



Computer Graphics

# Project 1: Advanced CG Topics

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Teacher: Dr. Zhuo SU (苏卓)

E-mail: [suzhuo3@mail.sysu.edu.cn](mailto:suzhuo3@mail.sysu.edu.cn)

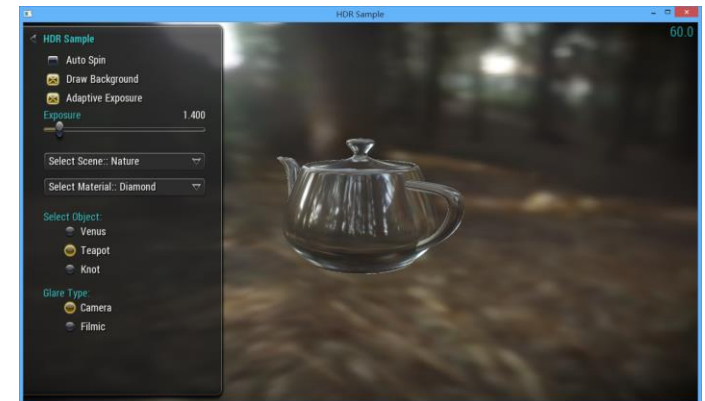
School of Data and Computer Science



# Requirement

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- Prepare a presentation about an advanced CG Topic
- 28 teams, and each team may consist of **5 or 6** students
- Plan to 16-17 week ( 4 Courses )
- Including
  - Necessary concepts, theories and technologies about your topic
  - **12-15 minute** presentations
  - Captured video show by screen recorder



# Submission

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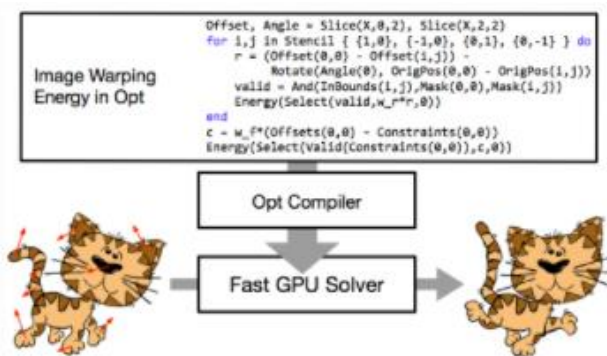
- Send your team member list to [cgcourse\\_homework@qq.com](mailto:cgcourse_homework@qq.com) before **April 5th, 2018**.
  - Including Student ID, Name, E-mail Address, Leader's QQ
  - E-mail title: CGteam+Leader ID+Leader Name
- All the presentation materials must be packed and sent to the homework mailbox: [cgcourse\\_homework@qq.com](mailto:cgcourse_homework@qq.com) before your presentation.
- E-mail title:  
e.g. CGteam+Leader ID+Leader Name



# Topics: Geometry and Shape

- Opt: A Domain Specific Language for Non-linear Least Squares Optimization in Graphics and Imaging

- <http://optlang.org/>



ARAP Image Warping



ARAP Mesh Deformation



ARAP Mesh Deformation

120k unknowns, 6 per vertex, vertex and edge energies  
18.3 kverts/s, 1.5x faster than CUDA, 20.0x Ceres

# Topics: Geometry and Shape

- Scalable Locally Injective Mappings
  - <http://igl.ethz.ch/projects/slim/>

publication ACM Transactions on Graphics  
authors Michael Rabinovich, Roi Poranne, Daniele Panozzo, Olga Sorkine-Hornung

## Flipless Parameterization of 25 Million Faces Mesh



*A locally injective parameterization obtained by minimizing the symmetric Dirichlet energy on a mesh with over 25 million triangles, computed with our algorithm in 80 minutes. The algorithm starts from a highly distorted locally injective initialization and in only 40 iterations, each requiring to solve a sparse linear system, it converges to a map with low isometric distortion that is guaranteed to be free of inverted elements.*

# Topics: Geometry and Shape

- Robust Hex-Dominant Mesh Generation using Field-Guided Polyhedral Agglomeration
  - <https://rgl.epfl.ch/publications/Gao2017Robust>

