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 2025		Academic year of realisation of subject	2025/2026			
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 -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Fiertek					
	Teachers	dr inż. Piotr Fiertek					
Lesson types and methods of instruction	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 aim of the course is to introduce image processing techniques used in autonomous vehicles. The following will be discussed: calibration techniques for vision systems, image processing techniques related to vision SLAM, image fusion (RANSAC), vision odometry, image processing techniques used in stereovision. Processing of points obtained from 3D cameras.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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_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_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 of calibrating vision systems.	[SK4] Assessment of communication skills, including language correctness
[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 those related to vision odometry and stereovision.	[SW1] Assessment of factual knowledge

Subject contents

1. Introduction to image processing in autonomous vehicles
2. Introduction to the vision SLAM technique (with a previous reminder of the principle of operation of the traditional SLAM technique)
3. Discussion of camera parameters (external and internal - related to, among others, image distortion) and calibration of camera parameters
4. Presentation of techniques related to vision odometry
5. Discussion of methods and techniques used in image stereovision
6. Discussion of the image fusion algorithm
7. Processing spatial data (point clouds) to obtain a 3D model of the robot's environment.

Prerequisites and co-requisites

Assessment methods and criteria

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

Recommended reading

Basic literature	William K. Pratt, Digital Image Processing, 2007
Supplementary literature	no requirements
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable