UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Department of Computer Science and Electronics

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Doctoral Programme of Computer Science

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Module name	: **C**OMPUTER **V**ISION
Module level	: **D**OCTORAL
Code, if applicable	: MII7865
Semester(s) in which the module is taught	: 1 (Odd)
Person responsible for the module	: Wahyono, Ph.D.
Lecturer(s)	: Wahyono, Ph.D. Agus Harjoko, M.SC., Ph.D. Moh. Edi Wibowo, Ph.D.
Language	: Indonesian
Relation to curriculum	: Elective Course in Curriculum 2017
Credit points	: 3 credits
Type of teaching	: Presentation, Discussion, Assignment, Examination
Workload	: 3 hours/week
Requirements according to the examination regulations	: Minimum 75% attendance
Recommended prerequisite	: Digital Image Processing
Module objectives/ intended learning outcomes	: Course Outcomes CO1: Students are able to understand the importance of vision sensors to make intelligent system applications and the basic concepts of digital image processing. CO2: Students are able to understand and explain how to collect data, increase the amount of data on vision data. CO3: Students are able to understand, explain, and implement object detection in images and/or videos. CO4: Students are able to understand, explain, and implement classification, recognition, object identification and are able to understand the differences among the them.

	CO5: Students are able to understand, explain, and implement object tracking and object behaviour analysis based on spatial and temporal information. CO6: Students are able to understand the concept of geometry between 2-dimensional images and 3-dimensional coordinates. CO7: Students have ability to implement intelligent system applications based on vision data.
Content	: List of Topics 1. Introduction to computer vision and its applications: Augmented reality, Surveillance system, traffic monitoring 2. Review of digital image processing: color space, image quality enhancement, feature extraction, feature representation 3. Image data acquisition and augmentation: data acquisition, data augmentation, data pre-processing 4. Localization and object detection: sliding windows with template matching, feature-based object detection, background subtraction 5. Classification of objects in digital images: binary classification, multiclass classification, image & shape analysis 6. Object recognition and identification: face recognition, person re-identification, person attribute identification, scene recognition 7. Object tracking: template-based matching, Kalman Filter, Multiple Camera Tracking 8. Object Behavior Analysis: Optical Flow, Spatial and Temporal Motion Analysis 9. Introduction to three-dimensional reconstruction: Key point Detector, Image Stitching, Calibration and Visual Geometry, Structure from motion 10. Vision-based intelligent project
Study and examination requirements and forms of examination	: Case-based Assignment (25%) Quiz (10%) Final Project (25%) Mid Term Examination (20%) Final Term Examination (20%)
Media employed	: Learning Management System, Website, Video
Reading List	: References 1. Richard Szeliski, Computer Vision: Algorithms and Applications, eBook, 2010 2. Roberto Brunelli, Template Matching Techniques in Computer Vision: Theory and Practice, Wiley, 2009. 3. S. Nagabhushana, Computer Vision and Image

Processing, New Age International Publisher, 2005. 4. Forsyth Ponce, Computer Vision: A Modern Approach, 2002.

The Mapping of COs to PLOs

COs	**PLOs**							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								
CO7								

The PLO of DP-CS

PLO	**Knowledge Area**	**PLO Description**
PLO1	[Values and principles]	A graduate should be devoted to God Almighty, uphold the humanity values, internalize academic values and ethics, responsible in working around expertise independently.
Managerial Capability		
PLO2	[Professional attitudes]	A graduate should have good interpersonal skills; able to work together within the organization, both as a leader and a member; able to be the initiator; able to manage and delegate tasks; and have a sense of responsibility for their own work as well as take responsibility for the achievement of the organization's work.
PLO3	[Communication skills]	A graduate should be able to communicate effectively and efficiently with stakeholders from various backgrounds; use English well; and able to write and present scientific papers correctly and well.
PLO4	[Life-long learning]	A graduate should be up to date with the state-of-the-art especially in computer science field, able to take parts in the development of computer science field that is engaged in and relate it to other fields throughout life.
Working Capability		
PLO5	[Problem-solving and Scientific skills]	A graduate should be able to analyse science and technology problems in the computer science field, develop alternative solutions through intra disciplinary, interdisciplinary, and trans disciplinary approaches to produce innovative, original, and tested works.
PLO6	[Ability to formulate and do research]	A graduate should be able to formulate research problems through critical, exploratory, and innovative studies both independently and in groups of computer science field that

		is engaged in and present research results in a scientific paper at regional or international level.
Mastering Knowledge		
PLO7	[Fundamental knowledge]	A graduate should be able to develop knowledge in the field of computer science that is engaged, which includes abstraction, complexity, evolution and philosophy of changes or developments in the field of science.
PLO8	[Applied knowledge]	A graduate should be able to develop theoretical, philosophical, and applied concepts in the field of computer science that is engaged in, and to represent them in a structured and systematic manner.