

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:	3D animacija likov					
Course title:	3D Character Animation					
Študijski program in stopnja Study programme and level	Študijska smer Study field			Letnik Academic year	Semester Semester	
Razvoj videoiger in razširjenih resničnosti, visokošolski strokovni študijski program prve stopnje	-			Drugi	Četrti	
Game and Extended Reality Development, first cycle Professional Study Programme	-			Second	Fourth	
Vrsta predmeta / Course type			Obvezni / Obligatory			
Univerzitetna koda predmeta / University course code:			4-RVRR-VS-3DAL-2025-09-19			
Predavanja Lectures	Seminar Seminar	Vaje Tutorials	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	45	-	-	115	6
Nosilec predmeta / Lecturer:			doc. Nadav Sagir			
Jeziki / Languages:	Predavanja / Lectures:		Slovenski, angleški / Slovene, English			
	Vaje / Tutorials:		Slovenski, angleški / Slovene, English			
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:			Prerequisites:			
Študenti predhodno osvojijo vsebine predmetov Osnove risanja z vizualnimi principi 2D in 3D percepcije, Fotografija za interaktivne medije, Razvoj likov za videoigre in 3D modeliranje. Študenti morajo imeti pozitivno ocenjene seminarsko projektno nalogo in vaje.			Students first study the content of the courses Fundamentals of Drawing with Visual Principles of 2D and 3D Perception, Photography for Interactive Media, Character Development for Video Games, and 3D Modeling. Students are due to have positively evaluated semester project assignment and exercises.			
Vsebina: Pri predmetu 3D animacija likov študenti pridobijo potrebno znanje in tehnično usposobljenost za uporabo animacijskih tehnik pri zasnovi in oblikovanju 3D lika za			Content (syllabus outline): In the 3D Character Animation course, students are expected to acquire the necessary knowledge and technical skills to apply animation techniques to the design			

videoigre.

Študenti bodo razumeli pomen okostja, pomembnost različnih položajev lika, simulacijo teže in mase ter načrtovanje gibanja po meri (hoja, skok, tek, itd).

Predmet temelji na znanju, pridobljenem pri predmetih Razvoj likov za videoigre in 3D modeliranje, nato pa ga nadgradi z vsebino predmetov Razvoj projektov razširjene resničnosti ter Razvoj likov za okolja razširjene resničnosti.

Teme:

- Pregled analognih in digitalnih tehnik animacije lika; analize primerov
- Dinamika v tradicionalnih kreativnih izrazih in 3D animaciji: od implicitne sugestije gibanja k eksplicitni simulaciji.
- Pridobivanje in interpretacija kvalitativnih referenčnih materialov pri oblikovanju giba; analiza dvonožnih in četrtonožnih likov
- Osnovno poligonalno 3D modeliranje likov
- Osnovne in pol-napredne tehnike 3D animacije lika
- Ustvarjanje osnovnega (človeškega in živalskega) okostja
- Določanje osnovnih položajev za humanoidne in nehumanoidne like
- Primerjava kontraposta v tradicionalnem kreativnem izrazu in rigginga v 3D animaciji: Mehanizmi za doseganje ravnotežja v fizični in virtualni sceni.
- Različne faze gibanj – ekstremne pozicije; vloga specifičnih poz v 3D animaciji (»A« in »T« pozicija)
- Poza kot pripovedni element: od statične zamrznitve giba v tradicionalnih ustvarjalnih izrazih do animacijske sekvence
- Tehnike deformacije: stiskanje, razširjanje; gibanje po loku, prekrivanje, itd.
- Nastavitev osnovnih gibov v animaciji lika - animacija hoje (cikel hoje), animacija teka, animacija skokov in animacija rotacije gibov v 3D prostoru

and creation of 3D character animation for video games.

Students will understand the importance of the skeleton, the importance of different character positions, weight and mass simulation, and custom motion design (walking, jumping, running, etc.). The course builds on the knowledge acquired in the courses *Character Development for Video Games* and *3D Modelling*, and then builds on it with the content of the courses *Extended reality projects development* and *Character development for Extended Reality environment*.

