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Expressive Compositing for Augmented Reality

Xavier Granier, Jiazhou Chen

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Expressive Compositing for Augmented Reality

Xavier Granier & Jiazhou Chen



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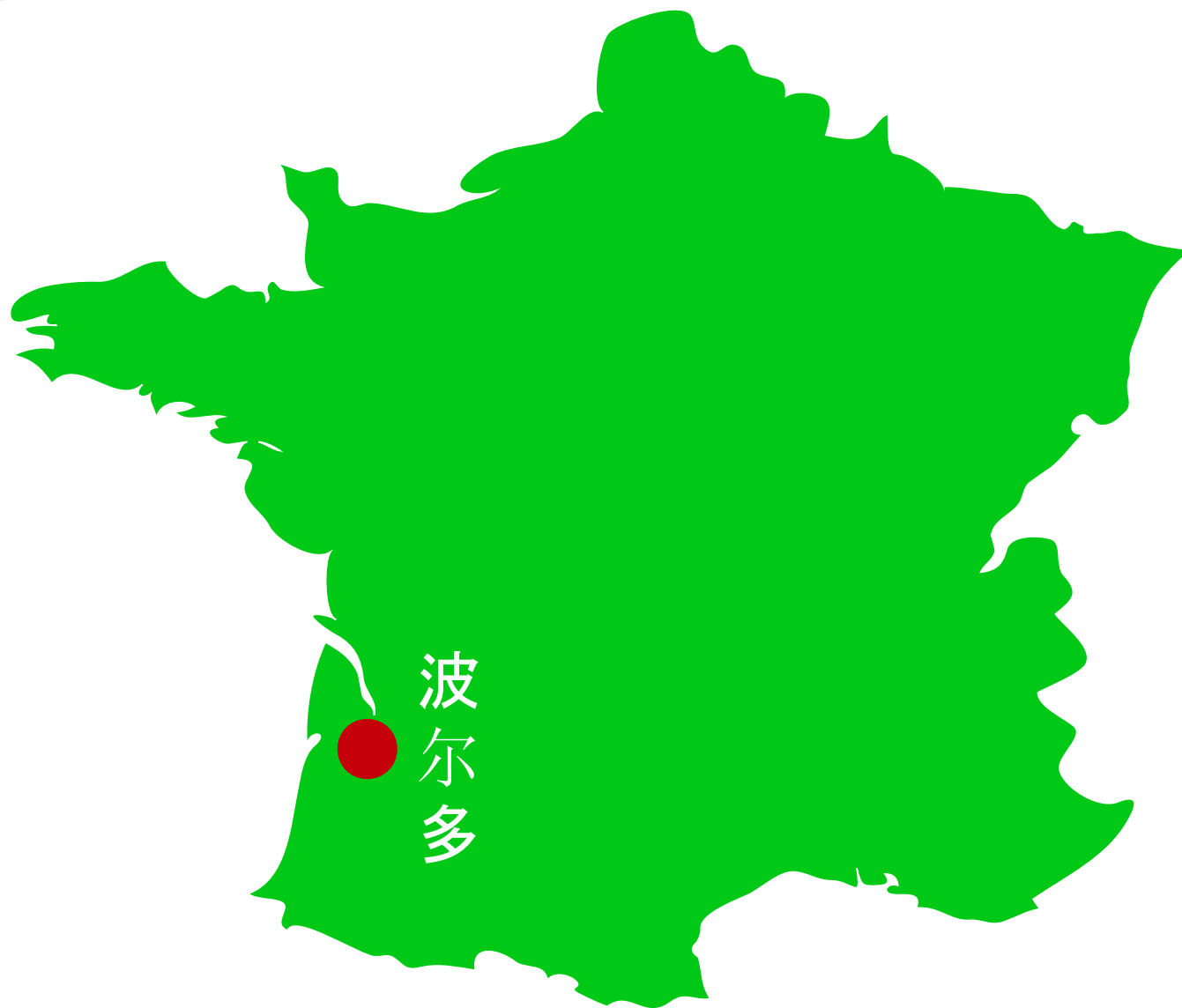
Inria



INSTITUT
d'OPTIQUE
GRADUATE SCHOOL

 UNIVERSITÉ DE
BORDEAUX

玛瑙科研组在哪里？



法国

玛瑙科研组是什么？

◦ Joint team



◦ Goals

LP2N

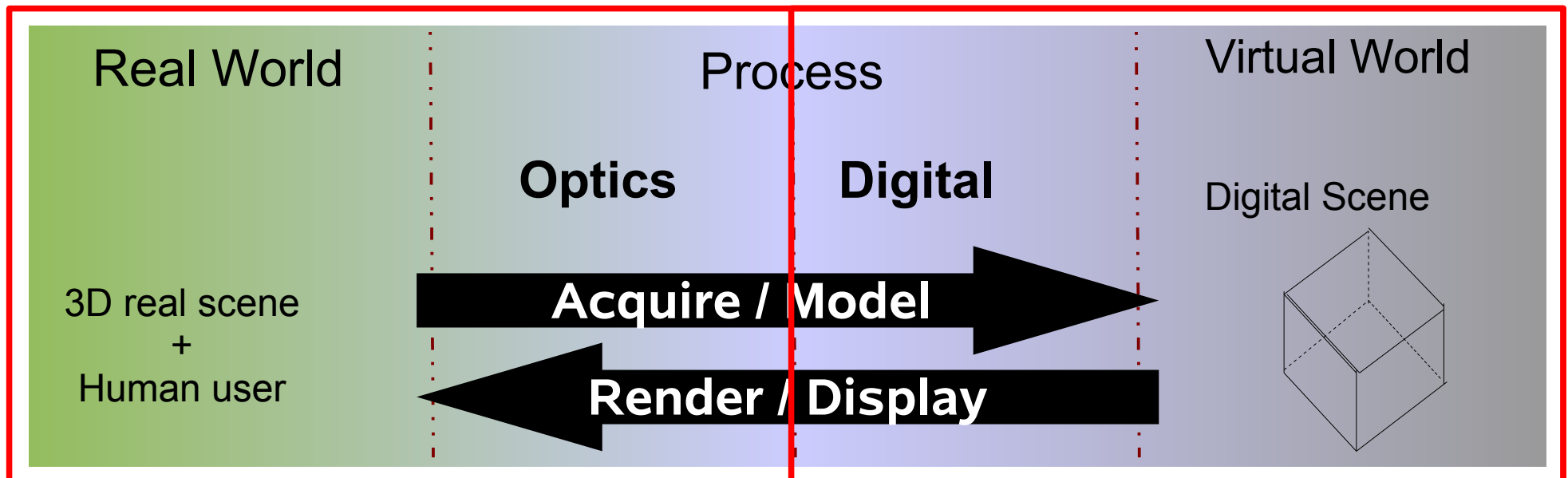


- **Study, model, acquire** interactions between light, shape and matter
- **Take into account observers** (humans or sensors)
- 4 axes
 - Analysis and Simulation
 - Acquisition and Display
 - Rendering, Visualization and Illustration
 - Creation and Edition