## Robust Hex-Dominant Mesh Generation using Field-Guided Polyhedral Agglomeration

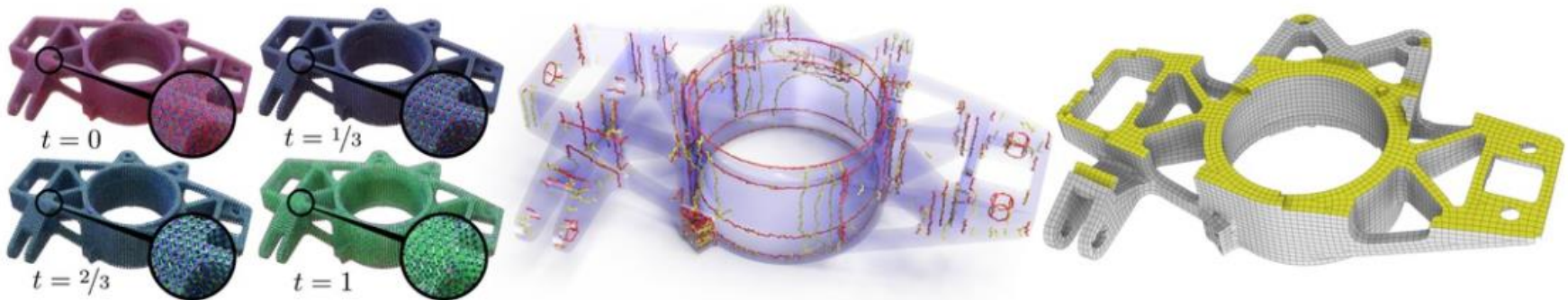
Xifeng Gao

Wenzel Jakob

Marco Tarini

Daniele Panozzo

*In ACM Transactions on Graphics (Proceedings of SIGGRAPH 2017)*





# Topics: Reality Rendering & Simulation

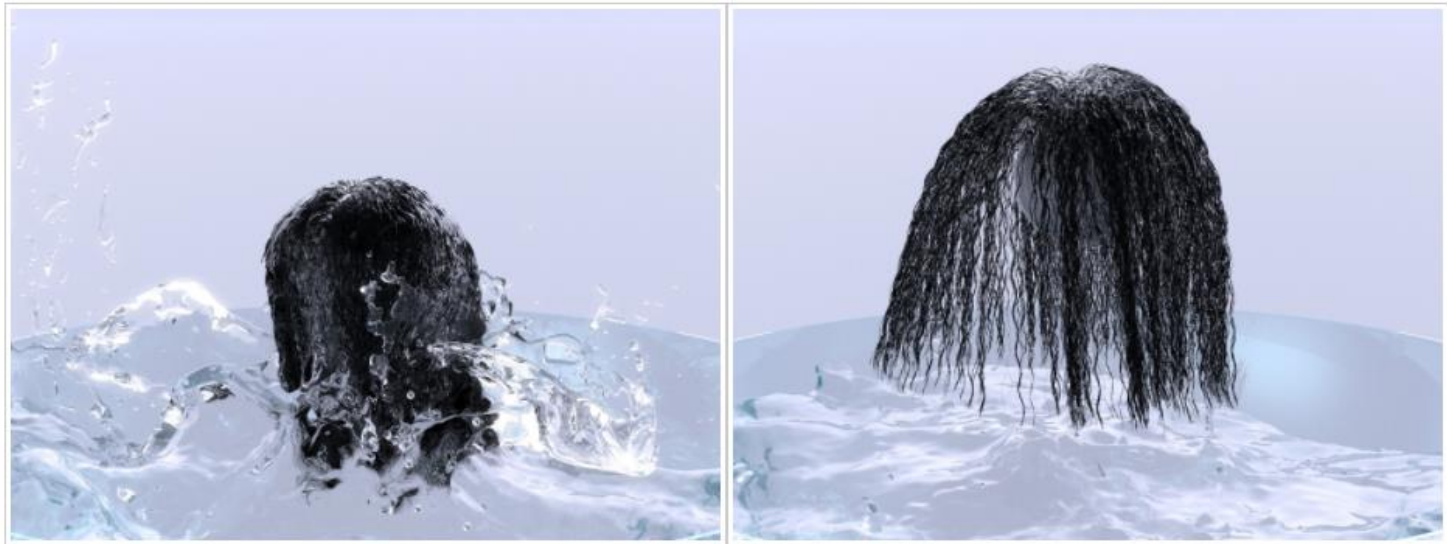
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- A Multi-Scale Model for Simulating Liquid-Hair Interactions
  - <http://www.cs.columbia.edu/cg/liquidhair/>



