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CSC 570 Current Topics in Computer Graphics
Syllabus

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Professor: Zoë Wood
Office: Building 14, room 209
Phone: 756-5540
office hours: T/Th 3-4pm (subject to change)
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Schedule: T-Th 4:40-6:30pm
Location: Building14-303

General: This course will expose you to the latest research in computer graphics. In particular the course is focused on 3D models (acquisition, reconstruction, representation, enhancement: simplification, parameterization, and texturing) **This course requires substantial math and programming skills.**   In particular it will be helpful if students are familiar with linear algebra and writing 3D computer graphics programs in OpenGL.

Assignments:
- One in class presentation about a current research paper from the instructor provided list of papers (~30% grade)
- One larger final programming project of the student's choice approved by the instructor. (~35% grade)
- 1-2 intermediate programming assignments (~10% grade)
- Participation in seminar discussions! (~12% grade)
- Weekly quizzes or homework assignments related to the lecture material and papers. (~13% of grade)

Text: We will be primarily reading research and survey papers published in computer graphics related journals and conferences. See next page for the list of papers.

Final time: Proposal to hold final Monday March 19 4:10-7pm (scheduled classes of MWF 6-7)

The following is a *tentative* schedule for seminar topics and assignments

Week 1	1/9/07	Orientation and introduction	
	1/11/07	Introduction to surface representation	
	Read	*Implicit Surfaces (Bloomenthal)*	
Week 2	1/16/07	Surface reconstruction (some vision basics) intro model acquisition	
	Read	*Surface Recon (Hoppe)*	
	1/18/07	Guest presentation/ Model acquisition	Quiz 1
	Read	*Marching cubes (Lorenson & Cline)*	
Week 3	1/23/07	Model acquisition	
	Read	*Vol. Method for Build (Curless & Levoy)*	
	1/25/07	Model acquisition	Quiz2
	Read	*Real-time 3D model Acq (Rusinkiewicz, et. al.)*	
Week 4	1/30/07	Model Acq. & representation: IBR	
	Read	*Modeling & Render Arch (Debevec, et. al.)*	Program 1
	2/1/07	Enhancement:simplification	
	Read	*Progressive Meshes (Hoppe)*	
Week 5	2/6/07	Enhancement:simplification	Quiz 3
	Read	*Surface Simp using quad (Garland, et. al)*	
	2/8/07	Enhancement:simp & representation	
	Read	*Dual contouring of Hermite (Ju, et. al.)*	
Week 6	2/13/07	Surface rep: NURBS & subdivision	Quiz4
	Read	*Sub-div course notes & book* **TBA**	
	2/15/07	Enhancement:simp & representation: MRA	
	Read	*Multires. Analysis of Arb. Meshes (Eck, et. al)*	
Week 7	2/20/07	Enhancement: representation: NURBS	
	Read	*Fitting Smooth Surfaces (Krishnamurthy & Levoy)*	
	2/22/07	Enhancement: representation: Normal maps	Program 2
	Read	*Gen. method for preserve. attribute(Cignoni, et. al)*	
Week 8	2/27/07	Enhancement: representation: Normal maps	Final project check-in
	Read	*Texture mapping PMs (Sander, et. al)*	
	3/1/07	Enhancement: representation: GIMs	Quiz 5
	Read	*Geometry Images (Gu, et. al)*	
Week 9	3/6/07	Representation:normal+geom	Final project check-in
	Read	*Efficiently Combining Pos&Nor (Nehab, et. al)?*	
	3/8/07	Texturing surfaces	
	Read	*Interactive Decal Compositing (Schmidt et. al)?*	

Week 10 3/13/07   Enhancement: representation   Final project check-in
         Read   *Spectral Surface Quadrangulation, (Dong et. al.)?*
         3/15/07   Recent trends in graphics
         Read   TBA
Final   3/19/07   **4:10-7pm (subject to change)**   **Final Projects demo**

We will be reading the following papers for this class:

Implicit Surfaces by Jules Bloomenthal p 1-18 **(surface representation intro.)**

Marching Cubes: A High Resolution 3D Surface Construction Algorithm,
William E. Lorensen and Harvey E. Cline; SIGGRAPH '87 **(representation volume)**

Surface reconstruction from Unorganized Points, Hugues Hoppe, PhD Thesis, Ch. 1
(surface reconstruction intro.)

A Volumetric Method for Building Complex Models from Range Images, Curless &
Levoy; Siggraph 1996 **(acquisition)**

Real-Time 3D Model Acquisition, Szymon Rusinkiewicz, Olaf Hall-Holt and Marc
Levoy, , SIGGRAPH 2002 **(acquisition)**

(not required just listed as a reference) *Surface reconstruction from Unorganized Points,*
Hugues Hoppe, PhD Thesis, Ch. 2 **(Representation points/surface)**

*Modeling and Rendering Architecture from Photographs: A Hybrid Geometry- and
Image-Based Approach*, Debevec. P., Taylor, Malik, Siggraph 1996 **(acquisition &
representation:IBR)**

Progressive Meshes, Hugues Hoppe, Siggraph 1996
(surface representation/enhancement:simplification)

Surface Simplification using Quadric Error Metrics, M. Garland and P. Heckbert,
SIGGRAPH 1997 **(enhancement:simplification)**

Dual Contouring of Hermite Data, Ju, Losasso, Schaefer & Warren; SIGGRAPH 2002
(volume representation/enhancement:simplification)

Multiresolution Analysis of Arbitrary Meshes, Eck, DeRose, Duchamp, Hoppe,
Lounsbery & Stuetzle, SIGGRAPH 1995 **(enhancement: represenation)**

Fitting Smooth Surfaces to Dense Polygon Meshes, Krishnamurthy and Levoy,
SIGGRAPH 1996 **(enhancement: represenation)**

A general method for preserving attribute values on simplified meshes, P. Cignoni, C. Montani, C. Rocchini, R. Scopigno, IEEE Visualization 1998 **(enhancement: represenation)**

Texture mapping progressive meshes, P. Sander, J. Snyder, S. Gortler, H. Hoppe. *ACM SIGGRAPH 2001***(enhancement: represenation)**

Geometry images, X. Gu, S. Gortler, H. Hoppe, *SIGGRAPH 2002* **(enhancement: represenation)**

Efficiently Combining Positions and Normals for Precise 3D eometry, D. Nehab, S. Rusinkiewicz, J. Davis, R. Ramamoorthi, Siggraph 06 **(enhancement: represenation)**
Or
Time-Varying Surface Appearance: Acquisition, modeling and Rendering, J. Gu, C. Tu, R. Ramamoorthi, P. Belhmeur, W. Matusik, S. Nayer, Siggraph 06 **(alternative represenation)**

Interactive Decal Compositing with Discrete Expoential Maps, R. Schmidt, C. Grimm, B. Wyvill, Siggraph 06 **(enhancement: texturing)**
Or
Mesh Quilting for Geometric Texture Synthesis, K. Zhou, X. Huang, X. Wang, Y. Tong, M. Desbrun, B. Guo, H-Y Shum, siggraph 06 **(enhancement: texturing)**

Spectral Surface Quadrangulation, S. Dong, P-T Bremer, M. Garland, V. Pascucci, J. Hart, siggraph 06 **(enhancement: represenation)**