Topics:

- Review of analog and digital techniques of character animation; case analysis
- Dynamics in traditional creative expressions and 3D Animation: From Implicit Suggestion of Movement to Explicit Simulation.
- Collecting and interpreting qualitative reference materials at motion design; analysis of two-legged and four-legged characters
- The basic polygonal 3D character modelling
- Basic and intermediate 3D Animation techniques
- Setting up basic (human & animals) skeletons
- Setting basic positions for humanoid and non-humanoid characters
- Comparison of Contrapposto in traditional creative expression and Rigging in 3D Animation: Mechanisms for achieving balance in physical and virtual scenes.
- Different phases of movement - extreme positions; the role of specific poses in 3D animation (»A« pose and »T« pose)
- Pose as a narrative element: from static freeze of movement in traditional creative expressions to animated sequence

<ul style="list-style-type: none"> • Optimizacija in izvoz 3D animacije za druga programska okolja 	<ul style="list-style-type: none"> • Deformation techniques: squeeze stretch; movement along the arc; overlapping, etc. • Setting up the basic movements in the character animation - walking animation (walking cycle), running animation, jumping animation and animation of motion rotation in 3D space • Optimising and exporting 3D animation for other software environments
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Temeljni literatura in viri / Readings:

<ul style="list-style-type: none"> • Jamie, K. (2024). 3D Character Rigging in Blender: Rig your characters from scratch to give them life and make them animation ready. Packt Publishing Limited. • Osti, R. (2021). Dynamic Human Anatomy: An Artist's Guide to Structure, Gesture, and the Figure in Motion. Monacelli Studio. • Johnston, O. & Thomas, F. (2018). Illusion Of Life: Disney Animation. Hyperion. • Matessi, M. (2018). FORCE: Dynamic Life Drawing: 10th Anniversary Edition., Taylor & Francis Ltd. • Williams, R. (2012). The Animator's Survival Kit: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and Internet Animators. Farrar, Straus and Giroux.

Cilji in kompetence:

<p>Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:</p> <p><i>Splošne kompetence:</i></p> <ul style="list-style-type: none"> • Raziskovanje, dokumentiranje, analiza in interpretacija razvojnih in oblikovnih konceptov v kontekstih videoiger in razširjenih resničnosti. • Prepoznavanje in ocenitev aktualnih in nastajajočih tehnologij in sodobnih metod, veščin in tehnik s področja videoiger in razširjenih resničnosti ter ocenitev njihove uporabnosti za reševanje potreb uporabnikov. • Sposobnost interdisciplinarnega povezovanja in nadgradnje znanj iz drugih sorodnih kreativnih področij. • Sposobnost samostojnega sledenja najnovejšim tehnološkim dosežkom in pridobivanja novih znanj, ki so uporabna v produkciji videoiger in razširjenih resničnosti.
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Objectives and competences:

<p>Teaching unit contributes to the development of the following general and subject-specific competences:</p> <p><i>General competences:</i></p> <ul style="list-style-type: none"> • Research, documentation, analysis and interpretation of development and design concepts in the contexts of video games and extended reality. • Identification and evaluation of current and emerging technologies and contemporary methods, skills and techniques in the fields of video games and extended reality, and assessment of their applicability to address user needs. • Ability to interdisciplinarily integrate and build on knowledge from other related creative fields. • Ability to independently keep up to date with the latest technological developments and gain new skills useful in video game and extended reality production.
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<ul style="list-style-type: none"> • Usposobljenost za skupinsko delo v vseh fazah razvoja in oblikovanja programske opreme. <p><i>Predmetno-specifične kompetence:</i></p> <ul style="list-style-type: none"> • Poznavanje tehnik animacije likov, ki združujejo klasična načela animacije s poznavanjem anatomije in gibanja; • Poznavanje osnovnih načel gibanja humanoidnih in nehumanoidnih likov; • Razumevanje poze kot univerzalnega estetskega orodja; • Sposobnost načrtovanja animiranih 3D likov na podlagi zgodbe; • Sposobnost prepoznavanja in določanja obraznih, antropoloških in anatomskih značilnosti lika za videoigre; • Interdisciplinarna analiza prehodov med statičnim in dinamičnim izrazom; • Oblikovanje izvirnega 3D lika, ki prikazuje ključna načela animacije v povezavi z oblikovanjem iger; • Učinkovito vključevanje tehnologije pri ustvarjanju 3D animacije z uporabo različnih tehnik, vključno z osvetlitvijo, teksturami, svetlobnim prikazom in izpisom 3D lika; • Ustvarjanje portfelja animiranih likov za videoigre in poznejši izvoz v okolja razširjene resničnosti, ki prikazuje vse faze 3D animacije lika. 	<ul style="list-style-type: none"> • Ability to work as part of a team in all phases of software development and design. <p><i>Subject-specific competencies:</i></p> <ul style="list-style-type: none"> • Knowledge of character animation techniques that combine classical animation principles with anatomy and movement; • Knowledge of the basic principles of movement of humanoid and non-humanoid characters; • Understanding pose as a universal aesthetic tool; • The ability to design animated 3D characters based on a storyline; • Ability to identify and define facial, anthropological and anatomical features of a character for video games; • Interdisciplinary analysis of transitions between static and dynamic expression; • Design an original 3D character demonstrating the key principles of animation in relation to game design; • Effective integration of technology in the creation of 3D animation using a variety of techniques including lighting, textures, lighting rendering and 3D character extraction; • Creating a portfolio of animated characters for video games and subsequent export to Extended Reality environments, showing all stages of 3D character animation.
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Predvideni študijski rezultati:

