



Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Računalniška animacija
Course title:	Computer Animation

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Izobraževalno računalništvo 2. stopnja		2.	zimski
Educational computer science 2nd level			Autumn

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30			90	5

Nosilec predmeta / Lecturer:

Jeziki / Languages: **Predavanja / Lectures:**
Vaje / Tutorial:

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Osnovno znanje programiranja.

Prerequisites:

Basics of computer programming.

Vsebina:

- Alias - antialias: povečano vzorčenje, vzorčenje področja, zamik piksla.
- Teksture: preslikava tekstur (preslikava naprej, inverzna preslikava), dvodelna preslikava teksture, preslikava izboklin, preslikava s pomikanjem, prostorske teksture, hiperteksture.
- Fraktali: definicija, metrični prostori, skrčitev, sistem IFS, konstrukcija fraktalov, kondenzacijski fraktali, izrek lepljenke, kaotični dinamični sistemi, fraktalna dimenzija, Juliajeve in Mandelbrotove množice.
- Animacijske tehnike.
- Animacija izoblikovanih podob: kinematika z delovanjem naprej, inverzna kinematika, animacija premikanja nog.
- Animacija obraza.
- Gibanje objektov: osnove premočrtnega gibanja, premočrtno gibanje v gravitacijskem polju brez dušenja in z dušenjem, gibanje po spiralni krivulji,

Content (Syllabus outline):

- Anti-aliasing: super-sampling, area sampling, pixel phasing.
- Textures: texture mapping (forward mapping, inverse mapping), two-part texture mapping, bump mapping, displacement mapping, solid textures, hypertextures.
- Fractals: definition, metric spaces, contraction mapping, IFS system, fractal construction, condensation fractals, collage theorem, chaotic dynamic systems, fractal dimension, Julia and Mandelbrot sets.
- Animation techniques.
- Animating articulated structures: forward kinematics, inverse kinematics, animation of legged figures.
- Facial animation.
- Object motion: fundamentals of linear motion, projectile motion in gravity field without resistance and with resistance, spiral motion, friction,



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<p>trenje, nihanja.</p> <ul style="list-style-type: none">• Zaznavanje trka: trk z okoljem, trk dveh gibajočih objektov.• Modeliranje in animacija pregrinjanja objektov s tekstilijami.• Izkrivljanje in preoblikovanje grafičnih objektov.• Animacija delcev.• Vedenjska animacija.• Modeliranje in animacija naravnih objektov (oblakov, dreves).	<p>oscillatory motion.</p> <ul style="list-style-type: none">• Collision detection: environmental collision, interobject collision.• Modelling and animating draping behaviour of woven cloth.• Warping and morphing graphical objects.• Particle set animation.• Behavioural animation.• Modelling and animation of natural objects (clouds, trees).
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Temeljni literatura in viri / Readings:

- D. S. Ebert, F. K. Musgrave, D. Peachey, K. Perlin, S. Worley: *Texturing and Modeling*. Third Edition, AP Professional, San Diego, 2003.
- D. Hearn, M. P. Baker, W. Carithers: *Computer graphics with OpenGL*, 4th Edition, Prentice Hall, Upper Saddle River 2010.
- R. Parent: *Computer Animation. Algorithms and Techniques*, Third Edition Elsevier, Amsterdam, 2012.

Cilji in kompetence:

Cilj predmeta je seznaniti študente z osnovami računalniške animacije.

Objectives and competences:

The objective of this course is to acquaint students with fundamentals of computer animation.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben

- razumeti temeljne metode antialiasa, tvorbe tekstur, fraktalov in animacijskih tehnik,
- načrtovati preproste grafične aplikacije,
- zgraditi preprosti osvetlitveni model.

Prenosljive/ključne spretnosti in drugi atributi:

- *Spretnosti komuniciranja*: ustni zagovor laboratorijskih vaj, pisno izražanje pri pisnem izpitu.
- *Uporaba informacijske tehnologije*: pisanje računalniških programov, uporaba programskih orodij za animacijske aplikacije.
- *Spretnosti računanja*: reševanje računskih problemov pri domačih nalogah.
- *Reševanje problemov*: izvedba preprostih animacijskih aplikacij.