Our approach: beyond Computer Graphics

A **global view but specialized** of processes

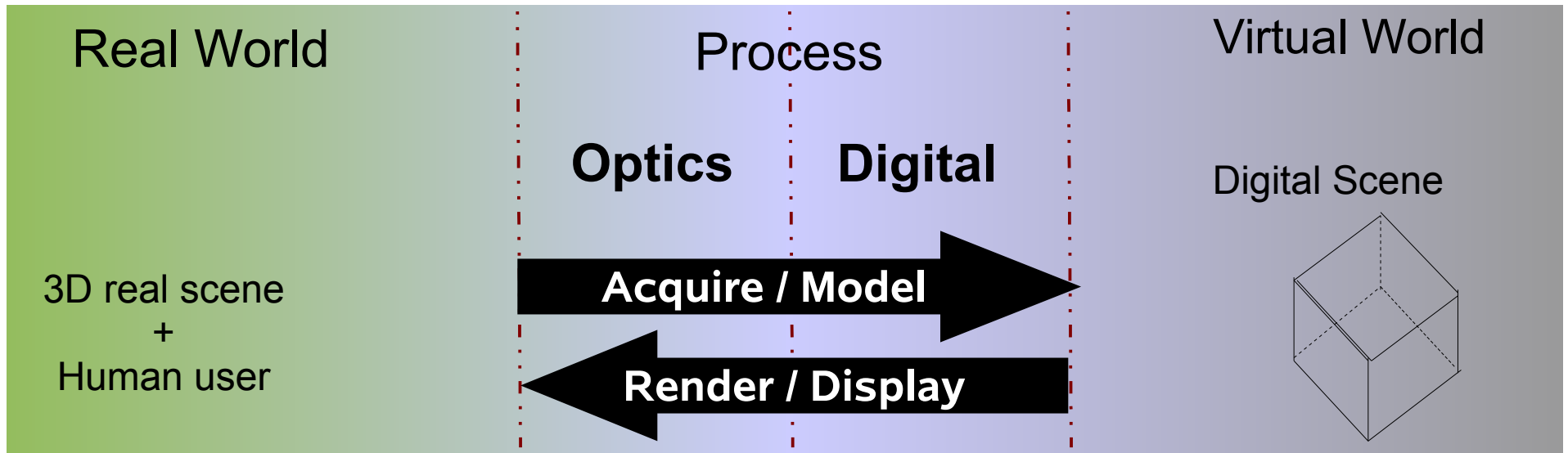
- **Real World:**
 - Physics and Optics laws
 - Human abilities
- **Virtual World:** models & algorithms



Our approach: beyond Computer Graphics

A **global view but specialized** of processes

- **Real World:**
 - Physics and Optics laws
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Members



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+5 PhD Students
+3 Master Students



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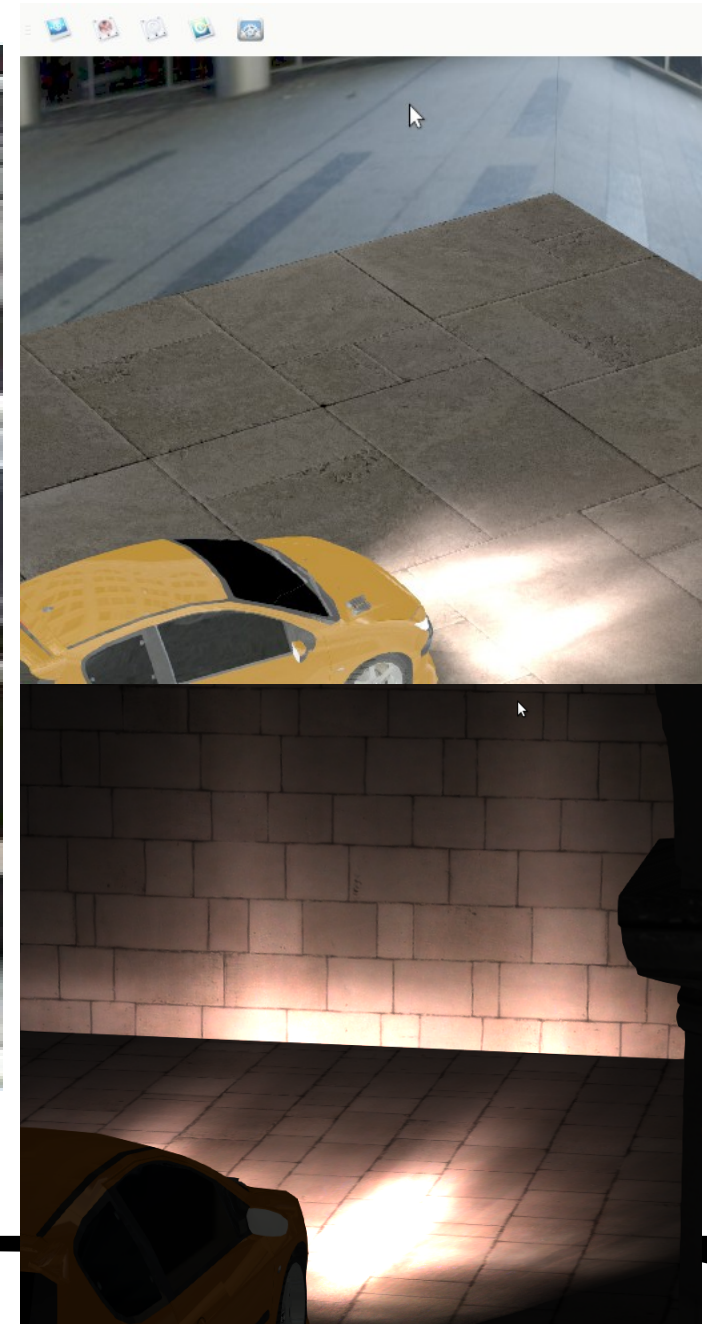
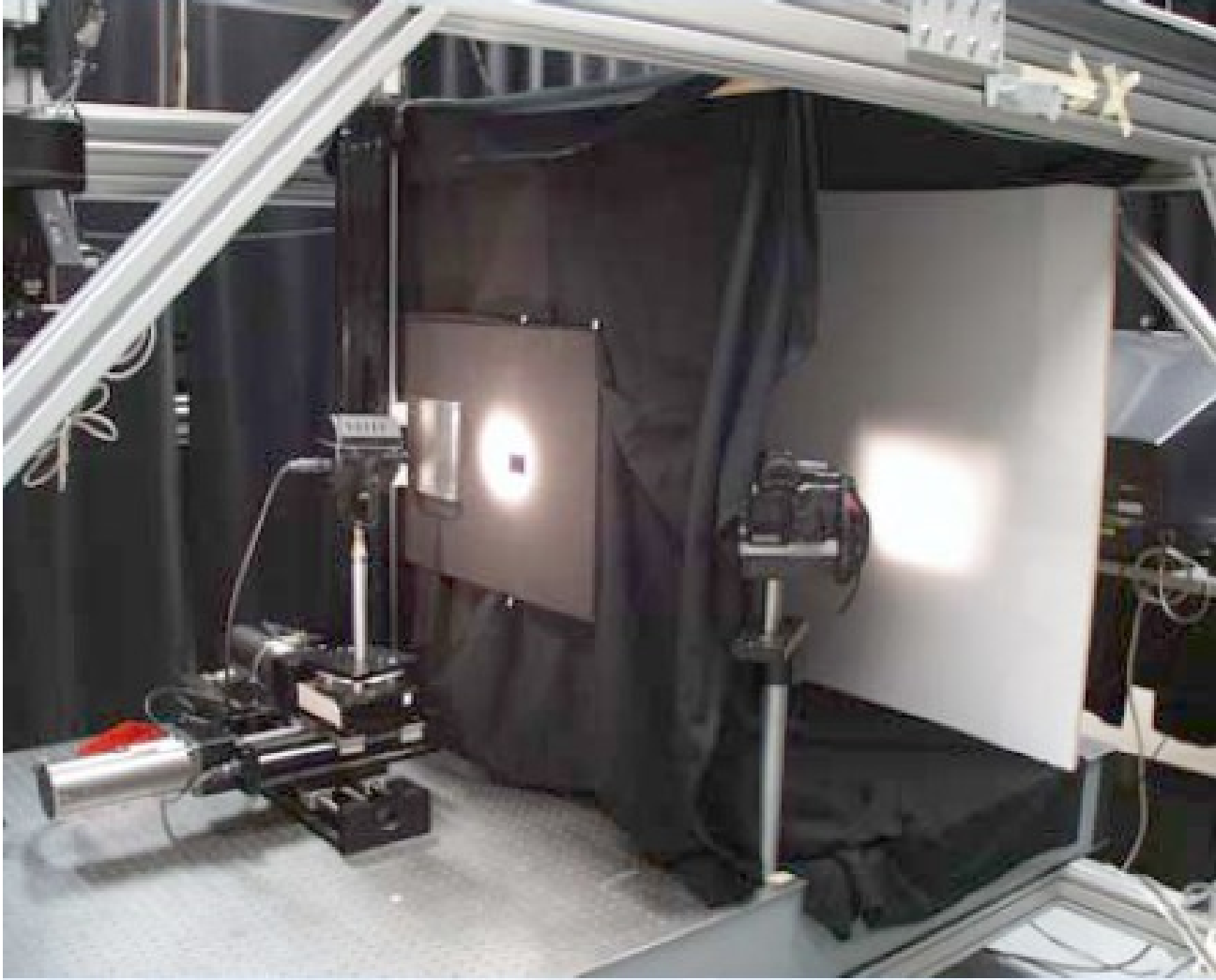


