Computer Graphics Group

Offer
- Physically-based image synthesis, including light transport simulation and appearance modeling
- Monte Carlo methods for the solution of transport problems, such as radiative or neutron transport
- Colour science
- Colour calibration and colour management
- 3D printing and appearance fabrication

Expertise
- Physically-based photo-realistic and predictive rendering
- Light transport simulation
- General transport theory including radiative and neutron transport
- Physics-based modeling of material appearance
- 3D printing and appearance fabrication
- Segmentation and visualisation of medical volume data
- Correspondence problems in triangle meshes and volume data

Partnerships and Collaborations

Academic Partners

- Univesity College London, IST Austria, Max Planck Institut Informatik: collaboration on high-fidelity appearance reproduction in 3D printing
- Faculty of Science, Charles University: collaboration on research in anthropology, biomedicine and forensic science. Results obtained with our software have been published in high-impact journals
- Na Homolce Hospital: collaboration with Department of radiology on research in medical image segmentation and diagnostic imaging, especially on CT and MRI

Industry Partners

- Weta Digital: research collaboration and technology transfer on multiple topics in the area of physically-based photorealistic rendering for visual effects in movies. Our contributions have been used in Hollywood blockbusters such as The Hobbit and Dawn of The Planet of the Apes
- Render Legion (Corona Renderer) and Chaos Group (V-ray): collaborative research and technology transfer aimed at the development of the physically-based Corona and V-ray renderers, with focus on architectural and product visualisation
- Disney Research Zurich (DRZ): collaborative research on Monte Carlo methods for realistic rendering of optically participating media such as smoke, clouds, joice, skin etc.
- PIXAR Animation Studios: technology transfer of the research results developed together with DRZ into the industry-standard rendering software developed by Pixar, Photorealistic RenderMan

Key Research Equipment

We possess efficient software implementations of some of the most advanced light transport simulation algorithms that are known today.
Our graphics software is also capable of simulating of physical effects that are still uncommon in mainstream software, such as light polarisation and fluorescence.
We have developed a 3D printing driver for PolyJetting printers, capable of accurate color and texture reproduction.
Furthermore, we maintain the Morphome3cs codebase, a unified software for biomedical research that features tools for surface data acquisition, statistical shape analysis and result presentation.

Main Recent Projects

- Adaptive sampling and Markov chain Monte Carlo methods in light transport simulation, 2016–2018, Czech Science Foundation (GAČR, 16-18964S)

- Efficient rendering of light polarisation effects in nontrivial scenes, 2016–2018, Czech Science Foundation (GAČR, 16-08111S)
- DISTRO: Distributed 3D object design, 2015–2018, EU Horizon 2020 (ITN 642841)
- Robust and Efficient Light Transport Simulation in Arbitrary Environments, 2013–2015, Czech Science Foundation (GAČR, P202-13-26189S)
- HDRi: The digital capture, storage, transmission and display of real-world lighting, 2011–2014, EU, (COST Action IC1005)
- CGI-for-Film: Controllable global illumination for film production, 2008–2011, EU FP7 (Marie Curie IOF 221716)

Are you interested in this expertise?

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Experts and their Department

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