## libWetHair

A Multi-Scale Model for Simulating Liquid-Hair Interactions



# Topics: Reality Rendering & Simulation

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- Water Wave Packets
  - <http://visualcomputing.ist.ac.at/publications/2017/WWP/>

## WATER WAVE PACKETS



Water wave packets create fast, detailed, and unconditionally stable simulations of water surface waves.



# Topics: Reality Rendering & Simulation

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- Interpolations of Smoke and Liquid Simulations
  - <https://ge.in.tum.de/publications/2017-tog-thuerey/>

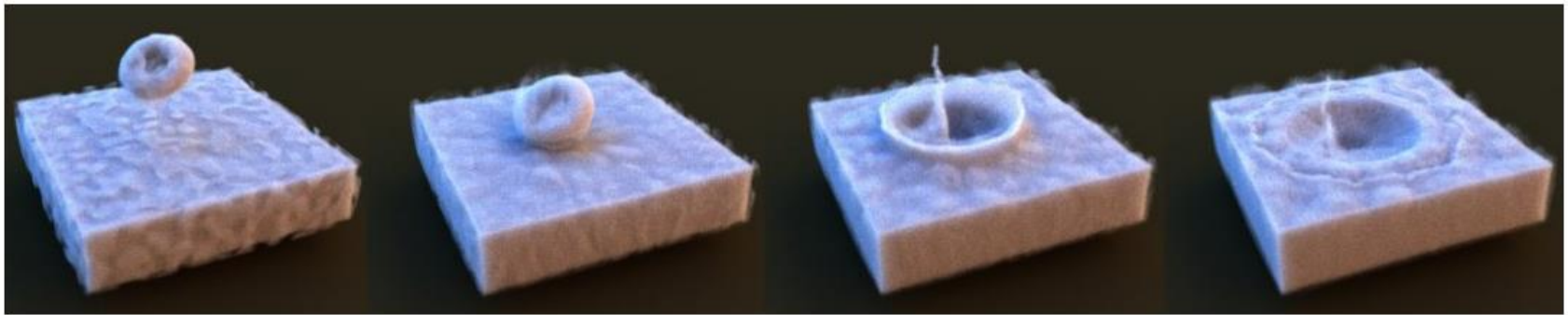
## Interpolations of Smoke and Liquid Simulations

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ACM Transactions on Graphics (Feb. 2017), Vol. 36 (1), Article No. 3

### Authors

*Nils Thuerey, Technical University of Munich*



# Topics: Reality Rendering & Simulation

- Practical acquisition and rendering of diffraction effects in surface reflectance
  - <http://wp.doc.ic.ac.uk/rgi/project/practical-acquisition-and-rendering-of-diffraction-effects-in-surface-reflectance/>

## Practical acquisition and rendering of diffraction effects in surface reflectance

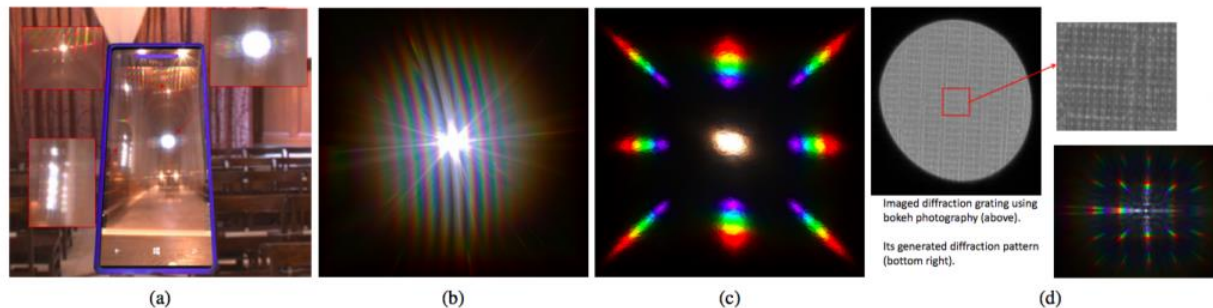
ACM Transactions On Graphics 2017

(Presentation at SIGGRAPH 2017)

