COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computer vision [N2AiR1-RiSA>SW]

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/1

Area of study (specialization)
Autonomous Robots and Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
20

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr inż. Marek Kraft
marek.kraft@put.poznan.pl

Lecturers

Prerequisites

Knowledge: A student beginning this subject should have basic knowledge of mathematics - including, mainly, matrix calculation, knowledge of elements of mathematical logic, basics of mathematical analysis and probabilistics. Skills: He or she should have the ability to operate a PC and implement simple algorithms and programming tasks. Additionally, the ability to obtain information from indicated sources is essential.

Course objective

The aim of this course is to learn the theoretical basics of image acquisition and processing methods and to learn about typical applications of image processing systems. The student should be able to select an algorithm or a set of algorithms that make up a complete vision system and implement and test such a system on their own.

Course-related learning outcomes

Knowledge
Has detailed knowledge of the construction and use of advanced sensory systems (K2_W6 [P7S_WG])
Skills

Can use advanced signal processing and analysis methods, including video, and extract information from analyzed signals (K2_U11 [P7S_UW])
Social competences
The graduate is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which the equipment and its components can operate (K2_K4 [P7S_KR])

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture - final credit test carried out on Moodle plaftorm.
Laboratories - design and final practical programming test.

Programme content

Image acquisition, image encoding methods, basic video encoding.
Using the OpenCV library for image processing.
Processing based on colors and histograms.
Pre-processing of the image - local methods (gamma correction, histogram-based processing, thresholding, etc.).
Contextual methods - evolution, linear and non-linear filtration; morphological operations.
Detection of image features (lines, points).
Image feature description and matching.
Segmentation and analysis of shapes.
The role of lighting in a computer vision systems.
Geometric transformations, spatial vision and multiple view geometry.
Introduction to video sequence analysis - motion detection, object tracking.

Course topics

The topics covered in this course include basic information to enable practical use of vision systems to solve engineering problems. The course begins with a discussion of the basic components of machine vision systems and their key parameters for selection for a specific application. This is followed by a discussion of the algorithms used in machine vision systems. The lecture concludes with introductory information about machine vision systems using machine learning methods.

Teaching methods

Lectures with multimedia presentations, additionally uploaded to a streaming service to be played later.
Laboratory classes covering the implementation and testing of selected algorithms for image and video processing using Python language and solving selected practical problems.

Bibliography

Basic
1. R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010
2. Supplementary course materials posted on Moodle
Additional
Selected scientific papers related to the course.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50