

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)						
Predmet:		Računalniška grafika in tehnologija iger				
Course title:		Computer graphics and game technology				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year	Semester Semester	
Interdisciplinarni univerzitetni študijski program Računalništvo in matematika		ni smeri		3	prvi	
Interdisciplinary first cycle academic study programme Computer Science and Mathematics		none		3	first	
Vrsta predmeta / Course type				izbirni / elective		
Univerzitetna koda predmeta / University course code:				63269		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	10	20			105	6
Nosilec predmeta / Lecturer:		doc. dr. Matija Marolt				
Jeziki / Languages:		Predavanja / Lectures:		slovenski / Slovene		
		Vaje / Tutorial:		slovenski / Slovene		
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:		
Vpis v letnik študija.				Enrolment in the programme.		
Vsebina:				Content (Syllabus outline):		

<p>Predavanja:</p> <p>Uvod.</p> <p>Geometrija, affine transformacije, koordinatni sistemi. Homogene koordinate.</p> <p>Predstavitve predmetov: poligoni, deljene ploskve, parametrične krivulje. Hierarhije.</p> <p>Upodabljanje: barve.</p> <p>Lokalno osvetljevanje in senčenje.</p> <p>Teksture.</p> <p>Grafični cevovod: izločanje in rezanje, rasterizacija, z-buffer.</p> <p>Senčilniki</p> <p>Detekcija trkov. Metode razdelitve prostora</p> <p>Načrtovanje iger.</p> <p>Globalno upodabljanje: sledenje žarka, sevalna metoda, kartiranje fotonov.</p> <p>Vaje:</p> <p>Laboratorijski projekt izdelave interaktivne igre. Na vajah podan uvod v OpenGL in Unity in samostojno delo na projektih z zaključno predstavitvijo študentov.</p>	<p>Lectures:</p> <p>Introduction.</p> <p>Geometry, affine transformations, coordinate systems, homogeneous coordinates.</p> <p>Representations: polygons, subdivision surfaces, parametric curves. Hierarchies.</p> <p>Rendering: colors.</p> <p>Local illumination and shading.</p> <p>Texture mapping.</p> <p>Graphics pipeline: culling and clipping, rasterisation, z-buffer.</p> <p>Shaders</p> <p>Collision detection. Space partitioning methods.</p> <p>Game design.</p> <p>Global illumination: raytracing, radiosity, photon mapping.</p> <p>Laboratory:</p> <p>Students will implement an interactive game. Exercises will include an introductory course on OpenGL and Unity and individual project work with final public presentation of results.</p>
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Temeljni literatura in viri / Readings:

Nikola Guid: Računalniška grafika. Univerza v Mariboru, FERl.

D. Hearn, M.P. Baker: Computer Graphics with OpenGL, Pearson Prentice Hall, NJ USA.

D.H. Eberly: 3D Game Engine Design, Morgan Kaufman Publishers, CA USA.

Cilji in kompetence:

Cilj predmeta je študentom predstaviti programsko in algoritmično ozadje računalniške grafike in iger. Študenti bodo pridobili naslednje kompetence:

- razumevanje in reševanje izzivov na področju računalništva in informatike,
- uporabo znanja za samostojno delo pri reševanju tehničnih in znanstvenih problemov na področju računalništva in informatike, sposobnost nadgradnje znanj,
- sposobnost samostojnega izvajanja manj in bolj zahtevnih inženirskih in organizacijskih nalog na ožjih področjih in samostojno reševanje dobro definiranih nalog na področju računalništva in informatike,
- sposobnost samostojnega razvoja 3D interaktivnih grafičnih aplikacij in iger.

Objectives and competences:

The objective is to present students the programming and algorithmic background of computer graphics and games. When completing the course, students will be able to gain the following competences:

- the ability to understand and solve professional challenges in computer and information science.
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science, the ability to upgrade acquired knowledge.
- the ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science
- the ability to independently develop interactive 3D applications and games.

