課程資訊

課程名稱	機器視覺與影像演算 Machine Vision and Image Processing Algorithm
開課學期	100-1
開課系所	工學院 機械工程學系
授課教師	陳亮嘉
課號	
課程識別碼	
班次	
學分	3
全/半年	半年
必/選修	選修
上課時間	
上課地點	
備註	總人數上限：30 人 (Due to some lab work required, the allowable number of the students is limited)
Ceiba 課程網頁	http://ceiba.ntu.edu.tw/1001IntroCEM
核心能力關聯	

課程大綱

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課程概述	Course description: **Machine vision** is the process of employing a range of technologies, such as optics, mechanical design, electronic control, image processing algorithms and instrumentation, in achieving imaging-based automatic optical inspection (AOI), process control and intelligent robot operation in various modern applications. Meanwhile, image processing techniques required in machine vision may include (but not limited to) thresholding, segmentation, blob extraction, pattern recognition, barcode reading, optical character recognition, dimensional measurement, positioning, edge detection, color analysis, filtering and template matching[1]. This subject aims to introduce the fundamentals in machine vision and image processing, especially the techniques required for automatic optical vision and manufacturing

production inspection. The subject intends to include the following topics:

(1) Introduction of machine vision,

(2) Image formation,

(3) Geomatric optics and optical system design,

(4) Lighting design,

(5) System design for machine vision,

(6) Camera calibration,

(7) Stereo vision,

(8) 3D vision by structured light,

(9) Fundamentals of digital image processing,

(10) Auto focusing and algorithms,

(11) Image matching and algorithms,

(12) Colors

(13) Introduction of OpenCV for image processing,

(14) Applications to robotics and manufacturing optical inspection,

(15) Factory visit,

(16) Student projects.

[作業規定]：
1. 請勿抄襲作業。
2. 鼓勵同學間相互討論研究作業內容，但最後繳交之作業必須是由各位同學自己獨力 (用自己的想法及思考邏輯) 所準備與撰寫完成之作業。
3. 請同學們使用 A4 規格淡色紙撰寫作業並且裝訂整齊(訂書針於左上角)。

課程目標	1. To learn the fundamentals in machine vision and image processing, especially the techniques required for automatic optical vision and manufacturing production inspection. 2. To acquire the basic tools for developing industrial applications using machine vision.
課程要求	Pre-requisites: Programming knowledge, engineering mathematics (有這些預修最好，但非絕對必要。)
Office Hours	另約時間 備註：課後 或以 e-mail 另約時間。
參考書目	1. References: Scott E. Umbaugh Computer vision and image processing: a practical approach using CVIPtools. ISBN: 0137908822 2. Stefan Florczyk, Robot vision = Video-based indoor exploration with autonomous and

	mobile robots. ISBN: 3527405445.
	3. Robert M. Haralick, Linda G. Shapiro, Computer and robot vision. ISBN: 0201108771.
	4. David Forsyth, Computer Vision: a modern approach. Pearson Prentice Hall, ISBN 0-13-191193-7.
指定閱讀	1. reference books 2. Class notes and handouts
評量方式 (僅供參考)	

No.	項目	百分比	說明
1.	Homework	30%	5~6 homework
2	Middle exam	30%	Week 10
3.	Term project	40%	oral 15%, written 25%

課程進度

週次	日期	單元主題
第 1 週	9/15	Introduction of subject and general arrangement
第 2 週	9/22	Introduction of machine vision
第 3 週	9/29	Image formation
第 4 週	10/06	Geomatric optics and optical system design
第 5 週	10/13	Lighting design
第 6 週	10/20	System design for machine vision
第 7 週	10/27	Camera calibration
第 8 週	11/03	Stereo vision
第 9 週	11/10	3D vision by structured light
第 10 週	11/17	Middle exam

第 11 週	11/24	Fundamentals of digital image processing
第 12 週	12/01	Introduction of OpenCV for image processing
第 13 週	12/08	Auto focusing and algorithms
第 14 週	12/15	Image matching and algorithms
第 15 週	12/22	Colors
第 16 週	12/29	Factory visit
第 17 週	1/05	Term project presentation

1. Reference from definition of machine vision http://en.wikipedia.org/wiki/Machine_vision