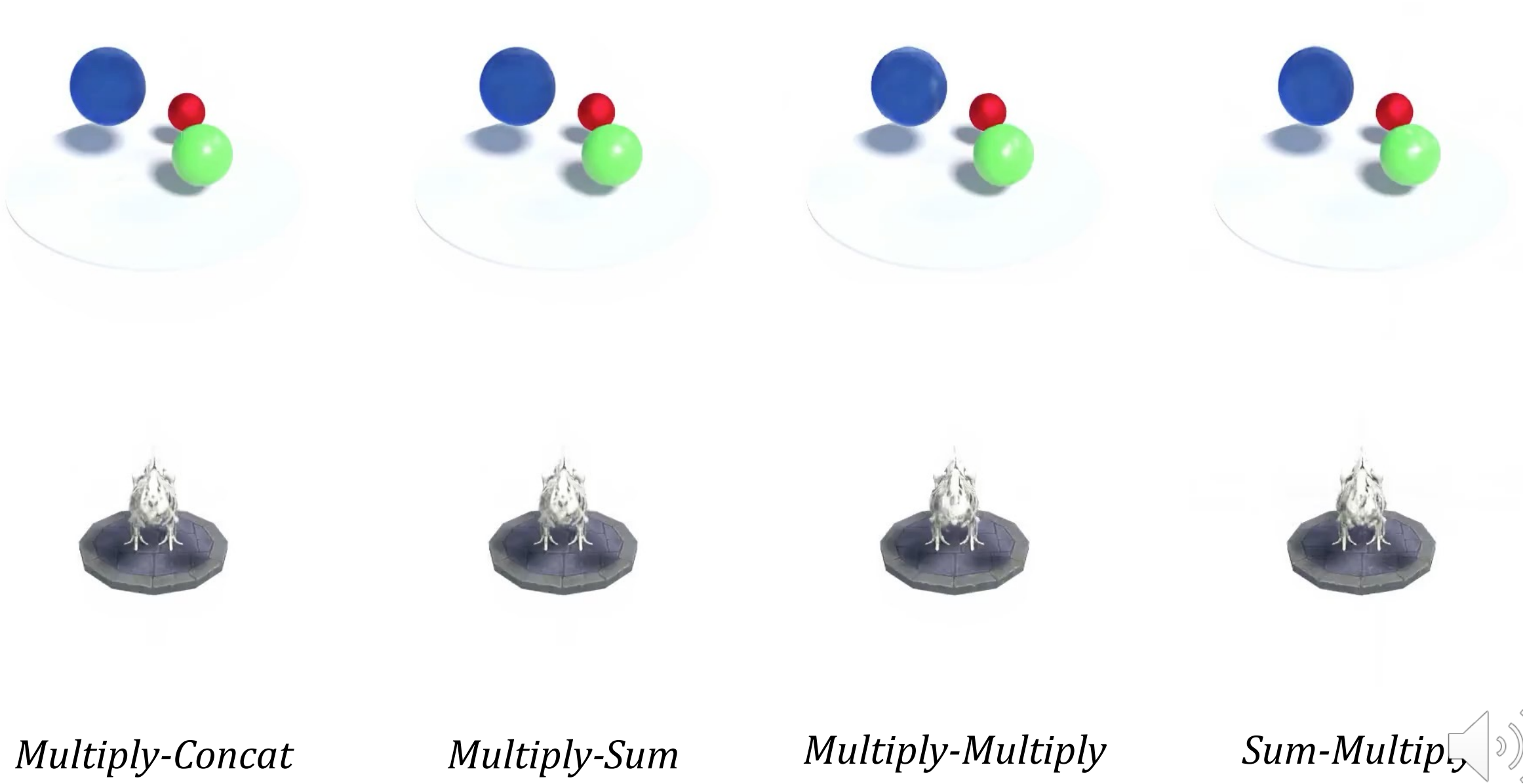
2 hours (672x)

HexPlane with different **coordinate systems**

Euclidean Coordinate
(x, y, z, t)

Spherical Coordinate
(θ, φ, r, t)

HexPlane with different **fusion designs**



Multiply-Concat *Multiply-Sum* *Multiply-Multiply* *Sum-Multiply*

HexPlane with different **decoding designs**

Spherical Harmonics

Tiny MLP

HexPlane: Summary

- We propose HexPlane, a simple and elegant solution for dynamic field representation
- We decompose a 4D grid into six 2D feature planes, and query point features via interpolation and fusion operations.
- It shows impressive results with significant acceleration for dynamic novel view synthesis task.

As a general 4D representation, HexPlane could empower generation and other 4D tasks.

Text-To-4D Dynamic Scene Generation, Uriel Singer et al. 2023

Thank you