Macao Polytechnic University

Faculty of Applied Sciences

Bachelor of Science in Computing

Module Outline

Academic Year 2022/2023 Semester 1

Learning Module	Digital Image and Video Processing		**Class Code**	COMP411-411/412	
Pre-requisite(s)	Nil				
Medium of Instruction	English			**Credit**	3
Lecture Hours	45 hrs	**Lab/Practice Hours**	0 hrs	**Total Hours**	45 hrs
Instructor	Dr. Yue Liu		**E-mail**	yue.liu@mpu.edu.mo	
Office	Rm. A313, Chi-Un Building		**Telephone**	8599-6433	

Description

The module focuses on the investigation of practical digital image and video processing techniques. It aims to equip the students with the background of developing image and video processing tools and applications. The topics include: 1) the fundamental theories and mathematical models in digital image and video processing; 2) the practical algorithms in digital image and video processing; 3) the relevant mainstream standards in engineering and applications; 4) the development of image and video processing applications in practice.

Learning Outcomes

After completing the module, students will be able to:

1. Illustrate and clarify underlying theories and mathematical models in image/video processing; (SM2p)
2. Apply and design quantitative and computational methods to model and solve image/video processing problems; (EA3p)
3. Identify and analyze practical needs and concerns in image/video processing and compressions; (D5p)
4. Develop and deploy suitable and creative designs for practical applications; (D4p)
5. Compare and contrast state-of-the-art standards in image/video compressions. (EP6p)

Content

1. Overview (6 hours)
    1.1. Introduction to Image and Video Processing
    1.2. Image Basics
    1.3. Introduction to Scilab and Matlab
2. Image Processing Techniques (18 hours)
    2.1. Image Histograms
    2.2. Point Operations
    2.3. Filters and Convolution
    2.4. Edge Detection
    2.5. Binary Image Analysis
    2.6. Color image processing
3. Transformations and Compressions (12 hours)
    3.1. Fourier Transform
    3.2. Wavelet Transform
    3.3. Frequency Filtering
    3.4. Image Compression Basics
    3.5. Image Compression Standards
4. Video Processing Techniques (9 hours)
    4.1. Video Basics
    4.2. Video Processing and Compression Techniques
    4.3. Video Compression Standards-MPEG family
    4.4. MPEG-1, 2, 4 and beyond

Teaching Method

Lectures, in-class lab or tutorials and in-class discussion.

Attendance

Attendance requirements are governed by the "Academic Regulations Governing Bachelor's Degree Programmes" of Macao Polytechnic University. Students who do not meet the attendance requirements for the module will not be permitted to sit the final or re-sit examination and shall be awarded an 'F' grade.

Assessment

This learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 being the passing score.

	Item	Description	AHEP3 LO	Percentage
1.	**Assignments/Classwork/Project**	**Home/Class-based exercises**	**EA3p, D5p, D4p,EP6p**	**30%**

2.	**Test**	**Knowledge assessment**	**SM2p, EA3p, D5p**	**20%**
3.	**Examination**	**3-hour written examination**	**SM2p, EA3p, D5p**	**50%**
			Total Percentage:	**100%**

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

Teaching Material

Textbook(s)

1. R. Gonzalez and R. Woods (2018). *Digital Image Processing* (Global Edition, 4th Edition). Pearson Publishing.

Reference

Reference book(s)

1. R. Gonzalez, R. Woods and S. Eddins (2020). *Digital Image Processing Using Matlab* (3rd edition). Gatesmark Publishing.
2. A. Bovik (2009). *The Essential Guide to Video Processing* (1st edition). Academic Press.