LUMINOUS: Context-Aware Situational Intelligence in XR

Future Directions: Visualization and Beyond

Paul Hinzer

Introduction

Photorealistic

Easily Editable

What do we expect from Visualizations in XR in the future?

Efficiently Streamable

Context Aware

Introduction

What we investigate



Human Modeling



World Modeling

Research Directions

Human Modeling



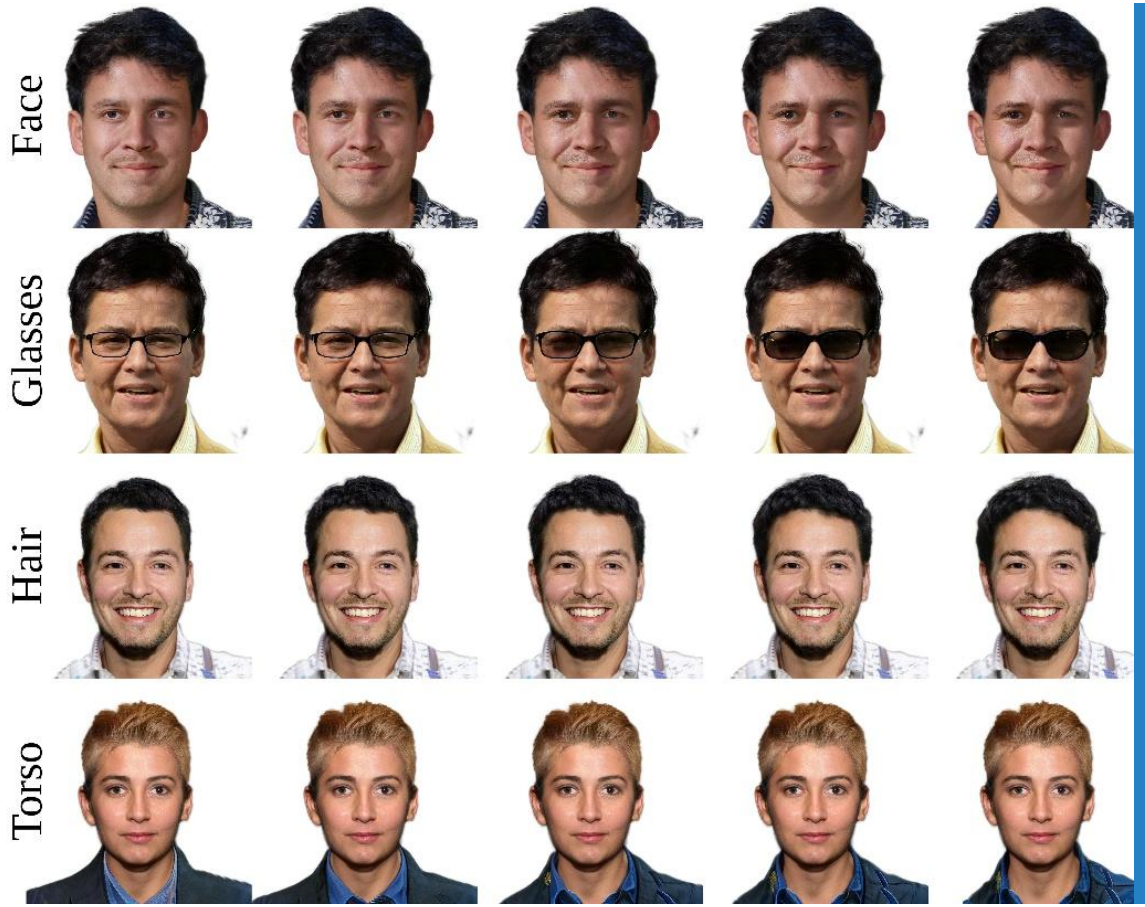
Human Modeling



World Modeling

Research Directions

Human Modeling: COSY



Generate and Edit convincing Faces

- 3DGS Synthesis for Disentangled Human Head Editing
- Independent Latent Spaces for different Attributes

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Research Directions

Human Modeling: Tri-DNO

Animate Humans based on Objects in their Environment

- Diffusion Inference Optimization to generate humans grasping household objects
- Choose the modality that is generated

