Computer Vision

Course Name	Course type (credit/hours)	Elective course(3/3)	Course code	F026
	Target students Division/major/grade	Software and Computer Engineering/Senior	Opening semester	2018 1ST SEMESTER
	Class time and classroom	Tue B(Pal410)Thu A(Pal410)	English Grade	A(100%English)
Reference to this course	Prerequisite courses	Data Structure		
	Related basic courses	Probability & Statistics I		
	Recommended concurrent courses			
	Related advanced courses	Artificial Intelligence, Computer Graphics		

Instructor	Name (title/division)	Wonjun Hwang(Assistant Professor, Software and Computer Engineering)				
	Office Room Number	팔달관 703호	Office phone Number	2632	e-mail	
	Office hours	Mon. 16:00-17:00, Wed. 10:00-11:00	Homepage address	https://sites.google.com/site/haepaly/		
Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

1. 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

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 Science Active Learning)
- [ ] others

7. Knowledge and ability required for taking this course

Students need to have a working knowledge of calculus, basic probability theory, computer programming and elementary data structure.

8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	
midterm exam	1	30%	
final exam	1	30%	
quiz			
presentation	1	10%	
discussion			
homework	2	20%	
etc			
study hours	6 hours		

9. Textbook and supplementary material

Main/Sub	Title (Web-site)	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

10. 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

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction to Computer Vision	E	Wonjun Hwang			
2	Basic Linear Algebra and Probability and Matlab Tutorial	E	Wonjun Hwang			

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
3	Image Formation and Processing	E	Wonjun Hwang			
4	Image Features: Edges and Corners	E	Wonjun Hwang			
5	Image Features: SIFT, SURF and Matching	E	Wonjun Hwang			
6	Object Detection and Recognition: SVM and Pedestrian Detection	E	Wonjun Hwang			
7	Object Detection and Recognition: Subspace Methods and Face Recognition	E	Wonjun Hwang			
8	Midterm Exam. and Problem Solving	E	Wonjun Hwang			
9	Grouping and Segmentation: Basic Clustering Algorithms	E	Wonjun Hwang			
10	Grouping and Segmentation: Spectral Clustering	E	Wonjun Hwang			
11	Geometric Computer Vision: Camera Model & Projective geometry	E	Wonjun Hwang			
12	Image stitching: motion models	E	Wonjun Hwang			
13	Motion and Tracking: Optical Flow and Deterministic Tracking	E	Wonjun Hwang			
14	Deep Learning	E	Wonjun Hwang			
15	Project Presentation	E	Wonjun Hwang			
16	Final Exam. and Problem Solving	E	Wonjun Hwang			

11. Other items of notification