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GASTVORTRAG

Bernd Bickel

Disney Research Zurich



“Human Faces - From Acquisition towards Fabrication”

Abstract:

The human face plays a critical role in almost all aspects of human interaction and face-to-face communication. As such, face modeling has long been considered a grand challenge in the field of computer graphics. Realistic simulation behavior, surface details, and appearance are still demanding tasks.

In this talk, I will present on our recent research efforts in acquiring and modeling deformable materials, with a special focus on human faces. Furthermore, based on these techniques, I will talk about a data-driven process for designing and fabricating materials with desired deformation behavior using multi-material 3D printers, demonstrating our efforts to close the loop between the virtual and real world.

In particular, I will present a passive stereo system for capturing the 3D geometry of a face in a single-shot under standard light sources and its extension to performance capture. The system is low-cost and easy to deploy. Results are sub-millimeter accurate, and the models meet the quality requirements of a demanding domain like the movie industry. Our primary technical contribution is a modification of standard stereo refinement methods to capture pore-scale geometry, using a qualitative approach that produces visually realistic results.

To close the loop between the virtual and real world, we also started investigating the inverse process of designing and fabricating materials with desired deformation behavior. The process starts with measuring deformation properties of base materials. Each material is represented as a non-linear stress-strain relationship in a finite-element model. For material design and fabrication, we introduce an optimization process that finds the best combination of base materials that meets a user's criteria specified by example deformations. We finally demonstrate the complete process by designing and fabricating objects with complex heterogeneous materials using modern multi-material 3D printers.

Biography:

Bernd is currently a part-time visiting professor at TU Berlin and a post-doctoral researcher at Disney Research Zurich. His research interests include computer graphics and computer vision. In particular, he focuses on computational materials and face and human modeling. Recent work includes next generation 3D surface scanner devices, performance capture, measuring and modeling the deformation behavior of soft tissue, and animation tools. Bernd received a M.Sc. in Computer Science in 2006 and spent nine months at Mitsubishi Electric Research Laboratories under the supervision of Prof. Hanspeter Pfister. He wrote his PhD thesis at ETH Zurich in the Computer Graphics Lab headed by Prof. Markus Gross and defended in November 2010.

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