GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Vision Systems of Autonomous Vehicles, PG_00064523		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Optional subject group Specialty 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Automatic Control -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Fiertek	
	Teachers	dr inż. Piotr Fiertek	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

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	15	2.0	8.0	25

Subject objectives

The course aims to introduce image processing techniques used in autonomous vehicles. It will cover vision system calibration techniques, image processing techniques related to vision SLAM, image fusion (RANSAC), vision odometry, and image processing techniques used in stereovision.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W11] knows and understands, to an increased extent, the general principles of creation and development of forms of individual entrepreneurship and the economic, legal and other conditions of various types of activities related to the awarded qualification, including the principles of protection of industrial property and copyright law	Directional effect unrelated to the lecture content	[SW1] Assessment of factual knowledge
[K7_K01] is ready to create and develop models of proper behaviour in the work and life environment; undertake initiatives; critically evaluate actions of their own, teams and organisations they are part of; lead a group and take responsibility for its actions; responsibly perform professional roles taking into account changing social needs, including: - developing the achievements of the profession, - observing and developing rules of professional ethics and acting to comply to these rules	Directional effect unrelated to the lecture content	[SK4] Assessment of communication skills, including language correctness
[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	During the course, students will learn about the practical use of vision systems in mobile robots and practical methods for calibrating vision systems.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Familiarization with basic image processing techniques used in autonomous vehicles: in particular, techniques related to visual odometry and stereoscopic vision.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture
1. Introduction to image processing in autonomous vehicles.
2. Introduction to the vision SLAM technique (with a prior review of the operating principle of the traditional SLAM technique).
3. Discussion of camera parameters (external and internal, including those related to image distortion) and camera parameter calibration.
4. Presentation of techniques related to visual odometry.
5. Discussion of methods and techniques used in stereoscopic vision.
6. Discussion of the image fusion algorithm.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Sprawdzian pisemny	55.0%	100.0%

Recommended reading

Basic literature	1. William K. Pratt, Digital Image Processing, 2007. 2. Bogusław Cyganek, Komputerowe przetwarzanie obrazów trójwymiarowych, EXIT 2002. 3. Xiang Gao and Tao Zhang, Introduction to Visual SLAM From Theory to Practice, 2021.
Supplementary literature	1. Rozprawa doktorska, Nieradka Grzegorz Krzysztof, Dopasowanie obrazów pary stereoskopowej z wykorzystaniem logiki rozmytej / Stereo pair matching using fuzzy logic
eResources addresses	

Example issues/ example questions/ tasks being completed

Practical activites within the subject	Not applicable

Document generated electronically. Does not require a seal or signature.