<p>Znanje in razumevanje</p> <p>Študent / študentka:</p> <ul style="list-style-type: none"> • se nauči, kako s tehničnimi in ustvarjalnimi spretnostmi ustvariti prepričljivo animacijo 3D likov • zna uporabljati klasična estetska načela v sodobnem digitalnem kontekstu 3D animacije likov
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Intended learning outcomes:

<p>Knowledge and understanding</p> <p>The student:</p> <ul style="list-style-type: none"> • learns how to create strong 3D character animation, using both technical and creative skills • know how to apply classical aesthetic principles in the contemporary digital context of 3D character animation

- uporablja tehnike animacije 3D likov, ki združujejo klasična načela animacije s poznavanjem anatomije in gibanja: predvidevanje (priprava na dejanje, kot je skok ali udarec), pretiravanje (potiskanje gibanja naprej), lok (gibanje po krožni poti), itd.
- pridobi znanje o tem, kako poudariti fizične elemente lika: iluzijo teže in volumna lika
- pridobi znanje, kako zgraditi osnovno konstrukcijo okostja (kosti in sklepi) za nizko natančni lik in kako »povezovati« kožo s okostjem
- pridobi znanje, kako nastaviti ukaze Inverzne Kinematike
- spozna pomen časa in razmikov pri simuliranju lastnosti teže, sile in vztrajnosti
- se nauči, kako nastaviti ključ in ključne sličice na časovnem traku za vsako gibanje ter kako nastaviti oznake sledenja in gibanja po ustavitvi
- prepozna različne sloge in materiale, ki se uporabljajo pri produkciji animacije
- razume produkcijski proces za 3D animacijo

- uses 3D character animation techniques which integrate the classic principles of animation with anatomy and movement knowledge: anticipation (preparation for an action such as a jump or a punch), exaggeration, arc, etc.
- learns how to emphasize the physical elements of a character: the illusion of a character's weight and volume
- learns how to build a basic armature & rigging system (bones & joints) for a low poly character and how to "skin" the armature to a model
- learn how to set up Inverse Kinematics controls
- learns the importance of timing and spacing in simulating the properties of weight, force, and inertia
- learns how to set the key and keyframes on the timeline for each motion, and how to set the tracking and motion marks after a stop
- recognizes the different styles of and materials used in animation production.
- understands the production pipeline for 3D animation

Metode poučevanja in učenja:

Predmet je organiziran kot kombinacija predavanj, in praktičnih vaj. Poučevanje na skupnih predavanjih in posameznih delovnih / individualnih nalogah. Analize ter primerjave uspešnih praks so sestavni del učnega procesa, prav tako tudi objektivna presoja in vrednotenje lastnega dela na podlagi podprtih argumentov. Vaje se izvajajo na programski opremi (Cinema 4D, Blender, ali podoben 3D program), ki omogoča realizacijo različnih projektov predvidenih v učnem načrtu. Delno se vaje izvajajo tudi na interaktivnih tablicah Wacom Cintiq Pro. Individualen pristop do vsakega študenta je posebej poudarjen pri praktični projektni nalogi, kje študent konceptualno opredeli svoj projekt, izbrana sredstva izražanja, tehnike, orodja, ter individualni vizualni jezikv skladu z vsemi profesionalnimi standardi na trgu.

