Introduction to Video Processing and Analysis

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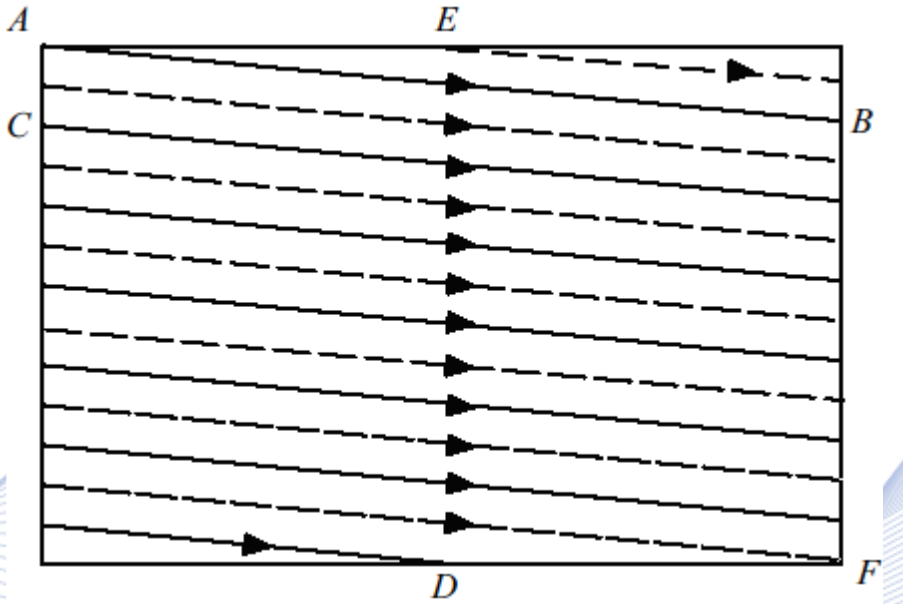
Artificial Intelligence & Information Analysis Lab

Outline

- Video sampling and digitization
- Visual Moving Image Perception
- Video filtering
- Motion Estimation
- 2D visual object tracking
- Video Compression
- Video indexing and retrieval
- Video description

Introduction

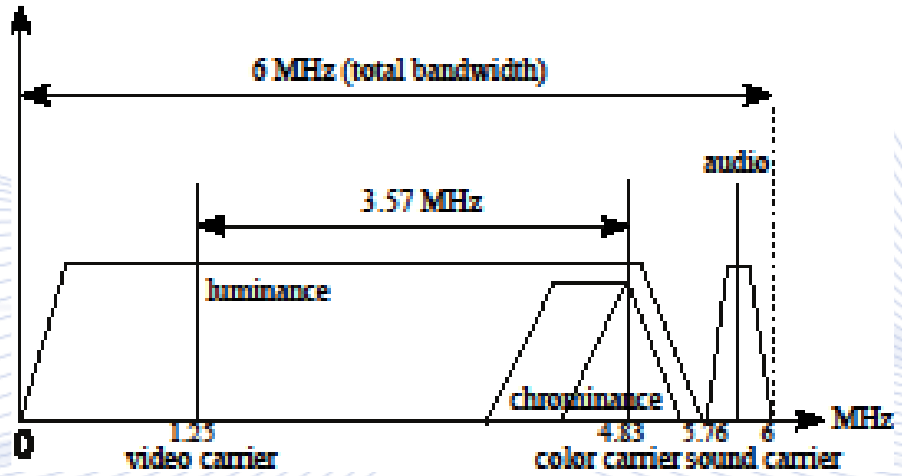
- Analog video signal is a time-varying image of the form $f(x, y, t)$:
  - x: horizontal coordinate
  - y: vertical coordinate
  - t: time variable.
- Analog video is scanned to be transmitted.



Analog video signal scanning.

Introduction

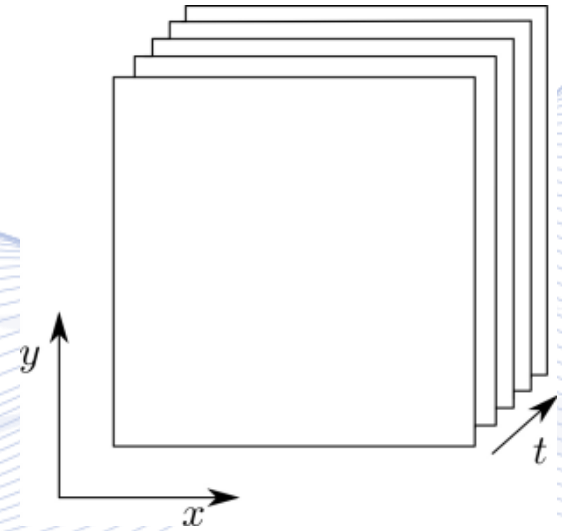
- Analog TV signal carries:
  - Luminance and color information
  - Stereo sound channels.



Analog TV signal bandwidth.

