GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Image Processing, PG_00047981		
Field of study	Informatics		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Intelligent Interactive Systems -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Maciej Smiatacz	
	Teachers	dr inż. Maciej Smiatacz	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	60	5.0	60.0	125

Subject objectives	The aim of the subject is to make students familiar with the basic problems and algorithms of image processing, and to allow them to acquire the practical skills necessary to implement their own image processing systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U43] can analyse date and formulate, apply and assess appropriate formal models and algorithms for solving problems in the field of information systems and applications	Student selects image processing algorithms appropriate for solving practical problems such as denoising, calculating parameters of objects etc.	[SU1] Assessment of task fulfilment
[K6_U07] can apply methods of process and function support, specific to the field of study	Student designs object-oriented software with the use of MS Visual Studio Environment.	[SU4] Assessment of ability to use methods and tools
[K6_W42] Knows and understands, to an advanced extent, architecture, design principles and methods of hardware and software support for local and distributed information systems, including computing systems, databases, computer networks and information applications, as well as the principles of human cooperation with computers and computer-aided teamwork	Students explains how the most important image processing algorithms work, describes the problems related to their complexity and the ways of solving the efficiency issues.	[SW1] Assessment of factual knowledge
[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student implements image processing algorithms in C++.	[SU1] Assessment of task fulfilment
[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student defines basic terms of image processing. Student explains teoretical foundations of image processing algorithms.	[SW1] Assessment of factual knowledge

Subject contents

1. Introduction. The role of image processing 2. Simple methods of image processing 3. Histogram and its transformations 4. Global thresholding 5. Local thresholding 6. Segmentation with multiple thresholding 7. Adaptive thresholding 8. Digital filters. Typical image distortions 9. Low-pass filters - characterictsics and examples 10. High-pass filters for edge detection 11. Sharpening filters and corner detection 12. Non-linear filters 13. Canny's edge detection algorithm 14. Introduction to skeletonization 15. Thinning and grass fire model 16. MAT, distance transform 17. Mathematical morphology in image processing 18. Dilatation and erosion 19. Morphological opening and closing 20. Hit-or-miss transformation 21. Morphological boundary extraction 22. Morphological shape analysis 23. Morphological operations on grayscale images 24. Morphological skeletonization 25. Hough transform 26. Geometrical image features 27. Basic image parameters 28. Object features 29. Moments 30. Shape coefficients 31. Image filtration in frequency domain 32. Texture features

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	30.0%
Practical exercise	50.0%	40.0%
Written exam	50.0%	30.0%

Recommended reading

Basic literature	R.C. Gonzales, Digital Image Processing, Prentice Hall, 2007.
Supplementary literature	M. Seul, L. O'Gorman and M. Sammon, Practical Algorithms for Image Processing, Cambridge University Press, USA, 2000.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Describe Canny's edge detector and discuss the practical meaning of its parameters.

2. What is the relation between discriminant analysis and Otsu algorithm?

3. Implement Pavlidis skeletonization algorithm in C++ language.

Work placement

Not applicable