Learning and teaching methods:

The course is structured as a combination of lectures, and practical exercises. Teaching in group sessions and individual work/individual assignments. Analysis and comparisons practices are an integral part of the learning process, as well as an objective assessment and evaluation of one's own work through discussion and exchange of arguments. Exercises are performed on software (Cinema 4D, Blender or similar 3D software) that enables realization of various projects envisaged in the curriculum. Some exercises are also performed on Wacom Cintiq Pro interactive tablets. The individual approach to each student is especially emphasized in practical project assignment, where the student conceptually defines his project, chooses modes of expression, technique, tools, and individual visual language following all professional standards on the market.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Študentska dela bodo ocenjena na podlagi predstavitve in izdelave, jasnosti namere, inventivnosti, organiziranosti in interpretacije navodil mentorja, individualnega napora in sodelovanja pri pouku.</p> <ul style="list-style-type: none"> vaje (različne tehnike in metodologije, analize primerov) semestrski projektna naloga 	<p>50 %</p> <p>50 %</p>	<p>Type (examination, oral, coursework, project):</p> <p>Student work will be evaluated on presentation and craftsmanship, clarity of intention, inventiveness, organization (deadlines) and interpretation of mentors directions, individual effort, and class participation.</p> <ul style="list-style-type: none"> exercises (various techniques and methodologies, case studies) semester project assignment

Reference nosilca / Lecturer's references:

<p>Strokovne izkušnje:</p> <p>2006–danes: Soustanovitelj, CEO in Kreativni direktor Direktor, CtrlArt Llc, Ljubljana, Slovenia (3D animacijski studio, 3D vizualizacije)</p> <p>2018–danes: direktor Cardotour Animation</p> <p>Mentor - SAE Institute Ljubljana</p> <p>2014–2016: soustanovitelj, direktor marketinga in financ, Revolv-AR, Izrael</p> <p>Ekshibicije / projekcije</p> <p>2021; Grad Škofja Loka, redna razstava 2021;</p> <p>Grad Visoko; projekcija Cveti v Jeseni</p> <p>2022–2023: The Annunciation of St.Mary - Bazilika Brezje Slovenija - Holographic display https://www.ctrlart.com/annunciation-of-mary---basilica-of-the-virgin-mary-brezje.html</p> <p>2015: Slovenski etnografski muzej dostopen za vse »Dostopnost« https://www.ctrlart.com/slovene-ethnographic-museum-accessible-for-all---dostopnost.html</p> <p>2014; ELLE Style Awards (Renault AR event presentation of new model Twingo); vodja projekta;</p> <p>2012; i-Emona Exhibition and Film; https://www.ctrlart.com/3d-model-of-1st-century-roman-city---emona.html</p> <p>2008; MGML Ljubljana, redna razstava portret Auserperg</p> <p>2004; Maribor, Utripajoča Škatla, Video Art ekshibicija</p> <p>Razvoj aplikacij</p> <p>2022; Aplikacija Crime Door - Alexander Hamilton and Aaron Burr Duel (ZDA); vodja projekta; https://www.ctrlart.com/crimedoor---hamilton-burr-duel.html</p> <p>2021; Aplikacija TravelAR Slovenija – Ptuj; vodja projekta; https://www.ctrlart.com/travelar-ptuj.html</p> <p>2021; Aplikacija Kurentova Simfonija; https://www.ctrlart.com/kurentovanje-simfonija.html</p> <p>2019–2021; Aplikacija CardoTour Jerusalem AR (Izrael); vodja projekta; https://cardotour.com/; https://www.ctrlart.com/cardotour.html</p> <p>2020–2023; DI-Gozd forestry inventory technology application; https://di-gozd.si/; https://www.ctrlart.com/di-gozd.html</p> <p>2016 – danes; Interaktivna aplikacija in delavnice TravleAR Slovenia; https://www.travelarslovenia.com/; https://www.ctrlart.com/travelarslovenia.html 2016;</p> <p>Gorenje 'Life Simplified' AR application (Nemčija); vodja projekta; https://www.ctrlart.com/lifesimplified.html</p> <p>2015; Multiplayer AR game 'Akes, finding the right one' for Abanka.</p>

<https://www.ctrlart.com/abanka---akescaron--finding-the-right-one.html>

Razvoj platforme

2019–2021; platforma WErPix (Izrael); <https://www.ctrlart.com/werpix--augmented-reality-platform.html>

Delavnice:

Crafty Builders Workshops/Creator Workshops za odrasle; <http://www.craftybuilders.com/>

Članek:

- Aldouby, H., Hasler, B. S., Nadav, T., & Friedman, D. (2022). Viewing images of jagged texture in digital artwork affects body sensations: A virtual reality study. *Psychology of Aesthetics, Creativity, and the Arts*. Advance online publication. <https://doi.org/10.1037/aca0000522> B.