画像情報特論 (1)
Advanced Image Information (1)

はじめに
Class Overview

情報理工・情報通信専攻　甲藤二郎

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This Year's Schedule

(tentative)

4/12   Class overview, Video Streaming (1)
4/19   Self study
4/26   Video Streaming (2)
5/10   Video Streaming (3)
5/17   Video Streaming (4)
5/24   Video Streaming (5)
5/31   Video Streaming (6)
6/07   Video Compression (1)
6/14   Video Compression (2)
6/21   Video Compression (3)
6/28   Video Compression (4)
7/05   Image Processing (1)
7/12   Image Processing (2)
7/19   Image Processing (3)
7/26   Final report

And, additional self studies on CourseN@vi,

Video streaming (1) TCP/IP

■ Loss-driven

... AIMD

cwnd

loss   loss   loss

$a=1$

$b=0.5$

buffer

BDP (capacity)

0   RTT round   n
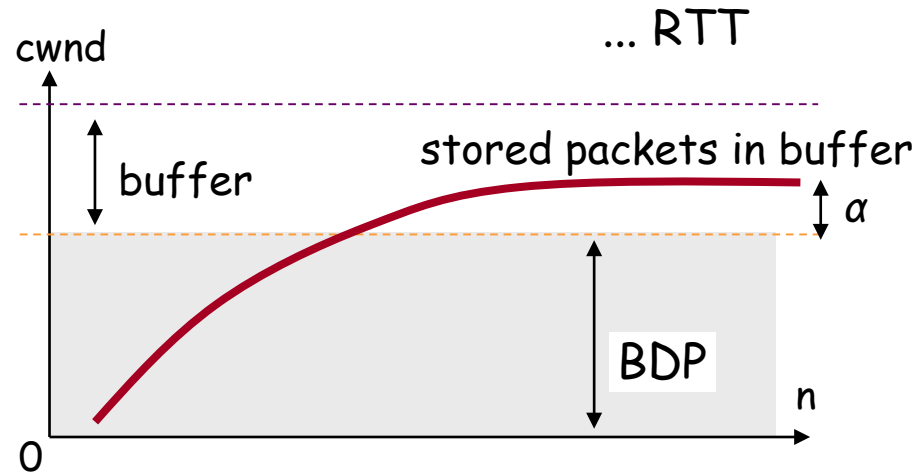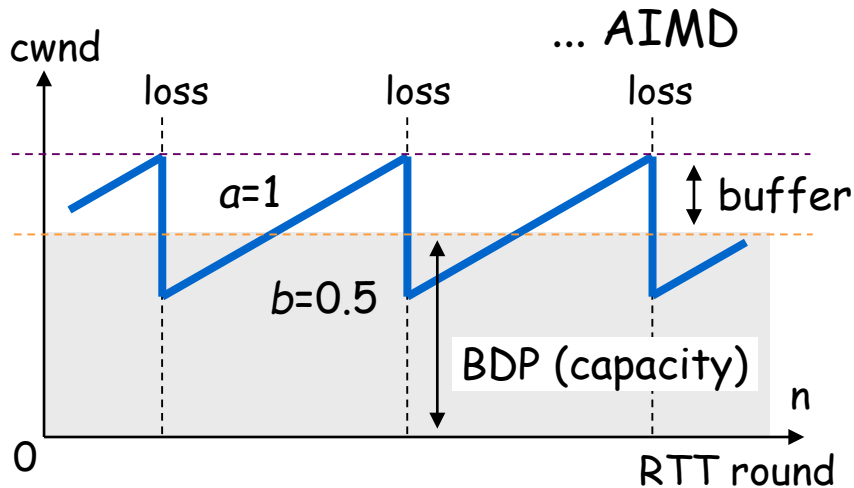
TCP-Reno, High-Speed TCP,
TCP-Westwood, CUBIC-TCP, ...