Romain Pacanowski
CNRS Research Engineer



Patrick Reuter
Assistant Professor @ Univ. Bordeaux

New Setup and Rendering



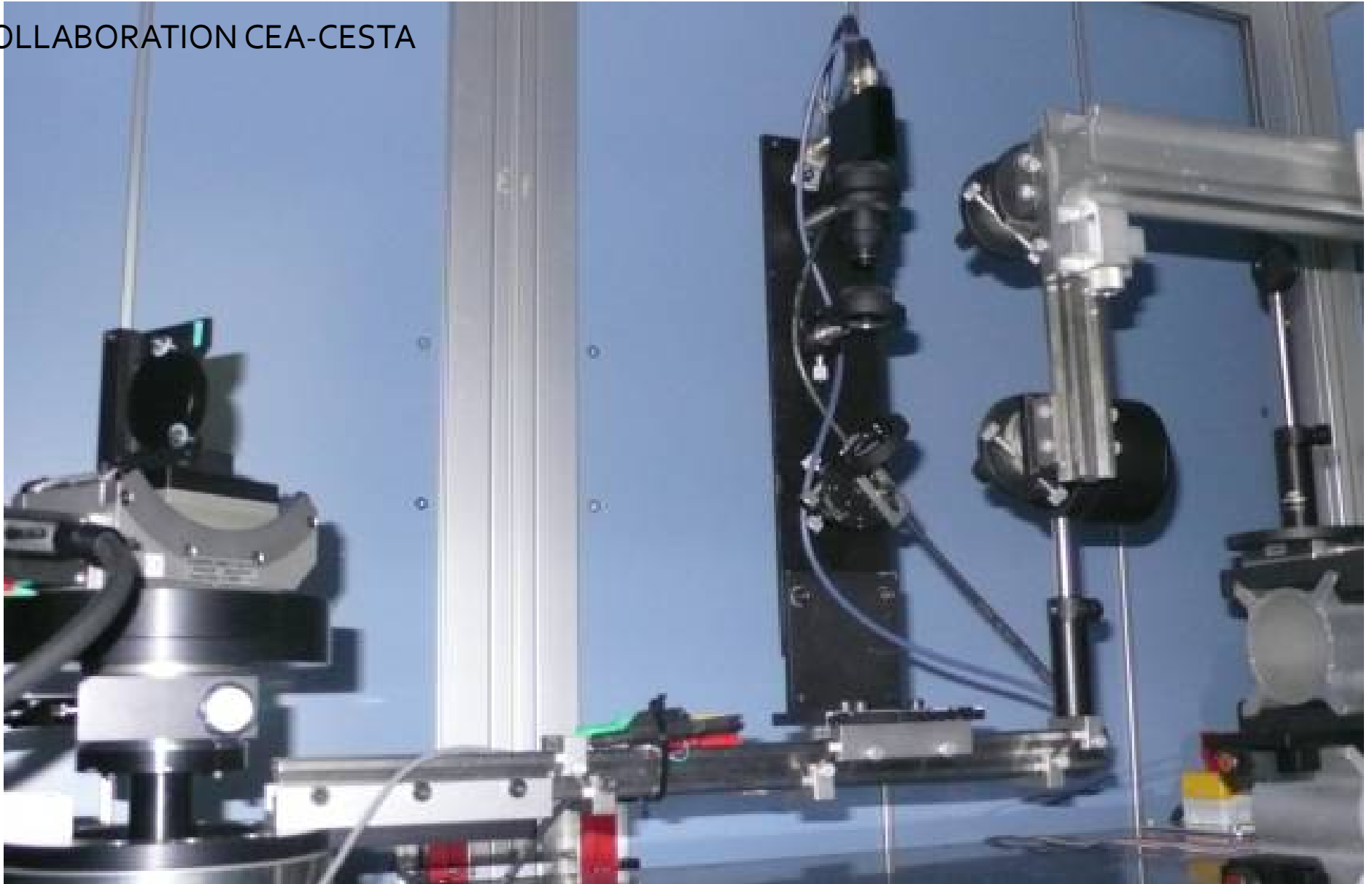
TEAM

Ex. AR

Conclusion

BRDF Acquisition

COLLABORATION CEA-CESTA

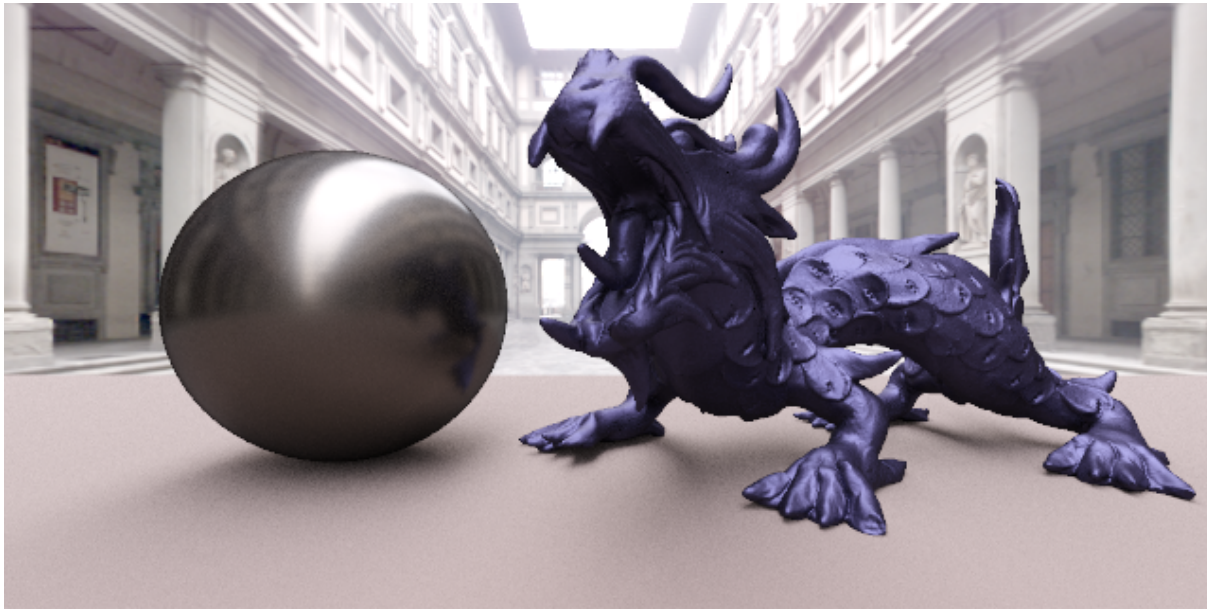


TEAM

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Conclusion

Accurate Approximation of BRDF



Original Data
99 MB

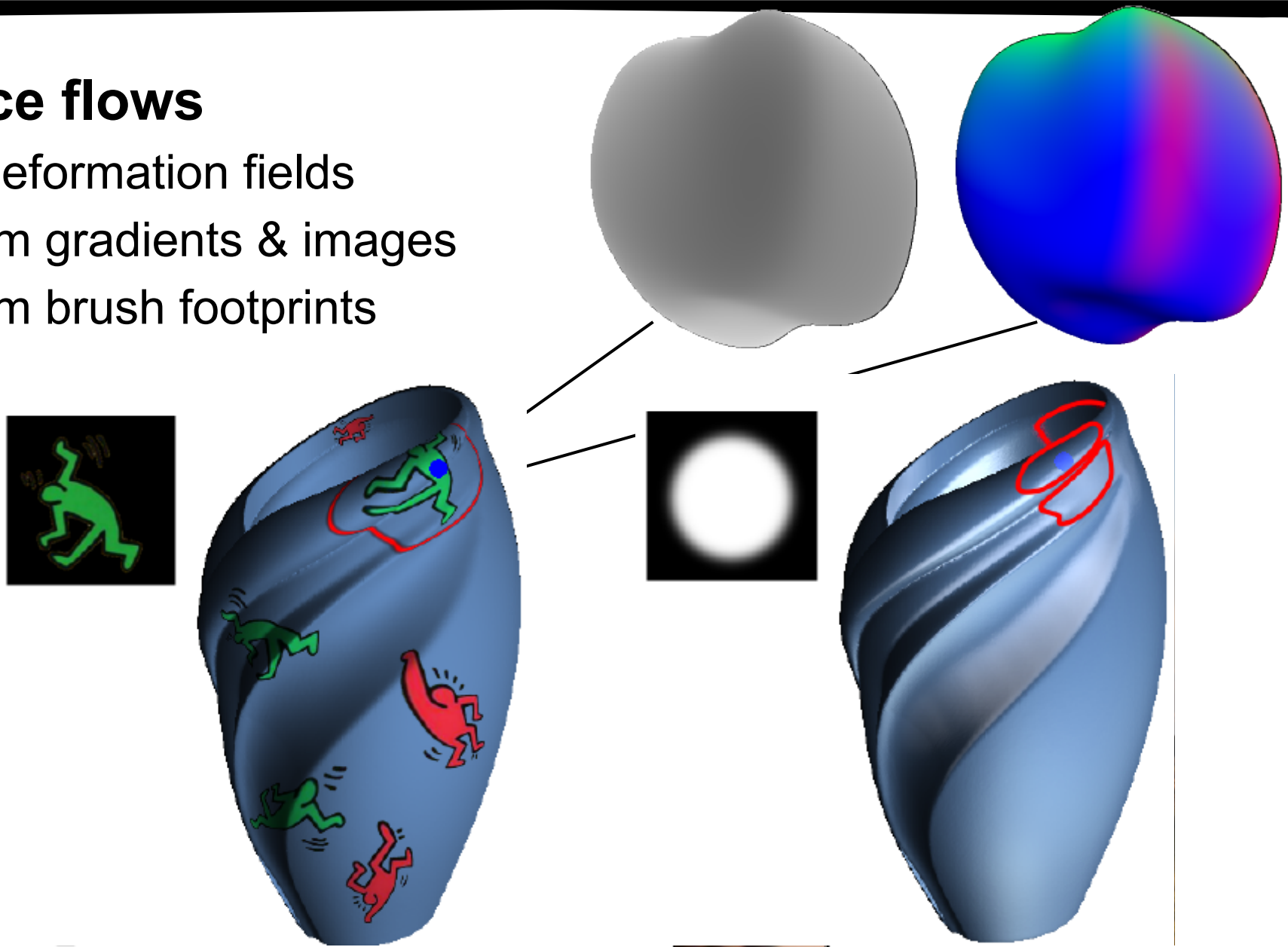
Approximation
1,7 kB



Shading by Image Deformation

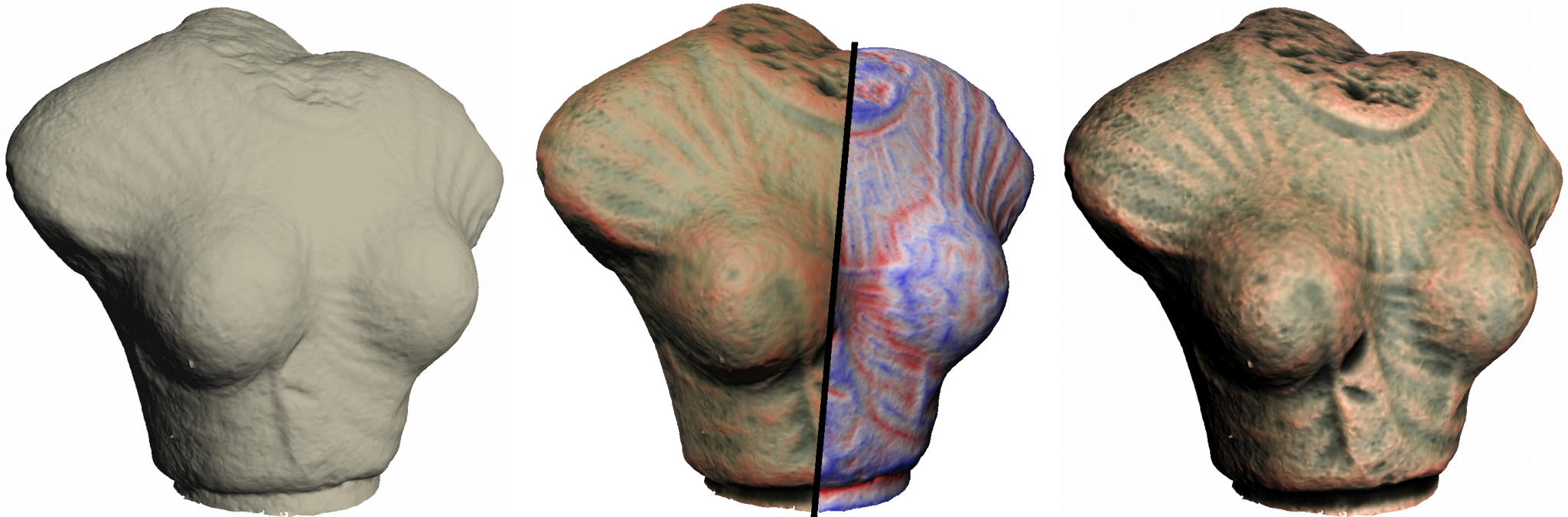
- **Surface flows**

- Two deformation fields
- Deform gradients & images
- Deform brush footprints



Illustrative Shading

- Based on new relief analysis
 - **Non-local**: features in neighborhood
 - **Multi-direction**: better anisotropy / filtering
 - **Multi-scale**: feature size



AR: Tracking of Outdoor Lighting



TEAM

Ex. AR

Conclusion

[Liu & Granier – IEEE VR 2012]

Expressive Compositing for Augmented Reality



Inria



State Key Lab of CAD&CG, Zhejiang University

Motivation

- Visualization of **underground pipelines** in video streams
- With visually **correct occluding order**
- **Without 3D geometry** of the real environment



Artistic painting on a street

Motivation

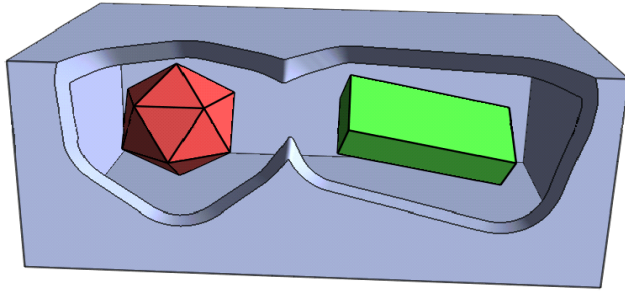
- Visualization of **underground pipelines** in video streams
- With visually **correct occluding order**
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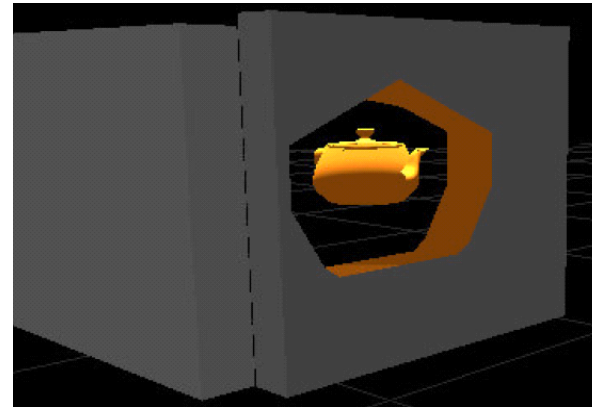
Artistic painting on a street

Related work

◉ Cutaways

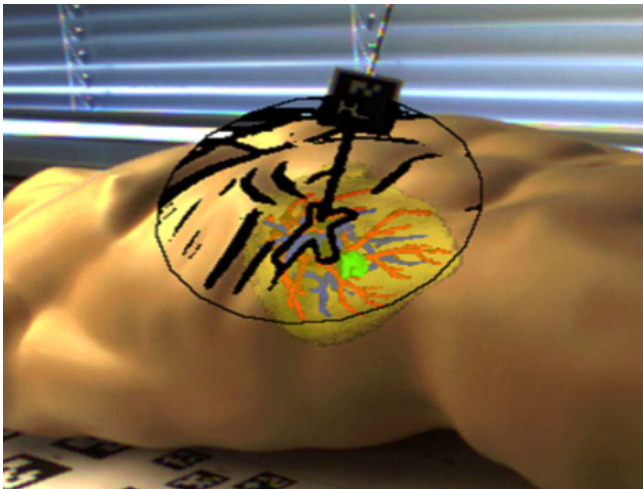


[Burns & Finkelstein 2008]

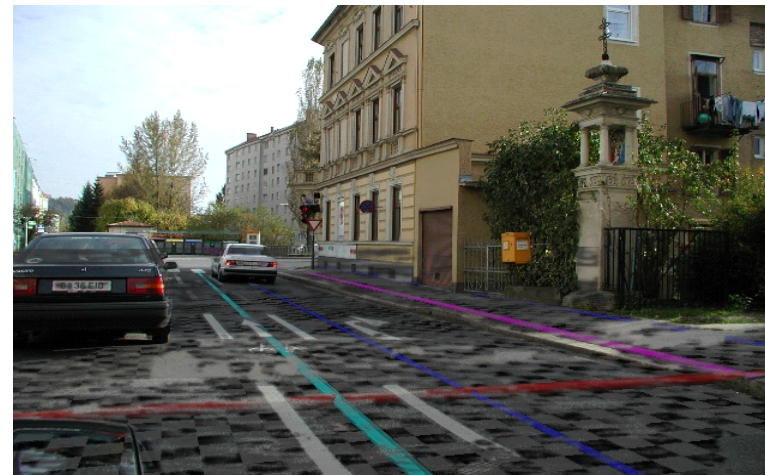


[Coffin et al. 2006]

◉ Transparency (**Focus+Context** rendering)