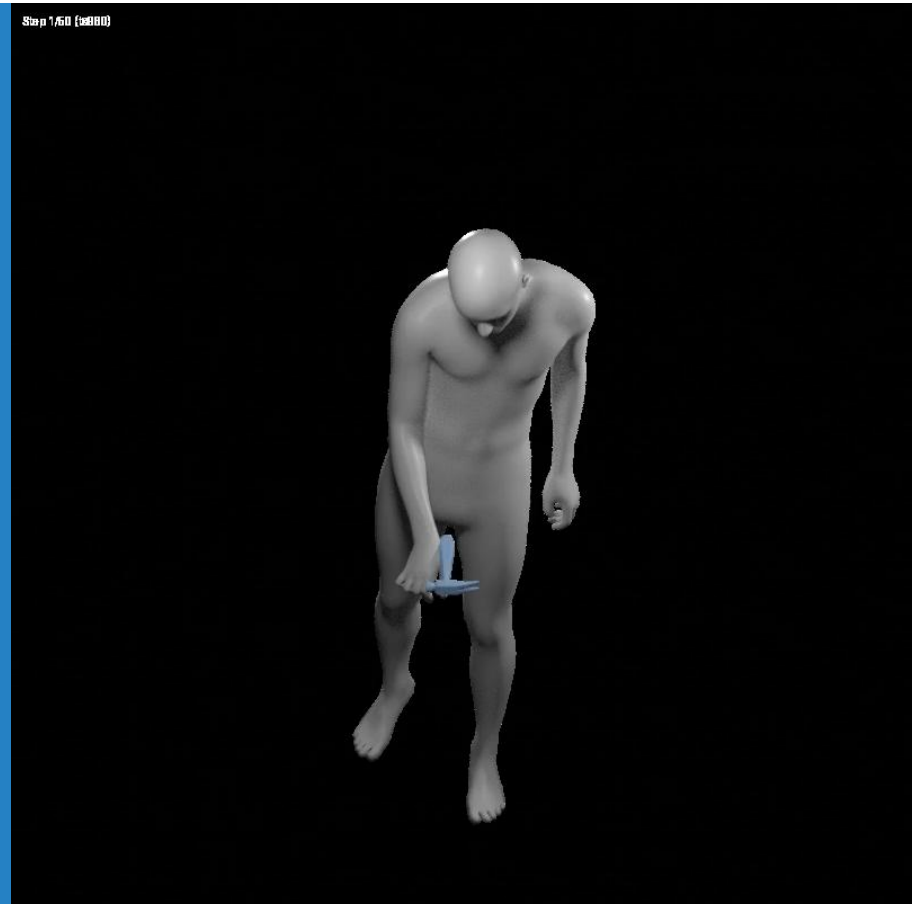


Research Directions

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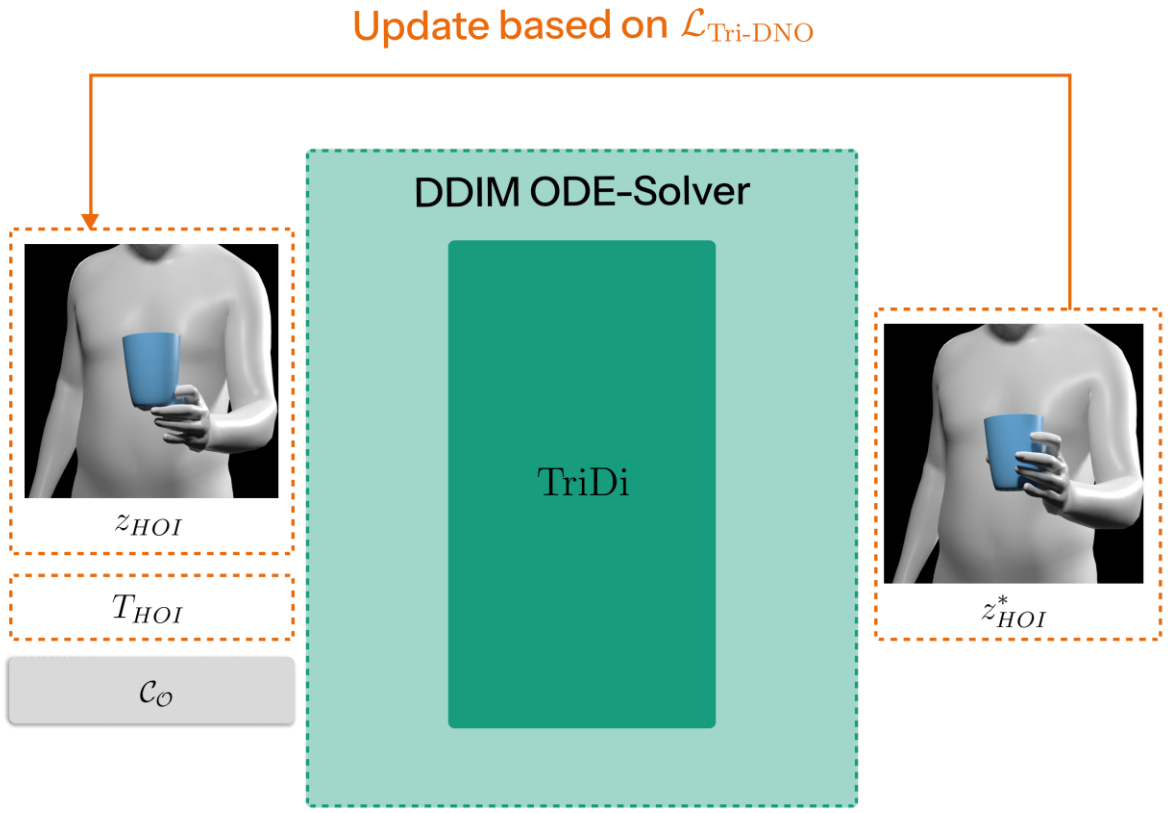


