University of Paderborn
Prof. Dr. Gitta Domik

Advanced Rendering

(formerly: Computer Graphics II)

Summer Term (SS) 2012

Prof. Dr. Gitta Domik

Dipl.-Inform. Stephan Arens

People

- Lecture:
  - Prof. Dr. Gitta Domik
    (F2.204)
  - Dipl.Inform.
    Stephan Arens
    (F2.209)
- Lab:
  - Dipl.Inform.
    Stephan Arens
  - N.N.
- Secretary:
  - Lydia Kreiss (mornings)
    (F2.207)

University of Paderborn
Prof. Dr. Gitta Domik

Lectures / Assignments

Lectures

- We 9:15 am F1.110
- Fr 9:15 am F1.110
- First day of lectures 04/04/2012
- Last day of lectures 05/25/2012
- Lab starts THIS week

Lab

- **Friday**, right after lecture, first in F1.110, then in F2.520
- Questions? Monday,15:00 to 17:00, F2.209/F2.204

University of Paderborn
Prof. Dr. Gitta Domik

Master Module III.4.1

Module „Computer Graphics and Visual Computing“

Advanced Rendering

+

Data and Information Visualization

University of Paderborn
Prof. Dr. Gitta Domik

Goals of Course

- Make computer graphics more exciting
- Add textures, shaders, bump maps, non-photorealistic rendering, image based effects, etc., to pipeline rendering
- Learn abilities useful for game programming
- Develop a theoretical understanding of alternate rendering algorithms (e.g. raytracing, radiosity)

University of Paderborn
Prof. Dr. Gitta Domik

Contents of Course

- Pipeline and GPU programming
- Scene Graph
- Advanced illumination and reflection
- Texture, Environmental and Bumb Mapping, Blending
- Image-based Rendering
- Non-photorealistic Rendering
- Advanced modelling (e.g. of curves)
- Raytracing
- Radiosity
- Guest lectures:
  - Professor Beatriz Sousa Santos, U of Aveiro, Portugal
  - Dr. Berssenbrügge, Dr. Radkowski, Dr. Fischer, UPB

University of Paderborn
Prof. Dr. Gitta Domik

Labs and Prerequisites

- Programming Assignments using OpenGL / JAVA
- You should be a moderate programmer of Java and OpenGL
- You should know the basics of computer graphics algorithms.
- „OpenGL – A Primer“ by Ed Angel is a good way to catch up.
- To finish module „Graphics and Visual Computing“ (III. 4.1), you will need the course Information and Data Visualization or a seminar.
- You need to sign up for course in PAUL and koaLA!!

University of Paderborn
Prof. Dr. Gitta Domik

Get a Grade …

- Every assignment needs to be done (Malus system … counting for *up to 2 grades*)
- There are four assignment sheets
- Extra bonus is possible for adding „user studies“ to exam topics
- Bonus counts *exactly one subgrade* (e.g. 1.7 to 1.3; or 2.0 to 1.7)
- Instead of a final test there will be a final project
- Grade = Grade of project (minus malus plus bonus)
- Grade of project has to be positive to pass course

University of Paderborn
Prof. Dr. Gitta Domik

Project „Campus“

- Gameslab provides basic model. **You will provide eye candy!** (winter scene, underwater scene, miniature toys scene...)

University of Paderborn
Prof. Dr. Gitta Domik

Project details

- 3 students per group (if necessary, exceptions possible)
- Basic project: **Campus Scene**
- Must use modeling, animation, shader(s)
- Add additional effects
  - *Either one or more of: photorealistic rendering (e.g. image based rendering) or non-photorealistic rendering effects*
- Presentation of the project proposals in lecture May 4
  - *At least: Set up a scene graph with dummies for all your final objects – Better: Show first results*
  - *Create a short 3 slide presentation of your goals and techniques*
- Submit your project: May 25 (installation on presentation PC)
- Present your project: May 30 / June 1
- More information in lectures/ lab or through koaLA and **grafik@upb.de**

University of Paderborn
Prof. Dr. Gitta Domik

Grading of Project

- Project will be graded:
  - 50% oral presentation (everyone presents, what he has done within the project)
  - 50% your delivered product

University of Paderborn
Prof. Dr. Gitta Domik

Bonus: user studies

- Participate in a user study
  - understand the strategy of **controlled** experiments
  - 20-45 min to evaluate a visualization or a game
  - will take place end of April
  - you can subscribe in a list (details shortly)
  - bonus: one subgrade

University of Paderborn
Prof. Dr. Gitta Domik

Module Exams

Three grades will be averaged:

- Advanced Rendering (project grade – malus + bonus)
- Visualization (project grade – malus + bonus) or seminar
- Oral exam

For the oral exam:

- Bring pictures of project (*one* A4 page) for each final project.
- You will be asked to present each project in less than 5 min.
- You will answer questions about your algorithms used in the project AND questions from a list of topics.

If seminar is part of module, it will only be a prerequisite, no questions on the seminar will be asked.

University of Paderborn
Prof. Dr. Gitta Domik

Module Exams (cont.)

Topics in Adv. Rendering	Topics in Visualization
Texture, Environment, Bump Mapping	The Data
GPU Rendering Pipeline	The User and the Task
Advanced Shading	Mapping Techniques in Visualization
Image Based Effects	Presentation Techniques
Non Photorealistic Rendering	Volume Visualization
Bezier and B-Splines	Flow Visualization
Raytracing	Interaction in Visualization
Radiosity	(evaluation by controlled experiments)
(evaluation by controlled experiments)	
Use lecture notes and text books to prepare	*Use lecture notes, on-line tutorial and text books to prepare*

University of Paderborn
Prof. Dr. Gitta Domik

Recommended Books

- T. Akenine-Möller, E. Haines and N. Hoffman
  Real-Time Rendering, Third Edition
- Edward Angel Interactive Computer Graphics, 5th Edition, 2008. – discount -
- D. Shreiner et al. OpenGL Programming Guide. Fifth Edition (Red Book) – discount -