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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Modul I: Slikovne tehnologije | | | | | | | | | | | | | |
| **Course title:** | | | Module I: Imaging Technologies | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Podiplomski magistrski študijski program druge stopnje Elektrotehnika | | | | | Avtomatika in informatika | | | | | | | 2 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Control systems and computer engineering | | | | | | | 2 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | Izbirni-strokovni /elective professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | 64276 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| 30 |  | | | 45 | | |  | | |  | | | 75 | |  | 6 |
|  | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Stanislav Kovačič | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik predmeta | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v 2. letnik | | | | | | | |  | Enrolment into the second year of studies | | | | | | | |
| **Vsebina:** | | | | | | | |  | **Content (Syllabus outline):** | | | | | | | |
| Uvod v obravnavane teme, slikovni detektorji in opisniki, aktivni modeli, vizualno sledenje, struktura iz gibanja, večsenzorski sistemi in primeri uporabe.   1. Slikovni detektorji in deskriptorji, SIFT, HOG, MSER, COV, in drugi. Večločljivostni pristopi. 2. Aktivni modeli krivulj, aktivni modeli oblik, aktivni modeli pojavnosti, nivojske množice. 3. Vizualna detekcija in sledenje objektov, sledenje z detekcijo. Sledenje v okviru Bayesovega sekvenčnega rekurzivnega filtriranja. Sledenje s Kalmanovim filtrom. Sledenje s filtri z delci. 4. Struktura iz gibanja, rekonstrukcija iz dveh ali več pogledov z nekalibriranimi ali delno kalibriranimi kamerami. 5. Računalniški in strojni vid v avtomatiki in robotiki. | | | | | | | |  | Introduction, feature detectors and descriptors, deformable models, visual tracking, structure from motion, multi-camera systems, and applications.     1. Feature detectors and descriptors, corner detectors, SIFT, HOG, MSER, COV, and others. Multi-resolution, multi-scale approaches. 2. Deformable models, active contour models, active shape models, active appearance models, and level sets. 3. Object detection and tracking, tracking by detection, Bayes sequential recursive filtering, tracking with Kalman filter, tracking with particle filter. 4. Structure from motion, reconstruction from two and multiple views, reconstruction with non-calibrated and weakly calibrated cameras. 5. Computer vision and machine vision in automation and robotics. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. D. Forsyth, J. Ponce, Computer vision, a modern approach, 2nd ed., Pearson 2012. 2. R. Szeliski, Computer vision, Algorithms and applications, Springer 2011. 3. Temeljni članki, objavljeni v znanstvenih revijah. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Spoznati izbrane sedanje in prihodnje probleme ter rešitve s področja računalniškega vida. Priprava študentov na timsko delo, kot tudi na samostojno raziskovalno in razvojno delo. | |  | | The aims of this course are to cover selected existing and emerging topics in computer vision, and to prepare students for teamwork, as well as independent work in research and development. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Biti sposoben realizirati zahtevnejše algoritme računalniškega vida.  Biti sposoben rešiti kompleksnejše probleme s področja računalniškega in strojnega vida. | | |  | Be able to implement advanced computer vision algorithms.  Be able to provide solutions to moderately complex problems in computer and machine vision. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, teoretične podlage s praktičnimi prikazi.  Laboratorijske vaje, priprave na praktično delo, praktično delo, programske rešitve v Matlabu/C/C++.  Domača projektna naloga. | | |  | Lectures, underlying theory with illustrative examples.  Laboratory work, instructions and assignments. Assignment solutions in Matlab/C/C++ with written reports.  Homework project. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Opravljene laboratorijske vaje s pisnimi poročili.  Domača projektna naloga s pisnim poročilom in z ustnim zagovorom.  Pisnega izpita ni. | 50 %  50 % | | | | Laboratory assignments with written reports.  Homework project with written report and oral defense.  There is no final written exam. |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. KRISTAN, Matej, SULIĆ KENK, Vildana, KOVAČIČ, Stanislav, PERŠ, Janez. Fast image-based obstacle detection from unmanned surface vehicles. *IEEE transactions on cybernetics*, ISSN 2168-2267, Mar. 2016, vol. 46, no. 3, pp. 641-654. 2. MANDELJC, Rok, KOVAČIČ, Stanislav, KRISTAN, Matej, PERŠ, Janez. Tracking by identification using computer vision and radio. *Sensors*, ISSN 1424-8220, Jan. 2013, vol. 13, no. 1, pp. 241-273. 3. KRISTAN, Matej, KOVAČIČ, Stanislav, LEONARDIS, Aleš, PERŠ, Janez. A two-stage dynamic model for visual tracking. *IEEE transactions on systems, man, and cybernetics. Part B, Cybernetics*, ISSN 1083-4419, Dec. 2010, vol. 40, no. 6, str. 1505-1520. 4. PERŠ, Janez, SULIĆ, Vildana, KRISTAN, Matej, PERŠE, Matej, POLANEC, Klemen, KOVAČIČ, Stanislav. Histograms of optical flow for efficient representation of body motion. *Pattern recognition letters*, ISSN 0167-8655, Aug. 2010, vol. 31, no. 11, str. 1369-1376. 5. PERŠE, Matej, KRISTAN, Matej, KOVAČIČ, Stanislav, VUČKOVIĆ, Goran, PERŠ, Janez. A trajectory-based analysis of coordinated team activity in a basketball game. *Computer vision and image understanding*, ISSN 1077-3142, May 2009, vol. 113, no. 5, str. 612-621. | | | | | |