CSCI 3280
Introduction to Multimedia

(2020 Spring)

Computer Science & Engineering
The Chinese University of Hong Kong

Teaching Staff

Lecturer:

Prof. Wong, Tien-Tsin **(ttwong@cse.cuhk.edu.hk)**
Office: SHB 1015
Office hour: Wed 2:30-4:30pm

Tutors:

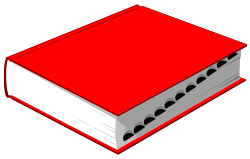
Xia Menghan **(mhxia@cse.cuhk.edu.hk)**
Office: SHB 1026

Xie Minshan **(msxie@cse.cuhk.edu.hk)**
Office: SHB 1026

Lectures, Tutorials, ...

- Lectures
  - LSB LT6 H2
  - LSB LT6 F2-3
- Tutorials
  - No tutorial for the first 2 weeks.
  - To be rescheduled next Thursday!!
- Homepage:
  http://course.cse.cuhk.edu.hk/~csci3280/
  Username: csci3280 Password: deepmm
- Newsgroup: blackboard
- Language: English

Textbook & References



- **Semi-Textbook:**
  "Fundamentals of Multimedia"
  by Ze-Nian Li and Mark S. Drew, Prentice Hall, 2004
- **References: (In order of importance)**
  - "***Multimedia Communication: Applications, Networks, Protocols and Standards***"
    by Fred Halsall, Addison Wesley
  - "***Digital Compression for Multimedia***",
    by Jerry D. Gibson, Tony Berger, David Lindbergh and Richard L. Baker, Morgan Kaufmann, 1998
  - Technical papers, online document, ...

Course Contents

1. Overview

human sense by digital signal
TV video-> listen and watch
VR(virtual reality)->sense,feel
Game
taste, smell-> danger for human to test on

   - Introduction
   - Multimedia applications
   - Media types

3D game-> change the angle
2D-> frame by frame, cant change angle

   - Challenges and research issues
   - Tools

GPU-> graphic processing unit
=>need parallel to process faster to process hair,water... in game
->military: nuclear, need demo-> need parallel machine to cal
->game development can become a economic income for investment
=>AI-> deep learning->neural networking

tengitable
mp3 vs mp4->MPEG 1 vs MPEG 4(format)
mp3-audio compression layer 3

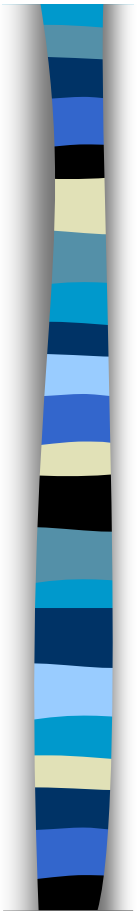
MIDI->music insturment

2. Media Data Representations
   - Digital audio
   - Computer music, MIDI, mp3
   - Digital image, video (2D or 3D)
3. Computer Graphics (not covered)
   - Will not be covered in this course.
     I recommend you to take CSCI3260
4. Data Compression
   - Lossless compression, Huffman, Arithmetic, LZW.
   - Lossy compression, JPEG, JPEG2000
   - Video coding, Motion JPEG, H.261, MPEG/2/4/7

real audio(.ra/.ram)
replace by mp3->with compression

2.compact disk(CD)/DVD->no compression
compress many songs into one disk
successful in digital audio
smaller size in japan-> max size=1 hour
CD-rom-> 650Mb-950Mb
4-5Mb per song->650/5*2~=200 song in 1CD-rom
mp3 CD->illegal, squeeze songs into one CD
run length encoding apply, repeated signal
eg zip and rar-> 2 to 1, eg 100 to 50
mp3 'compression method'-> take away some note/data that we cannot hear in some particular time, extremt case: drum and violet at the some time, we want to hear drum, so del violet

2jpg->JPEG(data size: 10 to 1,10 raw data-> 1 data in jpg)
png->portal network graphic(loseless, 2 to 1, 24 bit per pixel,size++)
gif->grahpic interchange format(first format)(2 to 1,8 bit per pixel,storing index) native support animated->animated gif
gif by Compuserve, no network-> we use telephone wire to communciate(fax also), by BBS(bulletin board system)=>GIF87,compact by LSW
Unisys(company) charge all gif user because it own LSW patent(~copyright)->stop in few years because patent expire
=>png invented to replace gif, compact in LZ77
LZ family good in compression

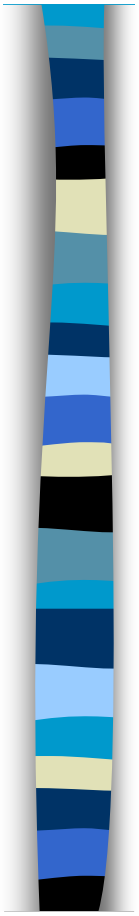


5. Storage Media (optional)

- Magnetic media
- RAID
- Optical disks
- Block placement and admission control

6. Network Communications (not covered)

- Recommend you to take a network course CSCI4430
- Techniques for transferring huge data volume
- Streaming

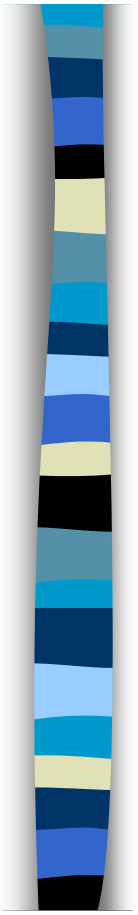


7. Project

- will be announced later
- P2P, streaming
- C, C++ or Java + some libraries or other

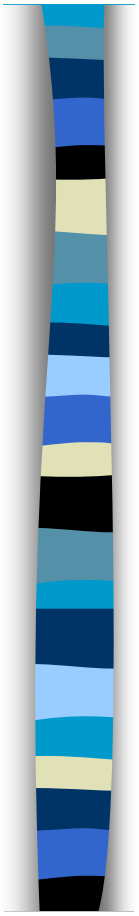
P2P peer to peer: network idea
before: client-to-server, problem: conjection occur if user grow: bandwidth<user access->server overload(DDOS)->centralization
P2P: no specific server, every one is a cilent and server->no DDOS-> decentralization, eg bitcoin and blockchain
every bitcoin user keep the same transaction database locally and request others if I have it

we do audio sharing, ask if peer have my request and stearming it(download it and play it)



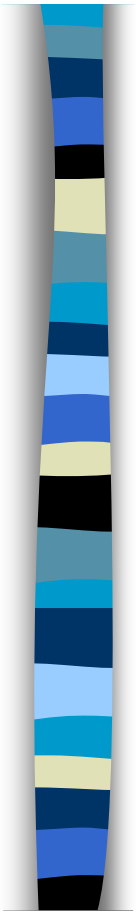
Evaluation

- 15%+15% Two programming assignments
- 20% Mini-project (group of 4)
- 50% Final exam
  (17 April 2020, Friday, 9:30-11:00am
  Venue will be announced later)
  If you cannot attend, please drop this course



Important Issues

- Switch off all your phones before lectures & tutorials
- If you want to receive the phone call, please move outside of the classroom
- To respect the rights of your classmates, refrain from talking during the lectures & tutorials
- No copy (or similar program copies) or cheating is allowed. Otherwise, ….



Important Issues (2)

- You need to have sufficient programming background (C, C++ or Java) in order to finish the assignments and projects
- Please refer the document of Student/Faculty Expectation on Teaching and Learning.