GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2019-2020

Computer Vision (E735023)

Course size (nominal values; actual values may depend on programme)

Credits	3.0	Study time	90 h	Contact hrs	36.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 2)	Dutch	group work	24.0 h
		lecture	12.0 h

Lecturers in academic year 2020-2021

Veelaert, Peter	TW07	lecturer-in-charge

Offered in the following programmes in 2020-2021	crdts	offering
Master of Science in Electrical Engineering Technology (main subject Automation)	3	A
Master of Science in Electronics and ICT Engineering Technology (main subject Electronics Engineering)	3	A
Master of Science in Electronics and ICT Engineering Technology (main subject ICT)	3	A
Master of Science in Computer Science	3	A
Master of Science in Information Engineering Technology	3	A
Exchange Programme Electronics and ICT Engineering Technology	3	A

Teaching languages

Dutch

Keywords

Computer vision, OpenCV

Position of the course

The course focuses on a number of modern techniques commonly used in image processing and computer vision such as face detection, recognition of pedestrians and cyclists, the use of intelligent cameras for surveillance tasks. The emphasis is on the design of algorithms and the acquirement of programming skills necessary for the implementation of complex algorithms. The programming environment is C++ and OpenCV.

Contents

This is a project course. The students work in groups on a problem in computer vision, for example, the recognition of the road surface. In the theoretical part , a brief overview is given of the most important methods in the domain.

1. Introduction: important applications
2. Basic problems computer vision: motion analysis, 3D modeling and scene reconstruction, segmentation of scenes and objects
3. Classification and performance measures: confusion matrices, ROC-curves, F1-score with examples (color segmentation)
4. Texture analysis: Gabor filters, co-occurrence matrices, local binary patterns
5. Support vector machines
6. Boosting: AdaBoost with examples (face detection)
7. Decision trees: ID3 algorithm and random forests
8. Object recognition: use of HoG and Luv features with examples (pedestrian detection)
9. Line detection: Hough transform and RANSAC

Initial competences

Fluent programming skills in C ++ and a basic knowledge of algorithms.

Final competences

1 To develop innovative algorithms for computer vision
2 To formally describe and evaluate an algorithm
3 To have a basic understanding of camera calibration, image segmentation and image classification in OpenCV

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, lecture

Learning materials and price

Slides theory on the electronic learning environment. Online documentation OpenCV. Template for project proposal. Test benches and ground truth for some projects.

References

Computer Vision: A Modern Approach, Forsyth and Ponce

Course content-related study coaching

The lecturer is during and after the lectures available for explanations. Students receive feedback for the first versions of the project proposal and the article. Test benches that can be used to measure and improve the performance of the software.

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Portfolio, assignment

Examination methods in case of periodic evaluation during the second examination period

Portfolio, assignment

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

At the end of the project, the following must be submitted:
1. code for the introductory lab sessions
2. project planning and description of work packages
3. software code of the project
4. article of 10-12 pages in English and Latex which describes the project

The project will be defended in a final presentation with a live demo and results.
Students who obtained an insufficient mark during the first examination period may resubmit a number of assignments individually during the second examination period (own work package, own part of the presentation).

Calculation of the examination mark

Group assessment: project planning (5%), originality (10%). performance (10%), oral presentation (10%), self-written paper (15%)
Student assessment: solution lab problems (5%), questions about the theoretical part of the course (20%), questions on self-written paper (10%), questions on key paper literature (15%)