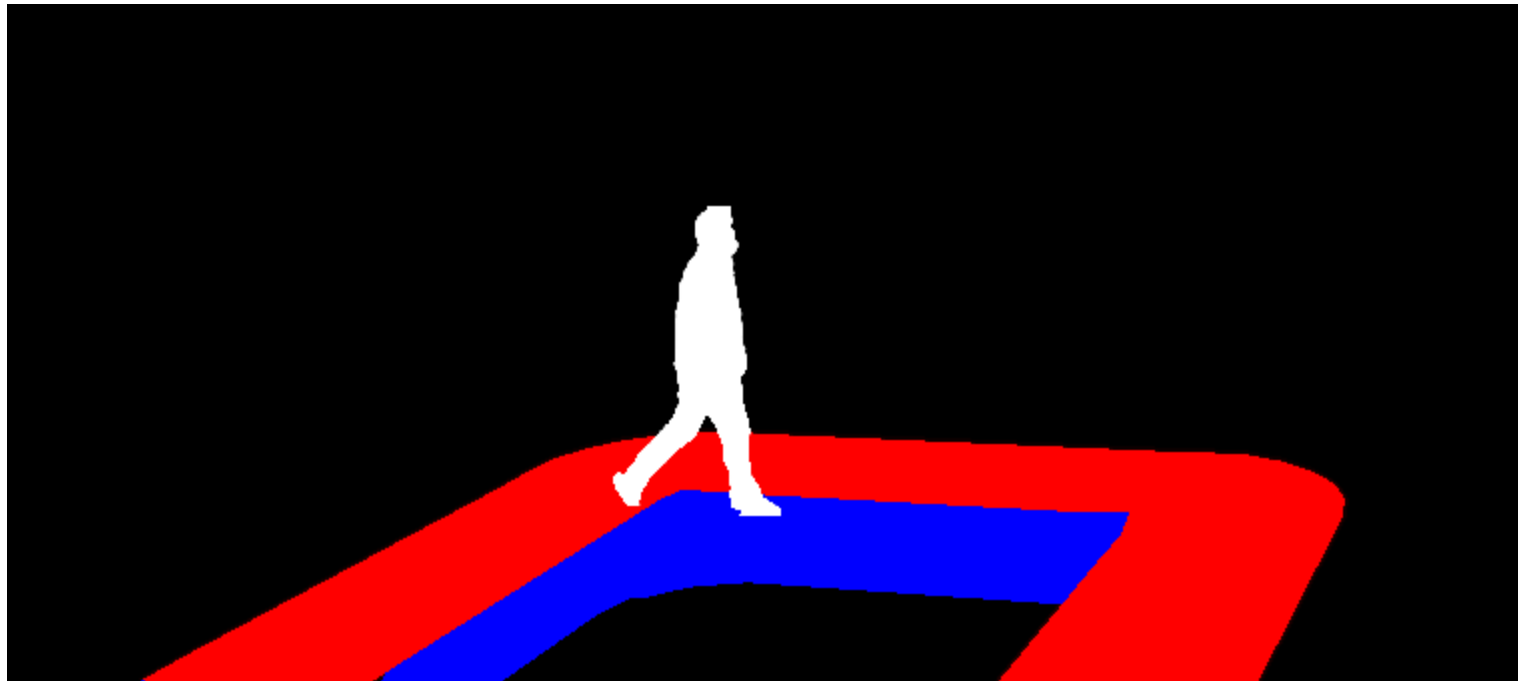
[Kalkofen et al. 2007]



[Zollmann et al. 2010]

Segmentation into Depth-ordered Regions

- Video segmentation [Zhong et al. 2009]
- Separation of front and back faced surfaces



□ Moving Context

■ Main Focus

■ Static Context

■ Second Focus

Region-based Compositing

- Moving contexts on the top
- Transparency for second focus



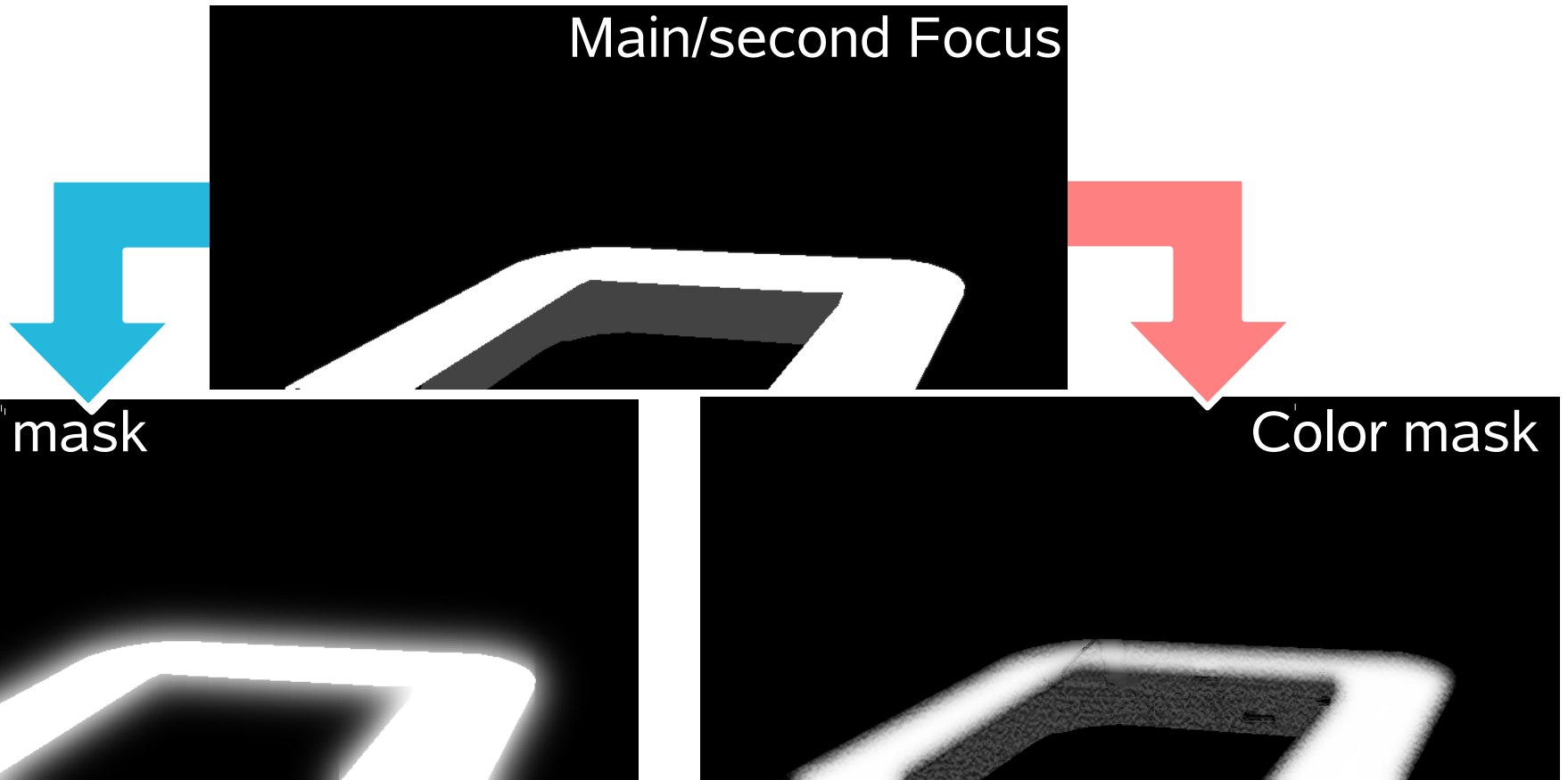
Depth Cues Using Contours

- **Contours** from pipelines and video streams
- But, boundary-breaking problem



Compositing Masks

- To preserve the **context continuity**
- Smooth outside using Gaussian filter
- Smooth inside using cross bilateral filter [Eisemann et al. 2004]