BDP/Buffer relationship

small buffer → ✗ efficiency
large buffer → ✗ delay

■ Delay-driven

... RTT

cwnd

stored packets in buffer

buffer

α

BDP

0   n

TCP-Vegas, FAST-TCP

Unfairness by loss-driven TCP

✗ friendliness

BDP: Bandwidth-Delay Product

Video streaming (2) TFRC

- TFRC (over RTP/UDP)
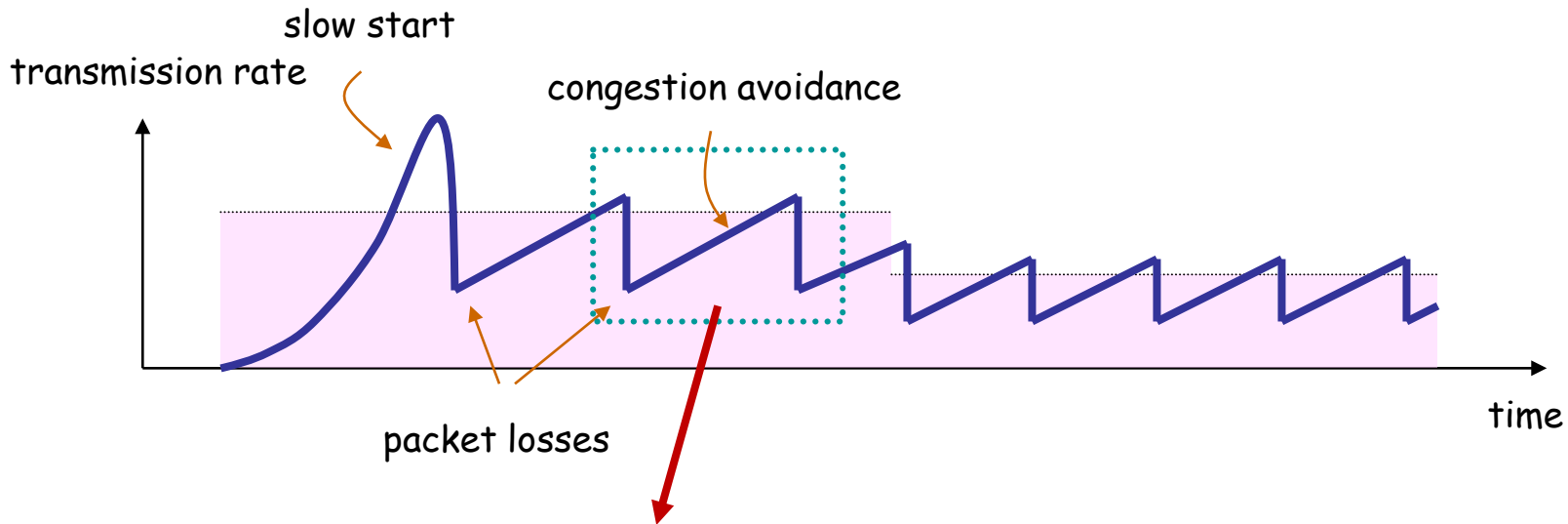
Modeling of steady-state TCP behaviors