Antoine Toisoul

Abhijeet Ghosh

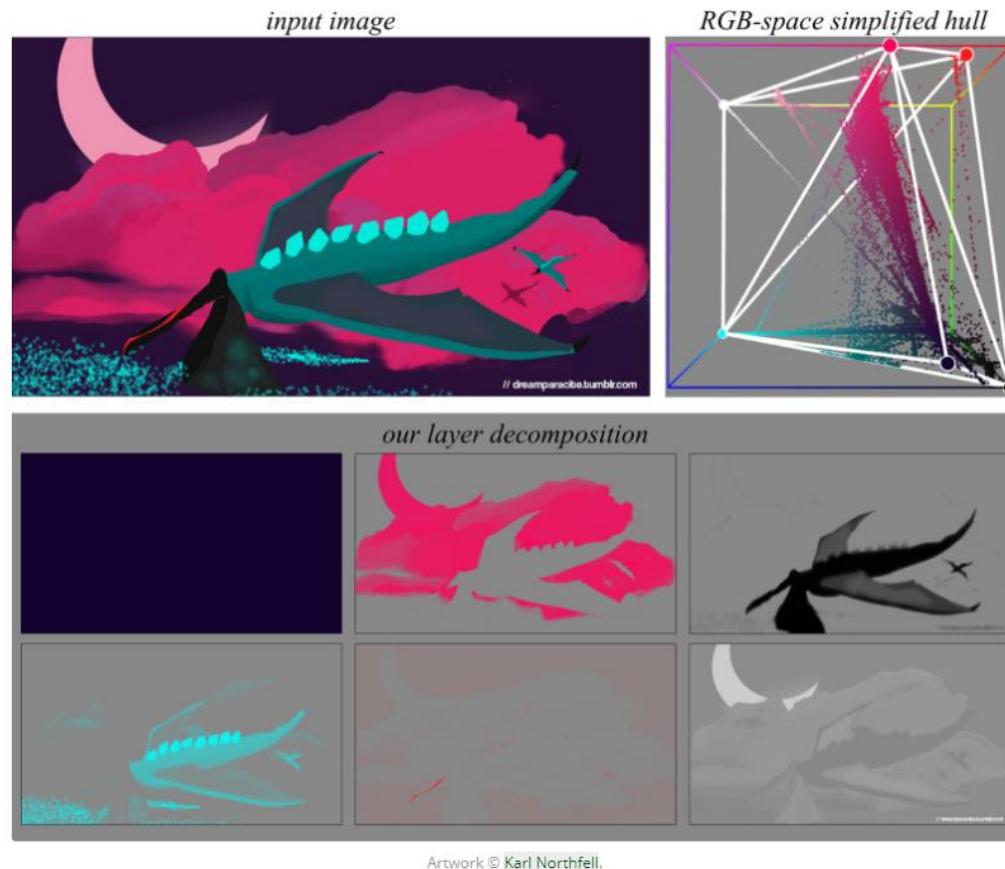
Imperial College London



**Fig. 1:** Renderings of diffraction effects observed in surface reflectance of a few common materials. (a) – (c) Proposed data-driven rendering results. (a) Diffraction patterns produced by an HTC 8X phone screen due to complex environmental illumination. (b, c) Diffraction patterns due to a point light source: (b) Bragg diffraction produced by a laptop (Lenovo Yoga) LCD screen, and (c) diffraction on a holographic paper. (d) Diffraction grating of an LG G3 phone screen measured using proposed “bokeh” photography and the resulting diffraction pattern rendered using a first order approximation (bottom right).