Research Directions

Human Modeling: Tri-DNO

Animate Humans based on Objects in their Environment

- Diffusion Model “TriDi” can freely sample human pose, object position, or contact points
- DDIM sampler allows for deterministic sampling



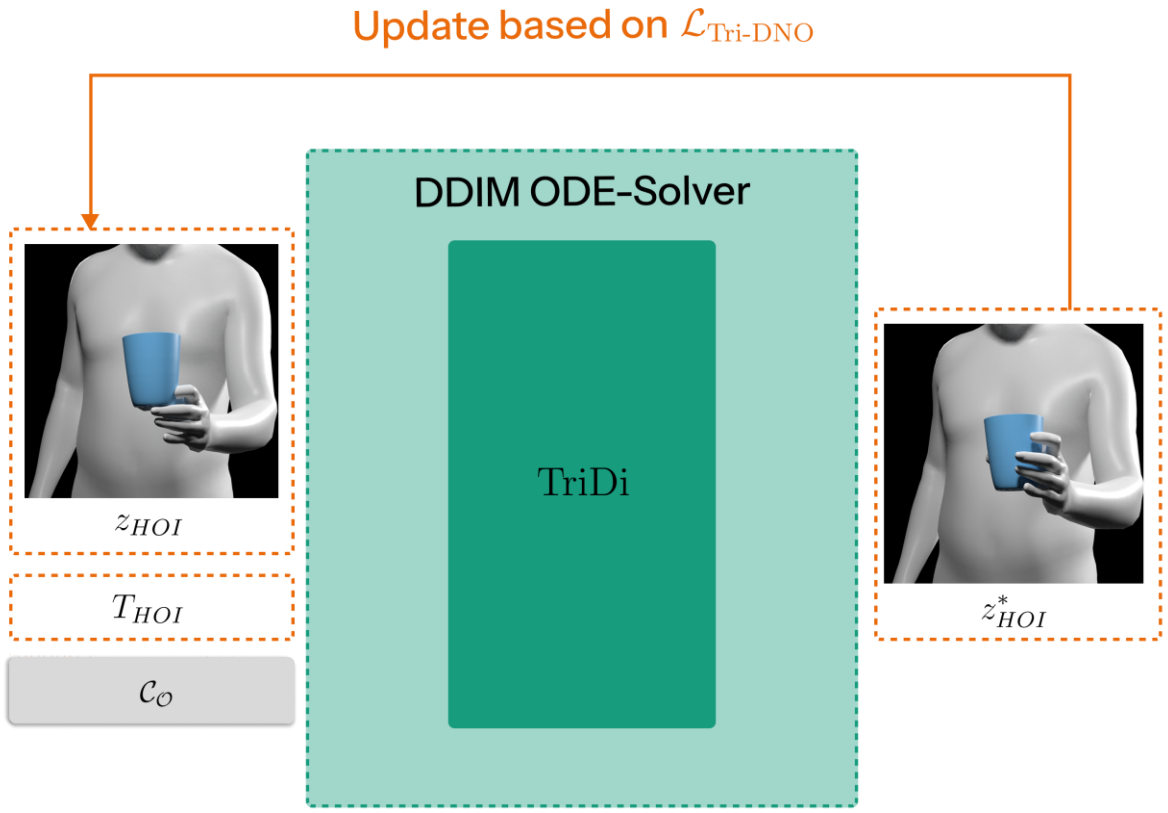
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Research Directions

Human Modeling: Tri-DNO

Animate Humans based on Objects in their Environment

- Start with initial latent noise
- Iteratively generate human object interaction scene
- Optimize latent noise based on geometric losses for contact, penetration avoidance and hand orientation



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Research Directions

World Modeling



Human Modeling



World Modeling

Research Directions

World Modeling: Flex3DGSEditor

Turn him into a marble sculpture



Edit a Scene with using a Text Prompt

- Given a 3DGS scene and a text prompt, edit the scene to have desired attributes

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Research Directions

World Modeling: Flex3DGSEditor

Turn him into a marble sculpture



Edit a Scene with using a Text Prompt

- Given a 3DGS scene and a text prompt, edit the scene to have desired attributes
- First, edit 2D frames with multi view consistency

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Research Directions

World Modeling: Flex3DGSEditor

Turn him into a marble sculpture



Edit a Scene with using a Text Prompt

- Given a 3DGS scene and a text prompt, edit the scene to have desired attributes
- First, edit 2D frames with multi view consistency
- Then, optimize gaussian attributes to generate a new 3D scene

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Research Directions

World Modeling: KISS GS

Making 3D Gaussian Scenes XR-Ready

- 228x size reduction for an average scene
- By pruning, reordering and compact encoding



Conclusion

Our Vision for XR



Animate a Photorealistic Avatar

With COSY, in real time



Let the Avatar Interact with their Environment

Using Tri-DNO human object interaction optimization



Edit the Environment

With our 3DGS Scene Editing strategy



Efficiently Stream it

Enabled by our KISS-GS compression scheme

Thank you! Any Questions?

Paul Hinzer
Vision and Imaging Technologies
Computer Vision and Graphics
paul.hinzer@hhi.fraunhofer.de