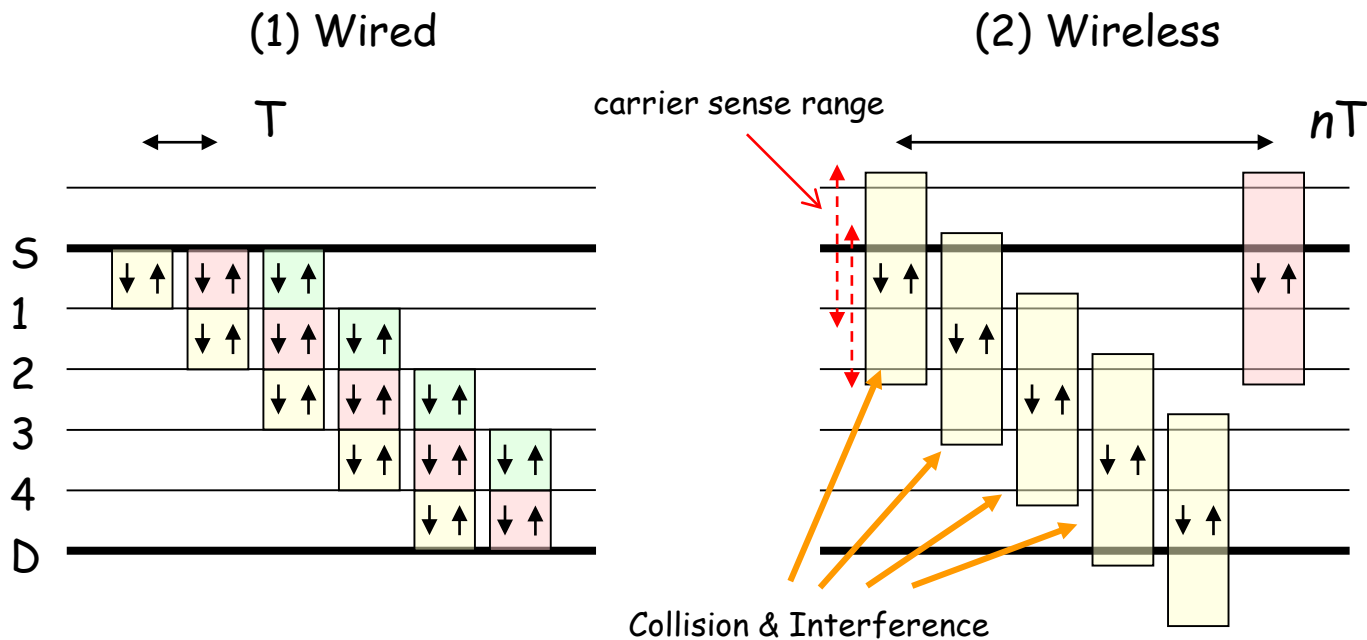$$R = \frac{1}{RTT}\sqrt{\frac{3}{2p}}$$

p: packet loss rate

BDP/Buffer relationship

small buffer → ×efficiency
large buffer → ×delay

TFRC: TCP Friendly Rate Control

Video streaming (3) Wireless

- Single-Channel Multi-hop Network

(1) Wired

(2) Wireless

carrier sense range

T

nT

S
1
2
3
4
D

Collision & Interference

Channel Efficiency = 1

Channel Efficiency = 1/n
(n : # of multi-hops)

Video streaming (4) CDN, P2P & Cloud

■ Overlay networks

Overlay

Underlay

■ tree

○ complexity
✕ robustness

■ mesh

✕ complexity
○ robustness
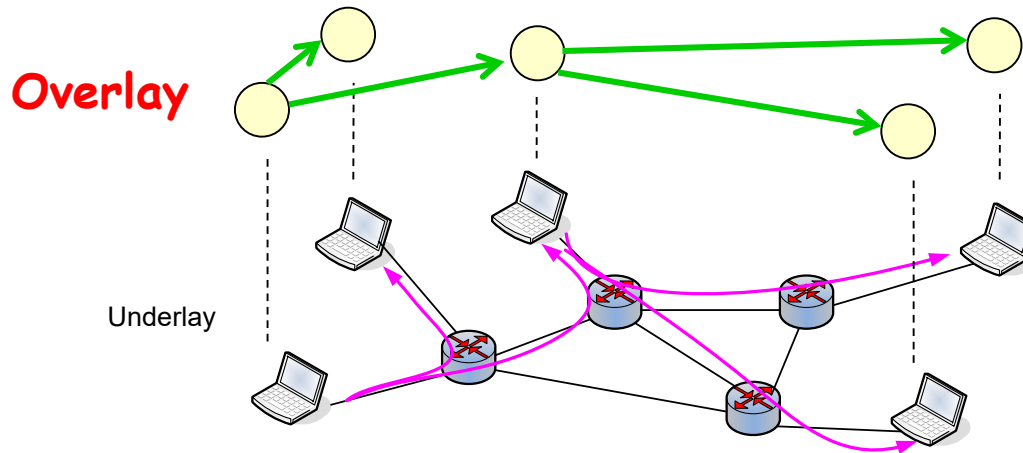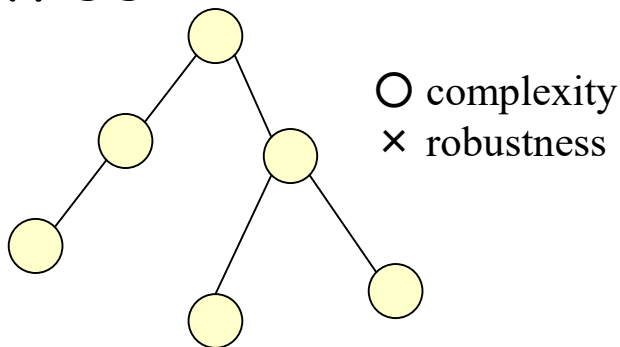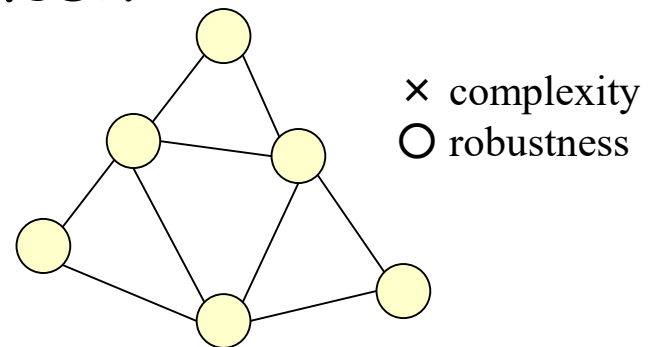
Video Compression: H.265 & Beyond

