GERMANY Bonn

Rheinische Friedrich-Wilhelms Universität Bonn

Institut für Informatik II
Rheinische Friedrich-Wilhelms Universität Bonn
Römerstr. 164
D-53117 Bonn, Germany
☎ +49-228-73 4201
🖷 +49-228-73 4212
✉ rk | weber@cs.uni-bonn.de
🌍 www.cg.cs.uni-bonn.de

Core Competence

Geometric Modelling, Shape similarity, Real-time Rendering, Virtual Reality, Physics-based Modelling; Animation

Head of the Institute
Reinhard Klein

History

The Computer Graphics activities at the University of Bonn started in the early 90's initiated by Dieter Fellner. After he moved to Braunschweig in 1998 Reinhard Klein founded a new Computer Graphics group in October 2000. In April 2001 Andreas Weber complemented the group in the field of physics-based Modelling and Animation.

Staff

2 Professors: Reinhard Klein, Andreas Weber.
1 Assistant professor: Gabriel Zachmann.
12 Research assistants: Ákos Balázs, Gerhard Bendels, Pavel Borodin, Michael Guthe, Ferenc Kahlesz, Mark Lichtner, Jan Meseth, Marcin Novotni, Andreas Prang, Ralf Sarlette, Mirko Sattler, Gerrit Sobottka
1 Secretary: Simone Schäfer

Rooms and Locations

The institute occupies some 400 square meters and is located in the second floor of the Computer Science

department building. This includes one special lab for visualisation, rendering and virtual reality research, a special lab for the acquisition of reflectance properties and a student PC-lab.

Financing

The basic staff (7 people) and one secretary, the rooms and other infrastructure are financed by the government. Most of the research assistants and some additional staff, as well as most special equipment are paid from projects funded by the EU, the German Israeli Foundation or by a German Science Foundation.

Current Structure and Important Partners

The Computer Graphics Group is organized in two main work areas, one for Modelling, Rendering and Virtual Reality (Reinhard Klein), the other for Physics-based Modelling and Animation (Andreas Weber).

Current Research

3D-Mesh Processing

We are working on 3D-mesh generation from point clouds, approximation of large trimmed NURBS models, compact Level of Detail representations and compression techniques as well as real time rendering

algorithms for these models. So far the major results are

- automatic generation semi-regular meshes especially optimized for processing scans of human bodies.
- view-dependent tessellation and visualisation of large models with 10000th of trimmed NURBS patches on current PC-class hardware with high fidelity on interactive frame rates and its integration into the OpenSG SceneGraph API.
- mesh simplification algorithm that allows for controlled topology modifications. This algorithm is especially useful to simplify e.g. cloth models were several cloth layers are stacked onto each other.
- New efficient data structure and algorithm for view-dependent LOD-visualization of textured terrain data.

3D Mesh Editing

In many applications in Computer Graphics – especially in animation and design – modelling and editing of 3D shapes is an essential task. We study / investigate techniques for interactively modelling 3D shapes represented by polygonal meshes.

Statistical Shape Analysis

We investigate the use of 3D Laser range scans and statistical shape analysis methods
for detecting physical abnormalities (e.g., scoliosis) of adolescent children. We expect these methods to reduce the necessity of x-ray examinations and, by observing the development over time, to assist physicians in adjusting the treatment.

Search in 3D Digital Archives

The results of this challenging research area will open new horizons for 3D object reuse. We aim at solving the problem of establishing compact but descriptive signatures of three dimensional objects serving as search keys in the retrieval system.

Realtime Photorealistic Rendering of Rough Surfaces

Within the scope of the "Virtual Try-On" and “Real Reflect” Projects we are currently building up a laboratory for the automatic high quality measurements of reflection properties of different materials. In this context we also develop efficient algorithms for compression and realtime rendering of this data under environmental illumination conditions. Special attention is paid to effects of microscopic and macroscopic shadowing effects.

Intuitive Interaction with Virtual Environments

We are developing algorithms that allow a user to use his virtual hand just like his real hand and interact with the virtual environment in a natural and efficient way. While the simulation of physically-based behavior of objects is a mature field in computer graphics, the underlying detection of collisions is still a major bottleneck. Therefore, we concentrate on efficient algorithms for collision detection of deformable objects and hardware for collision detection.

Physically based modeling

In the area of physics-based modelling, we are currently focussing on modelling and animation of human hair-styles. As an analogon to the "cognitive modelling hierarchy" of avatars we are currently working on methods for "descriptive modelling" of human dressing and hairstyles.

Important Recent Project Participations

- "OpenSG Plus", BMBF project, www.opensg.org (BMBF: 01IRA02D)
- "Virtual Try On", BMBF project, www.virtual-tryon.org , (BMBF: 01IRA01A)
- "RODA: Retrieval of 3D-Objects from Digital Archives", (DFG Kl 1142/1-1,2)
- "RealReflect", EU-IST project, www.realreflect.org (IST-2001-34744)
- "Modellieren von Haaren und Frisuren, (DFG We 1945/3-1)"

Important Recent Industrial Partners

TecMath AG, Kaiserslautern, DaimlerChrysler Stuttgart, Faurecia Industries Paris, Volkswagen AG Wolfsburg, T-Systems, Stuttgart

Future of the Lab

The institute will continue close cooperations with its current partners. It will intensify international and multidisciplinary projects as well. This includes research activities in the fields of medicine, geology, computational biology and computer vision. Along with the establishment of the group we aim at the extension of the current research directions. Due to its future relevance special emphasis will be laid on 3D-shape analysis and retrieval as well as on natural human-computer interaction. A further focus will be the measurement and synthesis of optical material properties.