科目ナンバリング												
授業科目 <英訳>			of Machine Vision-E2 of Machine Vision-E2			当者所 名・氏	合生存学	生存学館 制紹心物授 LIANG , Xuefeng				
群	情報学科目群 分野(分類) (各論)						使	使用言語 英語				
旧群	B群	単位数	2単位	週コマ数	174	7	授業	形態 講義(対面授業科目)				·目)
開講年度・ 開講期	2025・前期 曜時限		曜時限月	月5		配当	出学年 全回			対象学	生	全学向
[授業の概要・目的]												

Visual sensing devices (cameras) have deeply engaged in our everyday life. They do not only record visual data for memories but also provide great assistance. This course introduces fundamental concepts and techniques in image processing and computer vision, and reveals the secrets in a modern camera and its applications, such as the principle of a camera, diverse effects built in the camera, visual based robot localization, car navigation, tracking, face recognition, image understanding, etc.

[到達目標]

Students will be able to capture the high quality visual records and manipulate them for their studies by learning the principles of camera, image and video.

[授業計画と内容]

1. Human visual perception (about 1 week)

This section introduces the structure of human eye, types of visual neurons, and the mechanisms of visual perception, which inspire the design of cameras.

2. Principles of a camera (about 4 weeks)

This section first introduces the camera model, then explains the mechanisms of basic components (optical lens, shutter, aperture, and sensor). Finally, the major parameters of a modern camera for tuning image are discussed. These intrinsic factors in above potentially influence image quality.

3. Environment setting for image/video shooting (about 2 week)

This section introduces the principles and methods of setting up an appropriate environment for recording image/video data. These extrinsic factors also severely affect the quality of data, especially for scientific data records.

4. 3D from 2D (about 1 week)

This section introduces the basic theories of 3D reconstruction from 2D cue, which include stereo vision, structure from motion, structured light, and time of flight.

5. Image processing (about 2 weeks)

This section covers diverse topics in image processing including image formatting, digital image representation, image features, matching, edge detection, segmentation, etc. Afterwards, we discuss their applications including image effects in digital cameras, HDR function, panoramic photography, image editing, and so on.

6. Compute vision (about 2 weeks)

This section introduces the major research topics including face/expression/fingerprint recognition, motion analysis for video stabilization, image understanding for online image searching, matching for robot/car navigation, and tracking for action/event detection and recognition.

Fundamentals of Machine Vision-E2(2)へ続く

Fundamentals of Machine Vision-E2(2)

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7. Practice: a project using image processing and computer vision methods (2 weeks)

[履修要件]

特になし

[成績評価の方法・観点]

Evaluation is based on class participation (15 %), mini reports (50 %) and the implementation of an assigned project (35 %).

[教科書]

授業中に指示する

Lecture handouts will be provided in the class.

[参考書等]

(参考書)

Richard Szeliski [®]Computer Vision: Algorithms and Applications ^a (Springer) ISBN:978-1-84882-934-3 (Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing" 3nd Edition, Prentice Hall; ISBN: 9780131687288)

[授業外学修(予習・復習)等]

The instructor expects students to spend over 60 minutes after each class to review the content and build up their own logic.

[その他(オフィスアワー等)]

No office hours specified. But, questions and requests are welcome by email.

[主要授業科目(学部・学科名)]