Final compositing

- ◉ **Contrast enhancement**
 - ◉ around contours



Unsharp masking [Badamchizadeh et al. 2004]

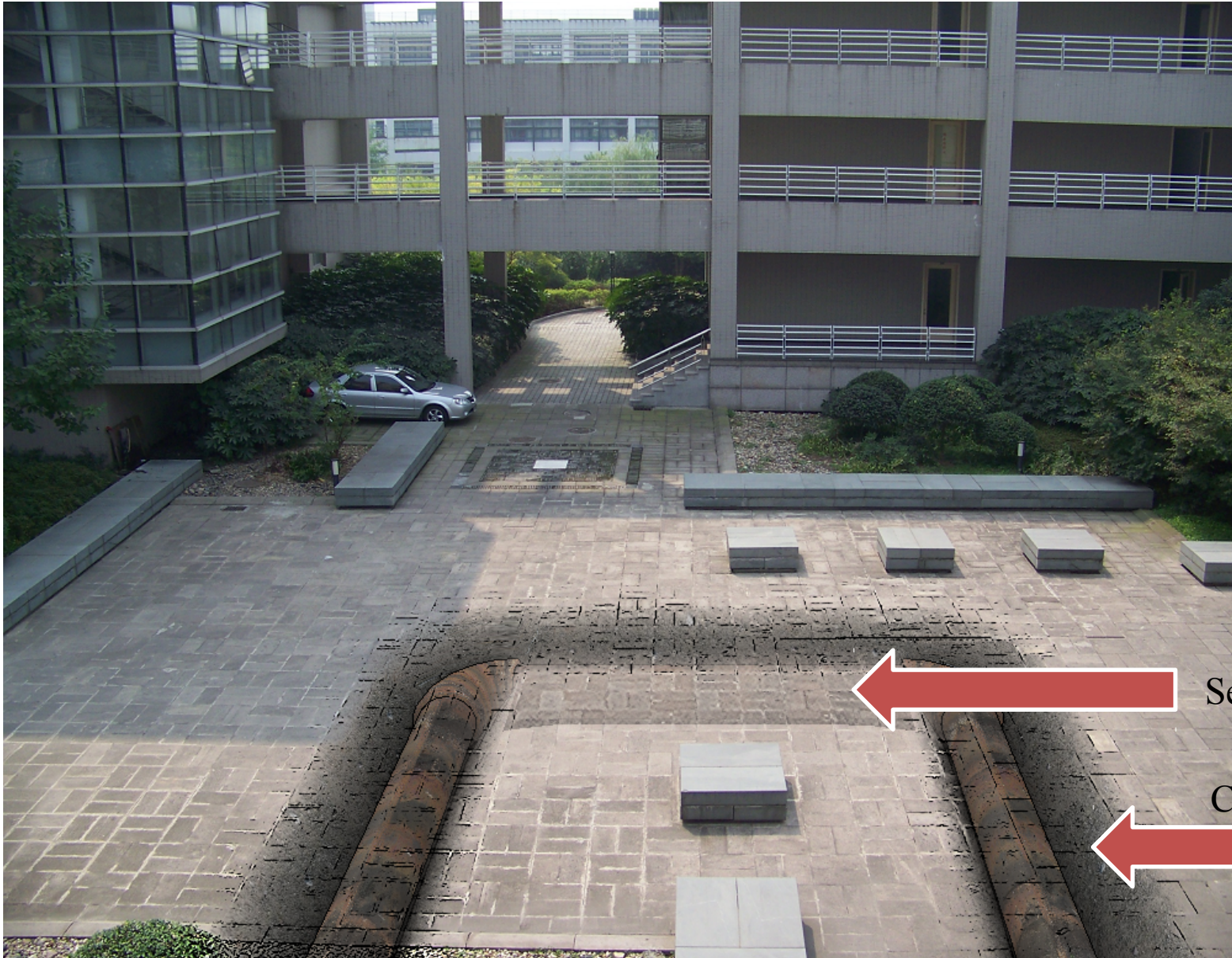
Final compositing

- ◉ **Contrast enhancement**
 - ◉ around contours



Unsharp masking [Badamchizadeh et al. 2004]

