

Computer Graphics II

NPGR 004

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Course content and form

- ◆ **advanced 3D computer graphics**
 - main topic: realistic rendering
 - follows the Computer Graphics I (NPGR003) lecture
- ◆ **2/1 Z, Zk**
 - 90 min lecture every week
 - 90 min lab every other week
 - practical examples, homework tasks for the credit (C#)



Lecture overview I

- **shading algorithms (2-3)**
 - more reflectance models (Strauss, Cook-Torrance, Oren-Nayar), shadow casting
- **recursive ray-tracing (~3)**
 - algorithm principles, intersections, textures, speedup techniques
- **anti-aliasing and sampling (1-2)**
 - sampling and image reconstruction, sampling methods, adaptive sampling



Lecture overview II

- **Monte-Carlo rendering basics (1-2)**
 - distributed ray-tracing (soft shadows, depth of field, motion blur, light dispersion..)
 - advanced methods are covered by lectures of doc. Křivánek and Wilkie (e.g. Computer graphics III)
- **radiosity (1-2)**
 - principle (FEM formulation of the global illumination problem), form-factors, radiosity system of equations
- ♦ **contemporary rendering (2-3)**
 - modern Monte-Carlo rendering (depends on spare time)



Literature (CZ)

- **Jiří Žára, Bedřich Beneš, Jiří Sochor, Petr Felkel: *Moderní počítačová grafika*, Computer Press, Brno, 2004, ISBN: 80-251-0454-0**



Literature (EN)

- **A. S. Glassner (ed.): *An Introduction to Ray Tracing***, Academic Press, London, 1989
- **Peter Shirley et al: *Fundamentals of Computer Graphics***, 3rd edition, AK Peters, 2008
- **A. S. Glassner: *Principles of Realistic Image Synthesis***, Morgan Kaufmann, 1995



Literature (EN)

- **Pharr M., Humphreys G.: *Physically Based Rendering: From Theory To Implementation*, Morgan-Kaufmann, 2nd edition, 2010**
- **E. Veach: *Robust Monte Carlo Methods for Light Transport Simulation*, PhD, Stanford, 1997**
- **Peter Shirley, Keith Morley: *Realistic Ray Tracing*, 2nd edition, AK Peters, 2003**
- **J. Foley, A. van Dam, S. Feiner, J. Hughes: *Computer Graphics, Principles and Practice*, 2nd edition in C, Addison-Wesley, 1997**



Requirements

- **basic programming**
 - algorithms, data structures, OOP
- **basics of programming in C#**
 - no in-depth knowledge of language or libraries is needed
- **basic analysis and linear algebra**
- **Computer Graphics I**
 - the actual knowledge, no formal pre-requisite



Important pointers

- general lecture information, Computer Graphics Group:
 - <http://cgg.mff.cuni.cz/>
 - <http://cgg.mff.cuni.cz/prednasky.en.php>
 - <http://cgg.mff.cuni.cz/~pepca/>
- labs, practical exercise:
 - <http://cgg.mff.cuni.cz/~pepca/grcis/>
 - <http://cgg.mff.cuni.cz/~pepca/grcis/rt.php>
 - <svn://cgg.mff.cuni.cz/grcis/trunk/>