Intended learning outcomes:

Knowledge and understanding:

On completion of this course the student will be able to

- understand fundamentals of antialias methods, texture construction, fractals, and animation techniques,
- design simple animation applications,
- construct a simple animation application.

Transferable/Key skills and other attributes:

- *Communication skills*: oral lab work defence, manner of expression at written examination.
- *Use of information technology*: writing computer programs, use of software tools for animation applications.
- *Calculation skills*: solving calculating problems in homework assignments.
- *Problem solving*: construction of simple animation applications.

Metode poučevanja in učenja:

Learning and teaching methods:



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<ul style="list-style-type: none">• predavanja,• seminarske vaje,• laboratorijske vaje.	<ul style="list-style-type: none">• lectures,• tutorial,• lab work.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<ul style="list-style-type: none">• laboratorijske vaje,• 1. vmesni pisni izpit,• 2. vmesni pisni izpit,• 3. vmesni pisni izpit.	<p>50</p> <p>17</p> <p>17</p> <p>16</p>	<ul style="list-style-type: none">• lab work,• 1st midterm written exam,• 2nd midterm written exam,• 3rd midterm written exam.
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Opomba:

Če študent ni uspešno opravil vseh treh vmesnih izpitov, jih nadomesti s pisnim izpitom v deležu 50 %.

Note:

If a student has not completed all three midterm exams, he replaces them with a written exam in the weight of 50 %.

Reference nosilca / Lecturer's references:

- STRNAD, Damjan, GUID, Nikola. A fuzzy-genetic decision support system for project team formation. *Applied soft computing*, ISSN 1568-4946, Sep. 2010, vol. 10, iss. 4, str. 1178-1187, doi: [10.1016/j.asoc.2009.08.032](https://doi.org/10.1016/j.asoc.2009.08.032). [COBISS.SI-ID [14386966](#)]
- STRNAD, Damjan. Parallel terrain visibility calculation on the graphics processing unit. *Concurrency and computation*, ISSN 1532-0634, 2011, vol. 23, iss. 8, str. 2452-2462. <http://onlinelibrary.wiley.com/doi/10.1002/cpe.1808/pdf>, doi: [10.1002/cpe.1808](https://doi.org/10.1002/cpe.1808). [COBISS.SI-ID [15693334](#)]
- KOHEK, Štefan, STRNAD, Damjan. Interactive synthesis of self-organizing tree models on the GPU. *Computing*, ISSN 0010-485X, Feb. 2015, vol. 97, iss. 2, str. 145-169, doi: [10.1007/s00607-014-0424-7](https://doi.org/10.1007/s00607-014-0424-7). [COBISS.SI-ID [18066454](#)]
- STRNAD, Damjan, GUID, Nikola. Parallel alpha-beta algorithm on the GPU. V: 33rd International Conference on Information Technology Interfaces [also] ITI 2011, June 27-30, 2011, Cavtat / Dubrovnik, Croatia. LUŽAR - STIFFLER, Vesna (ur.), JAREC, Iva (ur.), BEKIĆ, Zoran (ur.). *Proceedings of the ITI 2010*, (ITI ... (Tisak), ISSN 1330-1012). Zagreb: University of Zagreb: University Computing Centre, cop. 2010, str. 571-576, ilustr. [COBISS.SI-ID [15189014](#)]
- FISTER, Iztok, STRNAD, Damjan, YANG, Xin-She, FISTER, Iztok. Adaptation and hybridization in nature-inspired algorithms. V: FISTER, Iztok (ur.), FISTER, Iztok (ur.). *Adaptation and Hybridization in Computational Intelligence*, (Adaptation, learning, and optimization, ISSN 1867-4534, Vol. 18). Cham ... [et al.]: Springer, 2015, str. 3-50. <http://link.springer.com/book/10.1007/978-3-319-14400-9>. [COBISS.SI-ID [18405142](#)]