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Course Website

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My Contact Information

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If You Are interested in Projects

• Projects are optional in this semester!
• However, if you are interested in pursuing this option, you should start to think about possible projects
• My bottomline is that, the topic falls into your interest, and it should be done in the 5-6 week timeframe!
Project Proposal

• HARD Deadline (no extension): Monday October 7 at 2:20pm
• Hardcopies submission in class to the instructor
• One-page proposal
• Project is based on a paper entitled “XYZ”
• Detailed plan with weekly activities
Course Projects

• Sampled course projects from previous years:
  • Terrain rendering (rendering of heightmaps)
  • Realistic animation of liquids
  • Raytracing based on KD-trees
  • SPH (Smoothed Particle Hydrodynamics) Simulation of water
  • Modeling and rendering of cloud
  • Modeling plants with L-systems
  • Subdivision surfaces in character animation
Course Projects

- Shadow mapping techniques
- Modeling and rendering of seashells
- Particle-based modeling system for cloth animation
- 3D non-photorealistic rendering
- Hidden surface removal
- Particle-based fluid simulation for interactive applications
- Interactive ray tracing
Course Projects

• Procedural modeling for terrain generation
• Distributed ray tracer
• Teddy: A sketching interface for 3D freeform design
• As-rigid-as-possible shape manipulation
• Physical wave simulation
• Real-time shape illustration using Laplacian lines
• Cellular automata for cloud simulation
• Interactive technical illustration
Course Projects

- 3D terrain design
- Image deformation based on moving least squares
- Shape sculpting system based on vector field deformation
- Surface skinning techniques
- Video textures
- Simulating Chinese painting effects
- Digital inpainting and image restoration
Reverse Engineering

- Surface reconstruction
Geology – Terrain Modeling
Point Cloud Modeling/Rendering
Shape Modeling and Editing
Soft Material Animation
View Morphing
Image Morphing
Appearance Modeling
Sketch Modeling for Shape
Flow Simulation (Navier-Stokes Equation)
Fluid Simulation
Natural Phenomena
Simulation of Bubble Flow
Geometry Synthesis of Human Hair

(a) curly + long straight
(b) short spikes + wavy
(c) puffy + straight
(d) combing
Tree Simulation
Facial Expression Acquisition and Synthesis
Computer Art with Physical Interface
Non-Photorealistic Rendering
Collision Handling

Figure 5: Screenshots of (a) Collision Response and (b) Plane Simulation.
Shape Deformation and Editing
Shape Deformation
Motion Synthesis (Animation)
Shape Matching
Urban Modeling
Architectural Geometry
Biomedical Applications
Organ Deformation
Fig. 13. The soft tissue simulator produces realistic deformations of (a) the visualization geometry, and (b) embedded volumetric muscles.
Model Segmentation
Building Reconstruction

Figure 11: Additional reconstruction results using SmartBoxes. From left to right: real photograph, LiDAR scan, 3D reconstruction, and its textured version for a visual comparison with the photograph. The examples show reconstruction of complex buildings with some irregularity. Grouping and contextual force during drag-and-drop allow the reconstruction to deal with large-scale missing data (bottom row).
Texture Mapping and Synthesis
Geometry Texture Synthesis

High genus scales
Generating New Models from Examples
Augmented Reality in Neurosurgery
More Suggested Topics

