

UČNI NAČRT PREDMETA / COURSE SYLLABUS							
Predmet:		Zaznavanje v kognitivnih sistemih					
Course title:		Perception in cognitive systems					
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year		Semester Semester	
Interdisciplinarni magistrski študijski program Računalništvo in matematika		ni smeri		1 in 2		prvi	
Interdisciplinary Masters study programme Computer Science and Mathematics		none		1 in 2		first	
Vrsta predmeta / Course type				izbirni			
Univerzitetna koda predmeta / University course code:				63513			
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS	
45		30			105	6	
Nosilec predmeta / Lecturer:		Aleš Leonardis					
Jeziki / Languages:		Predavanja / Lectures:		slovenski/Slovene, angleški/English			
		Vaje / Tutorial:		slovenski/Slovene, angleški/English			
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:			
Vsebina:				Content (Syllabus outline):			
Predavanja:				Lectures: - Computational theories of perception			

<ul style="list-style-type: none"> - Računske teorije zaznavanja - Kognitivne arhitekture zaznavanja - Učenje, razpoznavanje, kategorizacija in abstrakcija vizualnih entitet - Aktivni vid - Računske teorije pozornostnih mehanizmov - Vizualni kontekst - Računske teorije zaznavanja prostora in prostorskih relacij <p>Vaje:</p> <p>Študenti se na vajah spoznajo z dodatnimi vidiki računskih modelov zaznavanja in z njihovo praktično implementacijo v okviru razvoja senzorskih ali robotskih sistemov. Pod vodstvom mentorja razvijejo programske in strojne rešitve s področja razpoznavanja in kategorizacije objektov, robotske lokalizacije in aktivnega vida.</p>	<ul style="list-style-type: none"> - Cognitive architectures of perception - Learning, recognition, categorization and abstractions of visual entities - Active vision - Computational theories of attentional mechanisms - Visual context - Computational theories of spatial perception <p>Exercises:</p> <p>Practical implementation of computational models related to perception and cognition. Under supervision, development of software and hardware solutions for object recognition and categorisation, robot localisation, and active vision.</p>
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Temeljni literatura in viri / Readings:

1. Object Categorization: Computer and Human Vision Perspectives, S. J. Dickinson, A. Leonardis, B. Schiele, M. J. Tarr, (Eds.), Cambridge University Press, 2009, (ISBN-13: 9780521887380).
2. A. Pinz, Object Categorization, Foundations and Trends® in Computer Graphics and Vision, 1(4), pp. 255-353, 2006, (ISBN: 1-933019-13-1).

Dostopna tudi: <http://www.emt.tugraz.at/system/files/CGV003-journal.pdf>

3. S. Thrun, W. Burgard, D. Fox, Probabilistic Robotics: Intelligent Robotics and Autonomous Agents, (ISBN-10: 0262201623).

Cilji in kompetence:

Cilj predmeta je študente računalništva in informatike naučiti osnov zaznavanja v kognitivnih sistemih, kar vključuje nekatere izbrane teorije računskega zaznavanja,

Objectives and competences:

The objective of the course is to teach the students basic competences in the area of artificial perception in cognitive systems, including selected computational theories of

računalniško modeliranje zaznavnih procesov ter uporabo teh modelov pri izgradnji aktivnih kognitivnih robotskih sistemov.

perception, computational models of perceptual processes, and application of these models for designing active cognitive robotic systems.

Predvideni študijski rezultati:

Študent naj bi po uspešno opravljenem predmetu:

- Poznal in razumel računske modele zaznavanja ter njihove implementacije v umetnih kognitivnih sistemih.
- Znal snovati praktične rešitve s področja umetnega zaznavanja v kognitivnih sistemih.
- Znal snovati in implementirati praktične rešitve s področja umetnega zaznavanja v kognitivnih sistemih, npr. v avtonomnih robotih, nadzornih sistemih, inteligentnih okoljih ali mobilnem računalništvu.
- Poznal širše raziskovalno področje umetnega in naravnega zaznavanja ter kognitivnih sistemov.
- Bil sposoben samostojnega in multidisciplinarnega raziskovanja na osnovi strokovne literature in eksperimentalnega dela. Sposobnost programiranja senzorskih ali robotskih sistemov.

Intended learning outcomes:

After successfully completing the course, the students will be able to:

- understand computational models of perception and their implementation in artificial cognitive systems,
- understand design principles for practical problems in the area of artificial perception in cognitive systems,
- design and implement practical solutions in the area of machine perception in cognitive systems, e.g., in autonomous robots, control systems, intelligent environments or mobile computing,
- understand wider research area of artificial and natural perception and cognitive systems,
- perform research based on professional literature and experimental work and program sensorial and robot systems.

Metode poučevanja in učenja:

Predavanja s podporo avdio-vizualne opreme. Laboratorijske vaje v primerno opremljenem laboratorijskem prostoru. Delo posamezno in v skupinah. Praktično delo in vrednotenje produktov.

Learning and teaching methods:

Lectures with slides. Exercises in appropriately equipped laboratories. Individual work and work in small groups.

Delež (v %) /

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

Reference nosilca / Lecturer's references:

Aleš Leonardis:

- LEONARDIS, Aleš, GUPTA, Alok, BAJCSY, Ruzena. Segmentation of range images as the search for geometric parametric models. International journal of computer vision, ISSN 0920-5691. [Print ed.], 1995, vol. 14, str. 253-277 [COBISS.SI-ID 482388]
- LEONARDIS, Aleš, JAKLIČ, Aleš, SOLINA, Franc. Superquadrics for segmenting and modeling range data. IEEE transactions on pattern analysis and machine intelligence, ISSN 0162-8828. [Print ed.], November 1997, vol. 19, no. 11, str. 1269-1295, ilustr [COBISS.SI-ID 714324]
- LEONARDIS, Aleš, BISCHOF, Horst. Robust recognition using eigenimages. Computer vision and image understanding, ISSN 1077-3142. [Print ed.], 2000, vol. 78, no. 1, str. 99-118, graf. prikazi [COBISS.SI-ID 1851732]
- JOGAN, Matjaž, ŽAGAR, Emil, LEONARDIS, Aleš. Karhunen-Loève expansion of a set of rotated templates. IEEE transactions on image processing, ISSN 1057-7149. [Print ed.], July 2003, vol. 12, no. 7, str. 817-825, ilustr [COBISS.SI-ID 3780692]
- FIDLER, Sanja, SKOČAJ, Danijel, LEONARDIS, Aleš. Combining reconstructive and discriminative subspace methods for robust classification and regression by subsampling. IEEE transactions on pattern analysis and machine intelligence, ISSN 0162-8828. [Print ed.], Mar. 2006, vol. 28, no. 3, str. 337-350, ilustr [COBISS.SI-ID 5235540]