# Topics: Image-based Graphics

- Decomposing Images into Layers via RGB-space Geometry
  - <https://cragl.cs.gmu.edu/singleimage/>



# Topics: Image-based Graphics

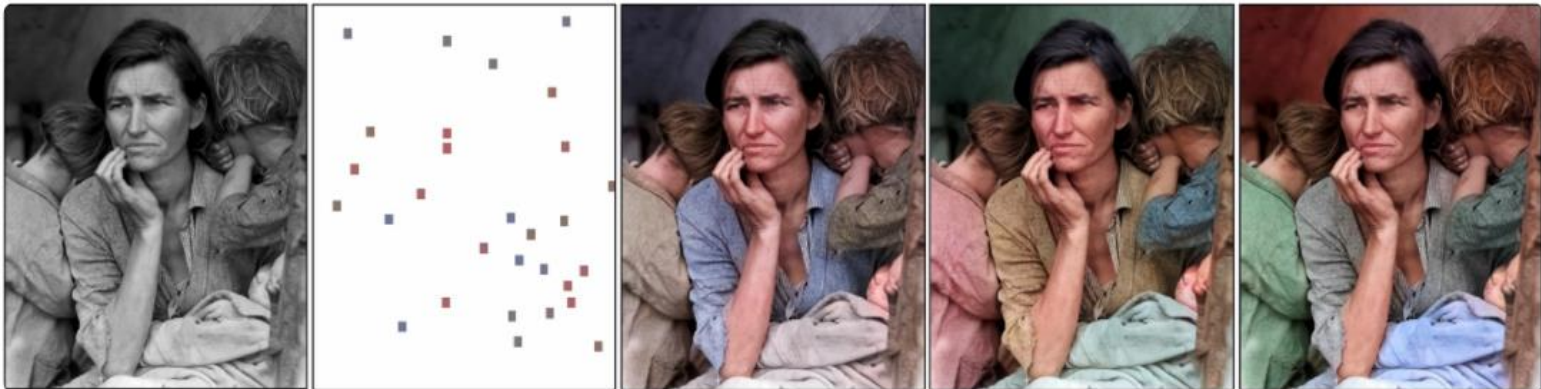
- Real-Time User-Guided Image Colorization with Learned Deep Priors
  - <https://richzhang.github.io/ideepcolor/>

## Real-Time User-Guided Image Colorization with Learned Deep Priors

Richard Zhang\* Jun-Yan Zhu\* Phillip Isola Xinyang Geng Angela S. Lin Tianhe Yu Alexei A. Efros

University of California, Berkeley

Code [GitHub] SIGGRAPH 2017 [Paper] Conference [Talk] Slides [ppt]



# Topics: Image-based Graphics

- Image-based Reconstruction of Wire Art
  - <http://geometry.cs.ucl.ac.uk/projects/2017/wire-art-reconstruction/>

