COURSE DESCRIPTION CARD - SYLLABUS

Course name

Image processing and analysis

Course

Field of study

Mathematics in technology

Year/Semester

3/6

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

Dr inż. Marek Kraft

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Faculty of Control, Robotics and Electrical Engineering

Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

1. Has an extended in-depth knowledge on a range of branches of higher mathematics and specific knowledge regarding the application of mathematical tools and techniques in engineering - [K_W01 (P6S_WG)]

2. Has an ordered, theoretically grounded knowledge on computer science, including numerical methods; knows at least one programming package or language [K_W06 (P6S_WG)]

3. Is capable of devising an algorithm to solve a simple engineering task; can implement and test the algorithm in selected development environment [K_U04 (P6S_UW)]

4. Is aware of the level of his/her knowledge w.r.t. the state of the art in technical and engineering research [K_K01 (P6S_KK)]

Course objective

The aim of the course is to learn the basics of methods of image acquisition and processing and gain the knowledge on typical applications of image processing systems. After completing the course, the student should be able to select an algorithm or a set of algorithms fort the implementation of a complete intelligent vision system.

Course-related learning outcomes

Knowledge

1. Has an extended in-depth knowledge on a range of branches of higher mathematics and specific knowledge regarding the application of mathematical tools and techniques in engineering - [K_W01 (P6S_WG)]

2. Has an ordered, theoretically grounded knowledge on computer science, including numerical methods; knows at least one programming package or language [K_W06 (P6S_WG)]

3. Has a structured knowledge on signal theory, measurement technology and data acquisition and analysis [K_W07 (P6S_WG)]

4. Knows and understands engineering technologies and is aware of the latest development trends in his/her study field [K_W11 (P6S_WG)]

Skills

1. Is capable of formulating an engineering problem, carry out detailed research using analytical, simulation or experimental methods interpret the results and draw conclusions - [K_U05 (P6S_UW)]

2. Can select appropriate method and measurement equipment to make basic measurements of physical quantities; can use basic data processing and analysis methods - [K_U07 (P6S_UW)]

3. Can use tools and devices according to the general guidelines and specific documentation; is capable of observing workplace safety regulations - [K_U09 (P6S_UW)]

Social competences

1. Is aware of the level of his/her knowledge w.r.t. the state of the art in technical and engineering research [K_K01 (P6S_KK)]

2. Is aware of the necessity of expanding one’s knowledge to solve more recent technical problems [K_K02 (P6S_KK)]

3. Understands and appreciates the importance of intellectual honesty and in his/her own and other poeople’s actions; is capable to demonstrate reliability, impartiality, professionalism and ethical attitude [K_K04 (P6S_KR)]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: A written exam at the end of the semester.

Laboratory: Completing laboratory exercises and practical exam at the end of the semester.

Programme content

Image acquisition, image encoding methods, video encoding. The use of OpenCV library for image processing. Colour spaces and histograms. Early image processing - local methods (Gamma correction, histogram-based processing, etc.) and local contextual methods - convolution, linear and non-linear filtration; morphological operations. Detection of features (line, points). Image feature and region descriptors. Shape analysis. Geometric transformations. Introduction to video sequence analysis. Introduction to machine learning methods in image processing - using scikit-learn and TensorFlow libraries.

Teaching methods

Lectures supplemented with multimedia content, with slides made available on the eCourses service. Laboratory classes using modern imaging devices (thermal cameras, depth cameras, smart cameras, industrial vision systems) and OpenCV, scikit-image and Tensorflow libraries.

Bibliography

Basic

1. R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010

2. Additional course metaerial published on university MOOC platform

Additional

1. Selection of additional online resources

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1,0

[1] delete or add other activities as appropriate