Computer Vision

Course Name	Course section (credit/hours)	Elective course(3/3)		course code	F012
	course item			course component	
	Target students Division/major/grade			opening semester	2021 1ST SEMESTER
	Class time and classroom	Mon E(Pal325)Wed E(Pal325)		English Grade	A(100%English)
Reference to this course	Credit compositon	Theory(3) + Design(0) + Practice(0)			
	Prerequisite courses	Data Structure			
	Related basic courses	Probability & Statistics, Linear Algebra			
	Recommanded concurrent courses				
	Related advanced course	Artificial Intelligence, Computer Graphics			
Instructor	Name (title/division)	Wonjun Hwang(Associate Professor, Software and Computer Engineering)			
	Office Room Number	팔달관 703호	Extension Number	2632	e-mail	wjhwang@ajou.ac.kr
	Office hour		Homepage address	https://sites.google.com/site/haepaly/	
Teaching Assistant	Name (title/division)				
	Office Room Number		Office phone Number		e-mail	

1. Course Introduction

Humans perceive the three-dimensional structure of the world with apparent ease. The goal of a computer vision is to achieve the dream of having a computer interpret an image at the same level. In this course, we will explores the variety of techniques commonly used to analyze and interpret images. It also describes challenging real-world applications where vision is being successfully used, both for specialized applications such as medical imaging, and for fun, consumer-level tasks such as image editing and stitching, which students can apply to their own personal photos and videos.

2. Course Objectives & course outcome

Program Objectives
- Improving mathematical foundation
- Understanding various image data sets
- Recognize engineering problems
- Enhancing usage of various tools
- Lifelong learning ability

Outcomes
- analize various image related problems (program outcomes item number 1, 2, 4)
- develop programming skills for various image handling tasks (program outcomes item number 1, 2, 4)
- recognize various application areas (program outcomes item number 4, 9)
- building ability to adopt newly developed vision ideas(program outcomes item number 8, 9, 10)

3. Class types and activities

This course consists of mostly lectures, presentation and discussions. Students are asked to have homework assignment, and term projects.
There will be two examinations (mid and final terms) and term project presentation will be held in last weeks.

4. Teaching Method

- [V] lecture
- [V] discussion and debate
- [V] team project(presentation and case studies)
- [ ] experiments(role-playing,etc)
- [ ] designing and production
- [ ] on-site learning(on-site training)
- [ ] others

5. Support Systems in Use

- [V] AjouBb
- [ ] automatic recording system
- [ ] web-based assignment
- [ ] cyber lecture
- [ ] online content
- [ ] class behavior analyazing system
- [ ] others

6. Teaching Tools

- [ ] PBL(Problem Based Learning)
- [ ] CBL(Case Based Learning)
- [ ] TBL(Team Based Learning)
- [ ] UR(Undergraduate Research)
- [ ] FL(Flipped Learning)
- [ ] DSAL(Data Sciencd Active Learning)
- [ ] others

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	
midterm exam	1	35%	
final exam	1	35%	
quiz			

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
presentation			
discussion			
homework	2	20%	
etc			
study hours	6 hours		

8. Textbook and Reference material

Main/Sub	Title	Writer	Publisher	Publication year
Main	Computer Vision: Algorithms and Applications	R. Szeliski	Springer	2011
Sub	Concise Computer Vision An Introduction into Theory and Algorithms	Klette, Reinhard	Springer	2014

9. Class system and Class shedule

We will cover following topics.
- Introduction and Preliminaries
- Visual Features
- Object Detection and Recognition
- Grouping and Segmentation
- Motion and Tracking
- Geometric Computer Vision
- Deep Learning

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
1	Introduction (CV and Linear Algebra)	E	3				
2	Camera Model and Geometry	E	3				
3	Image Formation and Processing	E	3				
4	Edge and Corner Detection	E	3				
5	Image Feature and Representation	E	3				

< Schedule >

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Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
6	General Concepts for Eigenspaces	E	3				
7	Feature-based Instance and Category Recognition	E	3				
8	Midterm Exam. and Problem Solving	E	3				
9	Clustering and Segmentation	E	3				
10	Neural network: Perceptron	E	3				
11	Deep Learning: Introduction	E	3				
12	Deep Learning: CNN	E	3				
13	Deep Learning: Loss Function and Optimization	E	3				
14	Deep Learning: Backpropagation	E	3				
15	Deep Learning: Advanced Topic	E	3				
16	Final Exam. and Problem Solving	E	3				

10. Contribution index of the course for attaining ABEEK program outcomes

course outcome	contribution scale
No Data	

11. Analysis of improved matters for the previous semester

13. Reference items

- The final evaluation rule will be shared in the first lecture day. (Tentative)