Study programme(s): Informatics (IA), Teaching Informatics (IC)

Level: master

Course title: Computer graphics 2 (IA131)

Lecturer: Dragan M. Mašulović

Status: elective

ECTS: 7

Requirements: none

Learning objectives

Introducing students to basic, as well as advanced principles of 3D computer graphics.

Learning outcomes

Successful students should be able to apply advanced techniques of 3D computer graphics (Java, OpenGL) to real-world problems, as well as to develop and adapt the basic algorithms of 3D graphics.

Syllabus

Theoretical instruction

Computer graphics and computer geometry as computer science subjects. Input/output devices. Graphics hardware. Raster graphics. Graphics in Java. Computer graphics and Euclidean 3D space. Geometric objects in 3D space. Transformations of Euclidean 3D space. Projections as a means of producing a plane representation of a 3D situation. Three special parallel projections. Perspective. Representing surfaces. Wireframe model of a polyhedron. Polygonal mesh, z-buffering algorithm. Convex polyhedra. Projections of convex polyhedra and backface-culling algorithm. Constructive solid geometry and ray-tracing.

Practical instruction

Basics of 3D computer graphics support in Java. The concept of 3D rendering and introduction to OpenGL. World transformations, projections, and 3D camera. Concepts of 3D animation. Texturing and multi-textures. The basics of 3D lighting. Loading and rendering 3D models generated using external tools. Terrain rendering. The application of fractals in procedural textures and dynamic terrains. Ray-tracing. OpenGL shaders. Development of modern 3D games using an existing framework.

Literature

1. D. Mašulović, *Uvod u računarsku grafiku*, skripta (odobrena za upotrebu na sednici Naučno-nastavnog veća PMF u Novom Sadu 23.9.2004.)

2. J. D. Foley, A. van Dam, S. K. Feiner, J. F. Hughes, *Computer Graphics, Principles and Practice (2nd Ed.)*, Addison-Wesley Publishing Co., 2003.

3. Dave Shreiner, Graham Sellers, John Kessenich, Bill Licea-Kane: *OpenGL Programming Guide: The Official Guide to Learning OpenGL*, Versions 4.1 (8th Edition), ISBN-13: 978-0321773036, 2013

4. Randi J. Rost, Bill M. Licea-Kane, Dan Ginsburg, John Kessenich, Barthold Lichtenbelt, Hugh Malan, Mike Weiblen: *OpenGL Shading Language* (3rd Edition), ISBN-13: 978-0321637635, 2009

Weekly teaching load				Other: 0
Lectures: 2	Exercises: 1	Other forms of teaching (computer lab): 2	Student research: 0	

Teaching methodology

Theoretical instruction lectures are based on the classical teaching model (blackboard+video beam). Practical instruction lectures are devoted to problem solving. Computer lab lectures are

devoted to acquiring hands-on experience in analyzing and developing simple computer graphics algorithms. Students' achievement is tested on two colloquia (midterm and the end of term). At the oral exam, students are expected to demonstrate the in-depth understanding of the material.			
Grading (maximum number of points 100)			
Pre-exam obligations	**points**	**Final exam**	**points**
Colloquia	**70**	Oral exam	30