• Realistic animation of clouds
• Multi-scale line drawings from 3D meshes for shape abstraction
• Simulation of smoke
• Stylized rendering techniques for scalable real-time 3D animation
• Image-based tree-modeling using particle flows
• Animation of fire
• Real-time 3D fluid simulation on GPU with complex obstacles
• Real-time non-photorealistic rendering
• Volcano animation
• Real-time procedural terrain generation
• Real-time collision handling in graphics games
• Image quilting for texture synthesis and transfer
• Sketch-based user interface for procedural terrain
• Interactive 3D terrain sketching
• 3D concept sketches using cross-section curves
• Particle-based fluid simulation for interactive graphics applications
• Automatic video texture synthesis
• Modeling and reconstructing objects with single photo
• Practical model for light transport
- Automatic and interactive lighting preview system
- Automatic generation of surface crack patterns
- Sketching solid models using blob trees
- Interactive architectural modeling using procedural extrusions
- Mesh simplification
- Out-of-core ray casting and ray tracing
- Fluid surface simulator
- Double-sided 2.5D graphics
- Cloth simulation
- Interactive global illumination
- K-means algorithm for image and geometry shape classification
- Fluid simulation with bubble generation
- Automatic construction of 3D models from line drawings
• Liquid interaction with deformable models
• Fluid dynamics for games
• Multiresolution dynamic deformations
• Rendering heightmaps based on GPU
• SPH simulation for water in pool
• KD-tree based ray tracing
• An extended toon shader
• Interactive technical illustration
• Image segmentation
• Progressive refinement for rapid radiosity
• Crowd simulation for game development
• Feature-sensitive bas relief generation
• Fast façade acquisition using line arrangements
• 3D shape retrieval based on visual similarity
• Video face replacement
• Poisson vector graphics
• Real-time oil painting
• Modeling of clouds using single photograph
• A curved ray camera for handling occlusions
• Realistic animation of liquids
• Subdivision surfaces in character animation
• Teddy
• Facial animation
• Simulation of cloud dynamics on GPU
• Simulating and animating liquids
• Shadow mapping based on ray tracing
• Modeling snow fall and accumulation
• Modeling sea shells
• Particle system for cloth modeling
• Real-time hidden surface removal
• Non-photorealistic rendering
• Digital inpainting and image restoration
• Real-time ray tracing based on graphics hardware
• Photon mapping and rendering
• Procedural modeling of cities
• 3d particle system for real-time video game
• Creation of maze art
• Real-time distributed ray tracing
• Procedural terrain based on scene voxelization
• 3D lego modeling based on shape voxelization
• As-rigid-as-possible shape manipulation
• Physical wave simulation for ocean scene production
• Real-time Eulerian water simulation
• Geometric skinning for human animation
• Video textures
• Real-time shape illustration using Laplacian lines
• A procedural watercolor engine for polygons
• Simple data-driven modeling of brushes
• Discrete element textures
• Photo watercolorization
• Computer generated floral ornament
• Silhouettes and outlines of arbitrary 3D models
• Simulating and modeling lichen growth
• Modeling plants using L-systems
• Procedural generation of road network
• Texture mapping for hand-drawn cartoons
• Qsplat: a multiresolution point rendering system for large meshes
• Image deformation using moving least squares
• Treakable light and shade for cartoon animation
• 3D mesh descriptors
• 3D model reconstruction from cross-sectional curve drawings
• Perlin noise generator
• 3D shape co-segmentation and clustering
• Extracting tree skeletal structures from point clouds
• Urban scene reconstruction using raw LiDAR data
• Image retargeting
• Creation of the impossible
• Multiresolution volume rendering
• Cross-boundary brushes for interactive shape segmentation
• Image color style transfer and colorization
• Photo-sketcher: Interactive sketch based image synthesis
• Snow cover generation
• Real-time realistic ocean lighting
• Face sketch synthesis via sparse representation
• Mesh denoising and smoothing via anisotropic diffusion of surfaces
• Adaptive ray-tracing
• Learning 3D model segmentation
• Graphical model simplification
• Multiscale rendering of 3D models
• Efficient image blending
• Synthesizing high-resolution smoke animation
• Large-scale sketch-based recognition
Journals and Conferences

- Siggraph (Siggraph Asia)
- Eurographics
- Pacific Graphics
- ACM Transactions on Graphics
- IEEE Transactions on Visualization and Computer Graphics
- Computer Graphics Forum
• Geometry-oriented journals and conferences (GMP, SPM, SMI, SGP, Computer-aided Design, CAGD, GMOD, Computers & Graphics)
• Computer Vision (CVPR, ICCV, ECCV)
• Image processing
• VR
• HCI