Computer Vision					AR-210
two-year Rota SS	**Duration** 1 Semester	**Semester** 2nd (Semester)	**SWS** 4 SWS	**Credit Points** 6	**Workload** 180 h

1 Modul Structure

Course (Abbreviation)	Type/ SWS	Presence	Self Study	Credit Points
a) Computer Vision (CV)	Lecture/ 2 SWS	25 h	95 h	4
b) Computer Vision (CV)	Tutorial/ 2 SWS	25 h	35 h	2

2 Language: English

3 Content

For the majority of living beeings vision is the most important perception mechanism for orienting themselves in the environment. Therefore, there exists a multitude of attempts to recreate this capability in artificial systems. In contrast to image processing techniques found in industrial applications the aim of such advanced systems for machine vision is to obtain a task-oriented interpretation of a complex scene with as few restrictions as possible concerning the context and the recording conditions.

In this lecture advanced techniques of machine vision are covered which to some extent are inspired by cognitive processes known from human visual perception. First, important aspects of imaging processes are introduced with an emphasis on the perception of colors. Afterwards, methods for the computation of local feature representations (e.g. texture, depth, or motion) and for the extraction of image primitives (e.g. regions, contours and keypoints) are presented. Finally, the lecture focusses on visual perception processes at the boundary between image processing and scene interpretation. Several appearance based object recognition techniques will be covered, e.g., Bag-of-Features approaches, Eigenimages, and deep Convolutional Neural Networks (CNNs) which define the state-of-the art for many current computer vision problems.

The accompanying tutorials will give students the opportunity to deepen their knowledge of the theoretical concepts presented in the lecture by working on relevant practical problems.

Literature:

- Szeliski, Richard: Computer Vision, Springer, 2010.
- Gonzalez, Rafael C.; Woods, Richard E.: Digital Image Processing, Pearson, 4nd Ed., 2017.
- Forsyth, David A.; Ponce, Jean: Computer Vision - A Modern Approach, Prentice Hall, 2003.

4 Competencies In this module students will be made familiar with solutions for advanced problems in the field of machine vision. A fundamental understanding of the principles underlying visual perception systems will enable participants to apply such techniques by themselves in innovative application scenarios - as, e.g., robotics and human-machine interaction – and to assess their strengths and limitations.

5 Examination Requirements

The final exam will be an oral (30-45 minutes) exam.

6 Formality of Examination

☒ Module Finals ☐ Accumulated Grade

7 Module Requirements (Prerequisites)

8 Allocation to Curriculum:

Program: Automation & Robotics, Field of study: Robotics, Cognitive Systems

9 Responsibility/ Lecturer

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