Predvideni študijski rezultati:

Znanje in razumevanje: razumevanje omejitev, ki jih različne platforme predstavljajo za razvijalce, razumevanje potrebnega ravnotežja med zmogljivostmi in porabo programja, razumevanje prednosti in slabosti programiranja za platformo v primerjavi s

Intended learning outcomes:

Knowledge and understanding:

Knowledge of background of computer graphics and games.

programiranjem brez takšnih omejitev.

Uporaba: razvoj programskega izdelka na izbranih specifičnih oziroma časovno kritičnih platformah, npr. mobilnih, interaktivnih, igralnih in robotskih platformah. Refleksija: Poleg konkretnih znanj bodo študenti dobili tudi širok teoretični pregled nad posebnostmi, ki jih prinaša razvoj produkta za različne platforme.

Prenosljive spretnosti - niso vezane le na en predmet: Znanje programiranja je potrebno za večino drugih predmetov študija.

Application:

Development of interactive 3D visualizations and computer games.

Reflection:

Knowing and understanding of the balance between the theory and practice on concrete examples from the field of computer graphics and games.

Transferable skills:

Developing graphical visualization in various fields.

Metode poučevanja in učenja:

Predavanja s praktičnimi demonstracijami, izvajanje laboratorijskega projekta pod mentorstvom asistenta.

Learning and teaching methods:

Lectures with practical demonstrations, laboratory work under the supervision of assistants.

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Sprotno preverjanje (domače naloge, kolokviji in projektno delo)	50%	Continuing (homework)
Končno preverjanje (pisni in ustni izpit)	50%	Final (written and oral exam)
Ocene: 6-10 pozitivno, 1-5 negativno (v skladu s Statutom UL)		Grading: 6-10 pass, 1-5 fail (according to the rules of University of Ljubljana)

Reference nosilca / Lecturer's references:

LESAR, Žiga, BOHAK, Ciril, MAROLT, Matija. Evaluation of angiogram visualization methods for fast and reliable aneurysm diagnosis. V: MELLO-THOMS, Claudia R. (ur.), KUPINSKI, Matthew A. (ur.). Medical imaging 2015 : image perception, observer performance, and technology assessment : 25-

26 February 2015, Orlando, Florida, United States, (Progress in biomedical optics and imaging, ISSN 1605-7422, vol. 16, no. 44), (Proceedings of SPIE, the International Society for Optical Engineering, ISSN 0277-786X, vol. 9416). Bellingham (Washington): SPIE, cop. 2015, str. [1-8], ilustr. [COBISS.SI-ID 1536347587]

BOHAK, Ciril, SODJA, Anže, MAROLT, Matija, MITROVIĆ, Uroš, PERNUŠ, Franjo. Fast segmentation, conversion and rendering of volumetric data using GPU. V: MUŠTRA, Mario (ur.). IWSSIP 2014 : proceedings, (International Conference on Systems, Signals, and Image Processing (Print), ISSN 2157-8672). Zagreb: Faculty of Electrical Engineering and Computing, Department of Wireless Communications, cop. 2014, str. 239-242, ilustr. [COBISS.SI-ID 10577236]

MAROLT, Matija. A connectionist approach to automatic transcription of polyphonic piano music. IEEE transactions on multimedia, ISSN 1520-9210. [Print ed.], str. 439-449, ilustr. [COBISS.SI-ID 4203860]

MAROLT, Matija. A mid-level representation for melody-based retrieval in audio collections. IEEE transactions on multimedia, ISSN 1520-9210. [Print ed.], Dec. 2008, vol. 10, no. 8, str. 1617-1625, ilustr. [COBISS.SI-ID 6908756]

MAROLT, Matija. Automatic transcription of bell chiming recordings. IEEE transactions on audio, speech, and language processing, ISSN 1558-7916. [Print ed.], Mar. 2012, vol. 20, no. 3, str. 844-853, ilustr. [COBISS.SI-ID 8992340]