## Image-based Reconstruction of Wire Art

Lingjie Liu<sup>1,2</sup>

Duygu Ceylan<sup>3</sup>

Lin Cheng<sup>2</sup>

Wenping Wang<sup>2</sup>

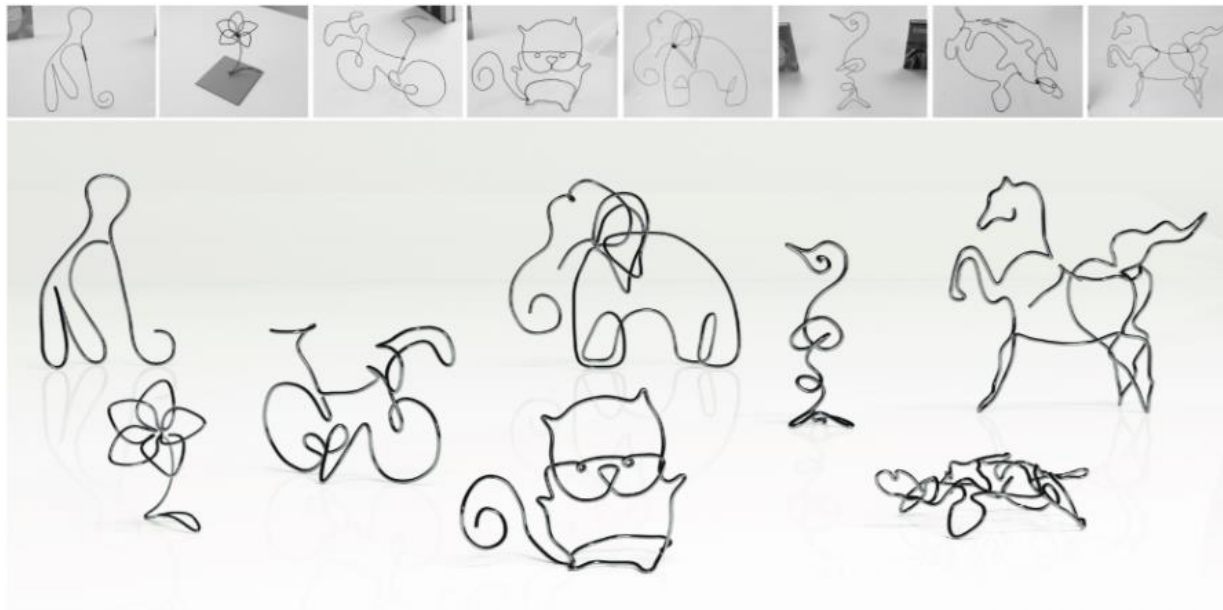
Niloy J. Mitra<sup>1</sup>

<sup>1</sup>University College London

<sup>2</sup>University of Hong Kong

<sup>3</sup>Adobe Research

SIGGRAPH 2017





# Topics: Image-based Graphics

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- Semantic Segmentation for Line Drawing Vectorization Using Neural Networks
  - <http://www.byungsoo.me/project/vectornet/>

## Semantic Segmentation for Line Drawing Vectorization Using Neural Networks

Byungsoo Kim<sup>1</sup>, Oliver Wang<sup>2</sup>, A. Cengiz Öztireli<sup>1</sup>, Markus Gross<sup>1</sup>

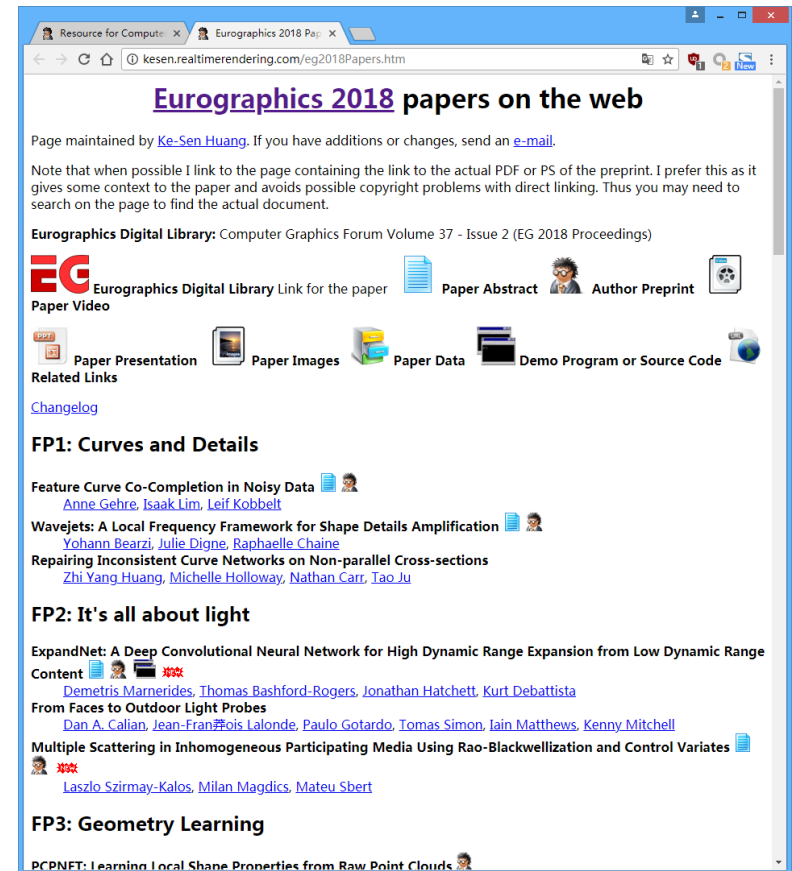
<sup>1</sup>ETH Zürich, <sup>2</sup>Adobe Research

Computer Graphics Forum (Proceedings of Eurographics 2018)



# More Topics...

- Find your interest topics from the cutting-edge researches
  - <http://kesen.realtimerendering.com/>



# Recorder

- Free online screen recorder for your presentation
  - <https://www.apowersoft.cn/free-online-screen-recorder>