Result using a Tunnel Cutaway



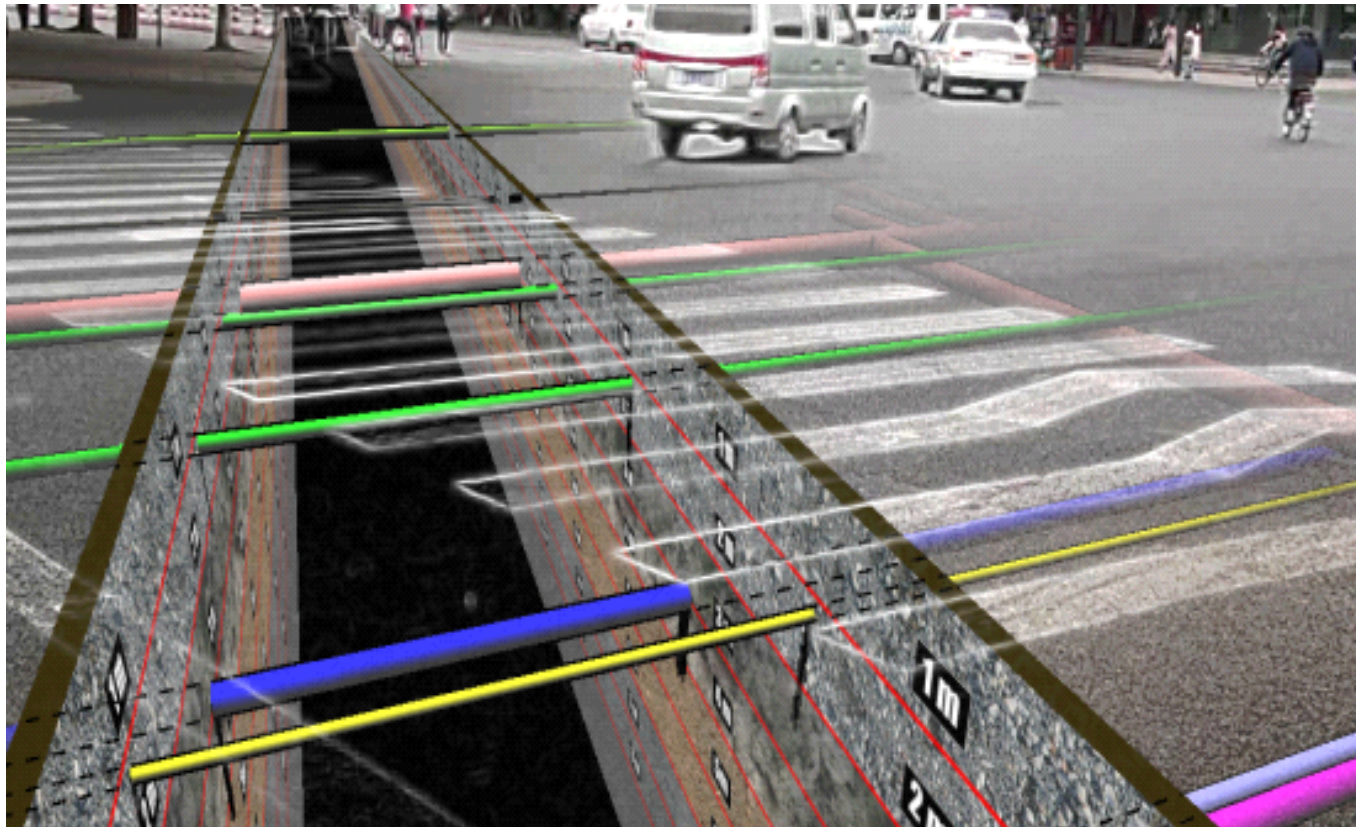
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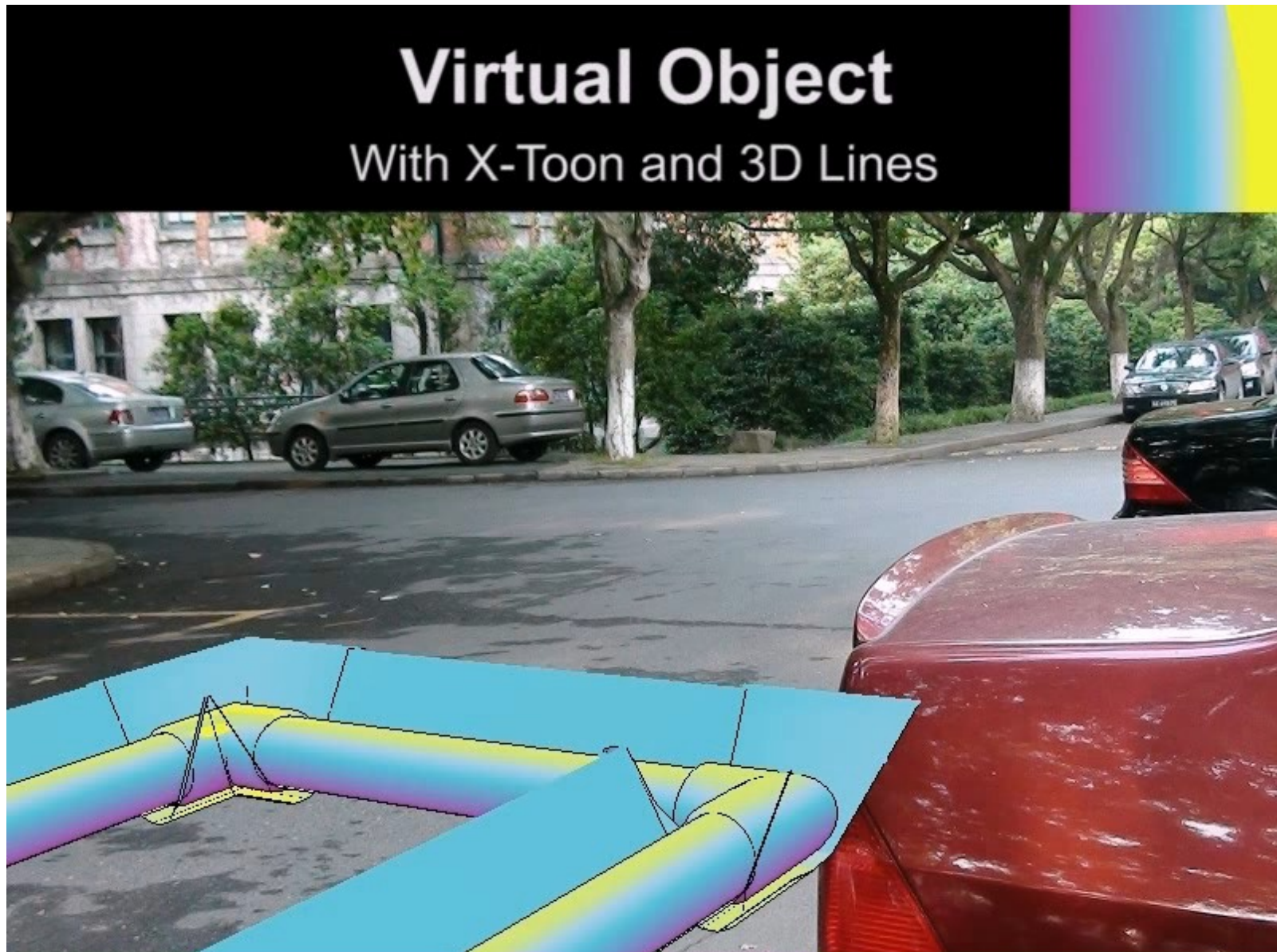
Conclusion

Result using other Cutaway Geometry

- ◉ Shadow casting
- ◉ Depth marks



Video 1



TEAM

Ex. AR

Conclusion

Video 2

Video: Walking (with Magic Lens)



Conclusion

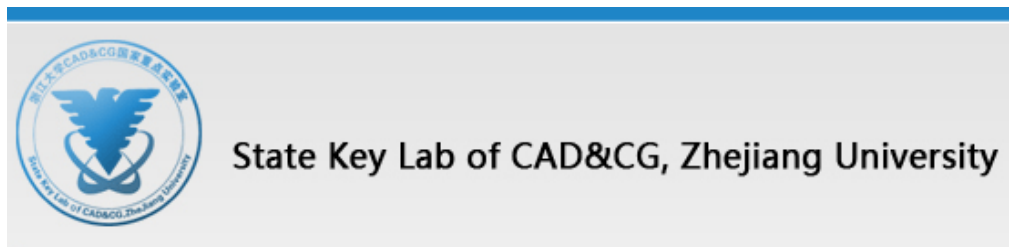
Summary & Limitations

- **Expressive Rendering**
 - Better visualization of occluding order
 - Do not require 3D geometry of the real environment
- **Limitations**
 - Moving camera
 - Camera registration
 - Quality of contours
 - Need improved contour detection
 - Only planar geometry

谢谢！
Merci !



<http://manao.inria.fr>



<http://www.cad.zju.edu.cn/>