- **HEVC & VVC**
  - HEVC: High Efficiency Video Coding (H.265)
  - VVC: Versatile Video Coding (H.266)
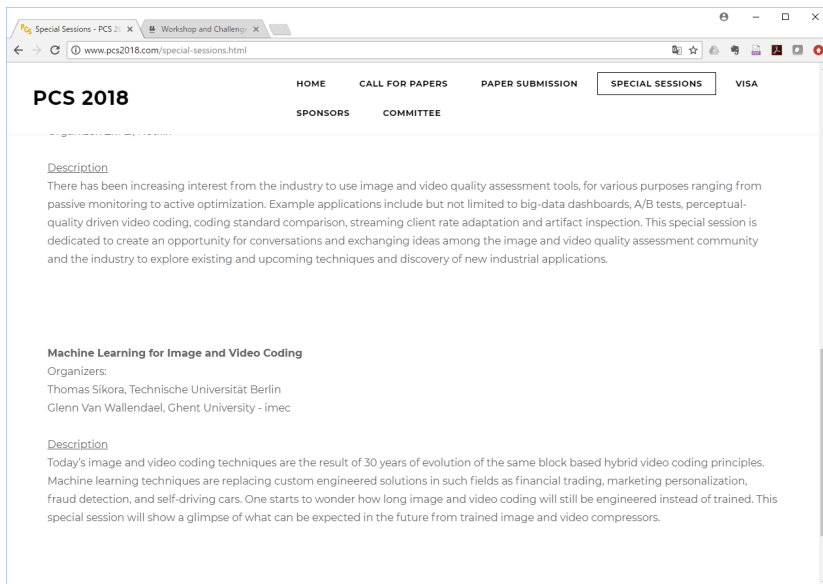
- **Other topics**
  - Higher resolution
    - spatial: U-HDTV
    - temporal: 10,000 frames
  - Wide gamut expansion
  - High dynamic range
  - 3D / freeviewpoint

color diagram

http://plusd.itmedia.co.jp/pcuser/articles/0805/23/news001.html
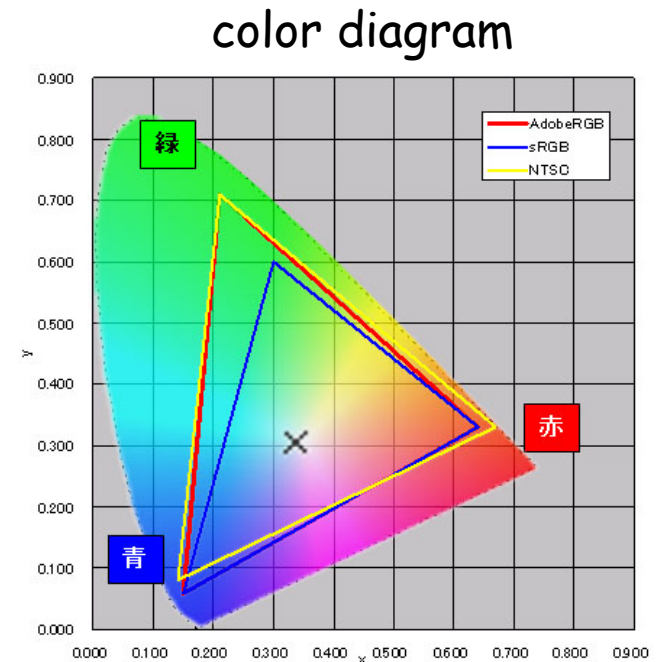
Machine Learning in Image/Video Compression

- On-going in these three years

PCS 2018 in June

CLIC in CVPR 2018 in June

http://www.pcs2018.com/

http://www.compression.cc/

Handouts

- Check handouts on CourseN@vi.
- (in April) check class web page
  - http://www.katto.comm.waseda.ac.jp/~katto/Class/