Macao Polytechnic University

Faculty of Applied Sciences

Master of Science in Big Data and Internet of Things

Module Outline

Academic Year <u>2022/2023</u>   Semester <u>2</u>

Learning Module	Multimedia Technology for IoT		Class Code	COMP6125
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. Yapeng Wang		E-mail	yapengwang@mpu.edu.mo
Office	Rm. A313, Chi Un Building, Main Campus		Telephone	8599-6432

Description

This learning module aims to provide students with the advanced topics of multimedia compression and communication, and the in-depth concepts and applications of computer vision. Topics include the principles of scalable video and audio codecs, file formats and codec settings for optimizing the quality and media bandwidth, applying the codecs in developing a basic media player application that is suitable for mobile access, in-depth concepts and methods of computer vision, and the structure of the applications of computer vision.

Learning Outcomes

After completing the learning module, students will be able to:

1. Discuss the principles of scalable video and audio codecs. (SM2fl)

2. Explain the file formats and codec settings for optimizing the quality for multimedia transmission. (SM2fl, EA2fl)

3. Apply the codecs in developing a basic media player application that is suitable for mobile access. (EA2fl, D1fl, D2fl)

4. Discuss the in-depth concepts and methods of computer vision. (SM2fl)

5. Explain the structure of the applications of computer vision. (SM3fl, EA2fl)

6. Build an IoT based computer vision applications. (D2fl, EP4fl)

Content

1. Multimedia Communication: Principles and Challenges   (6 hours)

    1.1. *Introduction of Multimedia and IoT: Concepts and Terminology*

    1.2. *Requirements of Multimedia Transmission*

    1.3. *Video codec: MPEG, H.26X*

    1.4. *Audio codec: MP3, AAC*

2. QoS in IP Networks & Multimedia Protocols   (6 hours)

    2.1. *QoS Requirements for Networked Multimedia Systems*

    2.2. *Network Protocols for Multimedia Applications*

    2.3. *Image Representation*

3. Error-Resilient Coding and Decoding for Video Communication   (6 hours)

    3.1. *Video Communication Systems*

    3.2. *Error-resilient Video Transmission*

    3.3. *Resynchronization and Error Concealment*

    3.4. *Error Mitigation*

4. Error-Resilient Coding and Error Concealment for Audio Communication   (6 hours)

    4.1. *Loss Concealment for waveform Speech Codecs*

    4.2. *Loss Concealment for CELP Speech Codecs*

    4.3. *Loss Concealment for Lapped Transform Codecs*

    4.4. *Forward Error Correction Techniques for Speech*

5. Bandwidth Adaptation for Multimedia Transmission   (6 hours)

    5.1. *Impact of Bandwidth on Multimedia Quality*

    5.2. *Bandwidth Adaptation Architectures*

    5.3. *Coding Techniques for Bandwidth Adaptation*

    5.4. *Scalable Video Coding*

    5.5. *Scalable Audio Coding*

6. Multimedia Networking   (3 hours)

    6.1. *Multimedia Networking Applications*

    6.2. *Streaming stored audio and video*

    6.3. *Real-time Multimedia: Internet Phone Case Study*

6.4. *Protocols for Real-Time Interactive Applications*

7. In-depth Computer Vision Techniques: Classification   (6 hours)

   7.1. *Minimum Distance Classifiers*

   7.2. *Support Vector Machine*

8. In-depth Computer Vision Techniques: Symbol Recognition   (6 hours)

   8.1. *Case Study: Optical Character Recognition on Printed Text*

   8.2. *Case Study: Optical Character Recognition on Handwriting*

Teaching Method

Lectures/discussion and projects

Attendance

Attendance requirements are governed by the "Academic Regulations Governing Master's Degree Programmes" of Macao Polytechnic University.

Assessment

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

	Item	Description	AHEP3 LO	Percentage
1.	Assignments(x2)	Home based exercises and small projects	D1fl, D2fl, EP4fl	30%
2.	Test	Knowledge assessment	SM2fl, EA2fl, SM3fl	30%
3.	Project	Group project with full report	D1fl, D2fl, EP4fl	40%

Total Percentage: 100%

Teaching Material(s)

Textbook(s)

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu (2014), Fundamentals of Multimedia, 2nd edition, Springer.

2. Mihaela Van Der Schaar and Philip A. Chou (2007). "Multimedia over IP and wireless networks: compression, networking, and systems", 1st Edition, Elsevier.

3. J. R. Parker (2010). "Algorithms for Image Processing and Computer Vision", 2nd Edition, Wiley.

Reference

Reference book(s)

1. Iain E. G. Richardson (2002), "Video COdec Design Developing Image and Video Compression Systems", 1st Edition, John Wiley and Sons.

2. Ken C. Pohlmann (2010), "Principles of Digital Audio, Sixth Edition (Digital Video/Audio)", 6th Edition, McGraw-Hill Education.

3. R. Szeliski (2011). "Computer Vision Algorithms and Applications", Springer.