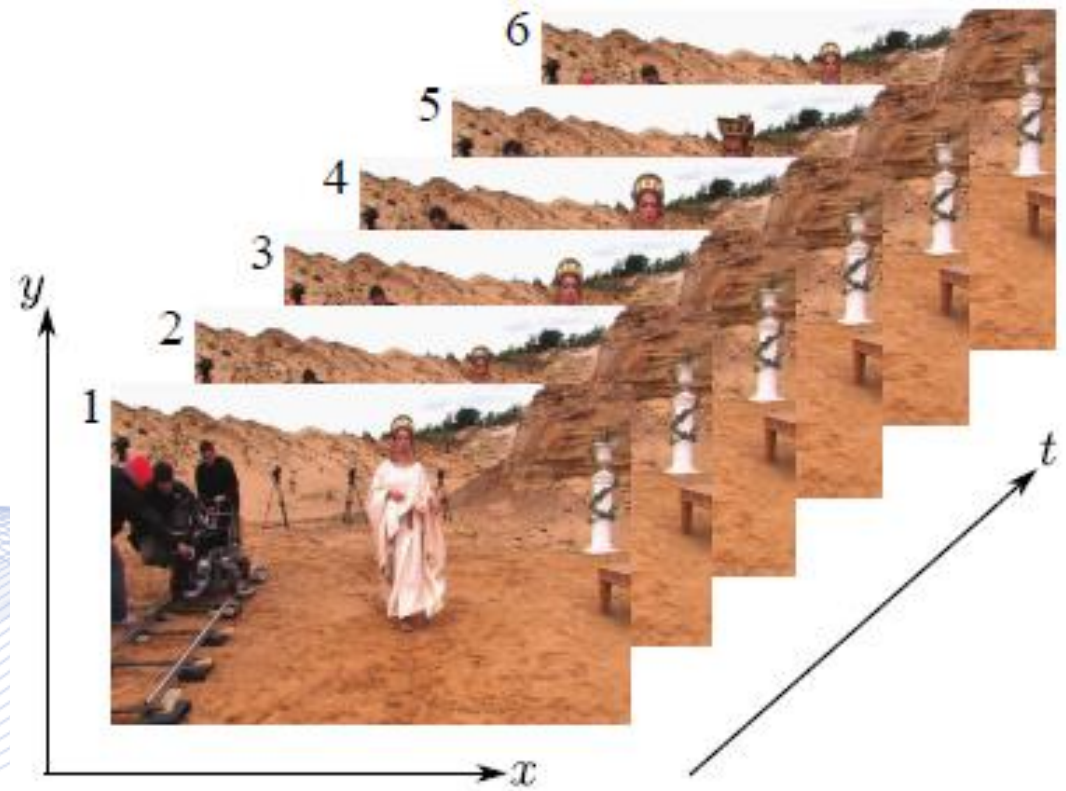
Introduction

- Digital representation of video signal is obtained by spatiotemporal sampling of analog video along its coordinates x, y, t.

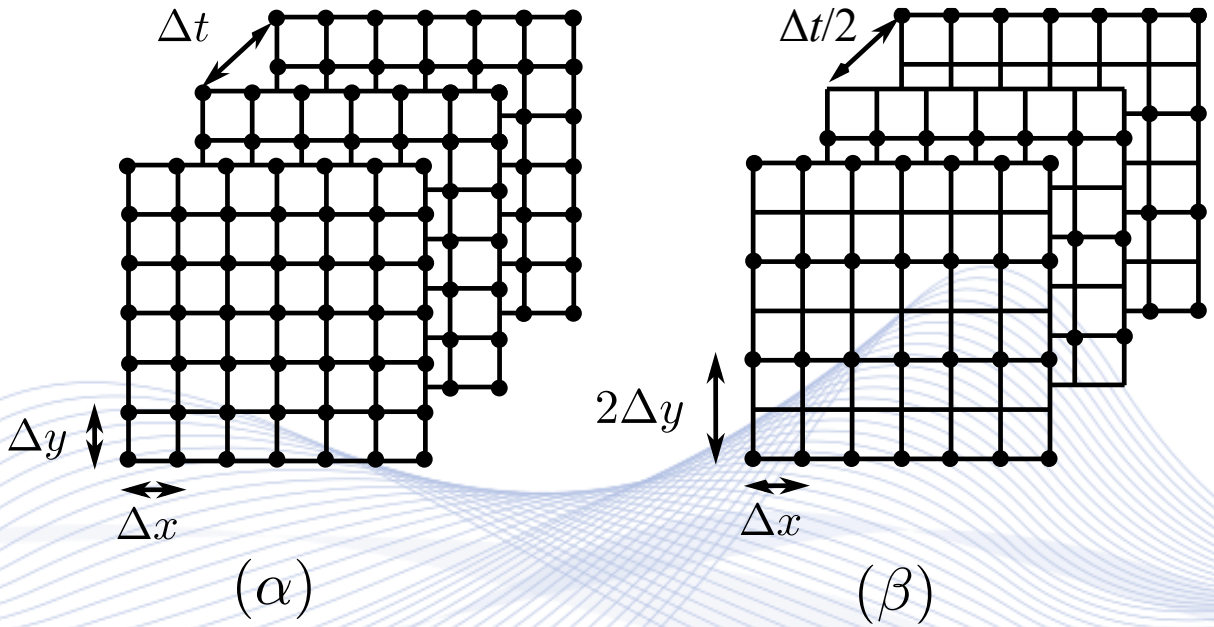


Spatiotemporal video signal.

Images $f(x, y)$ and videos signal $f(x, y, t)$



Video sampling



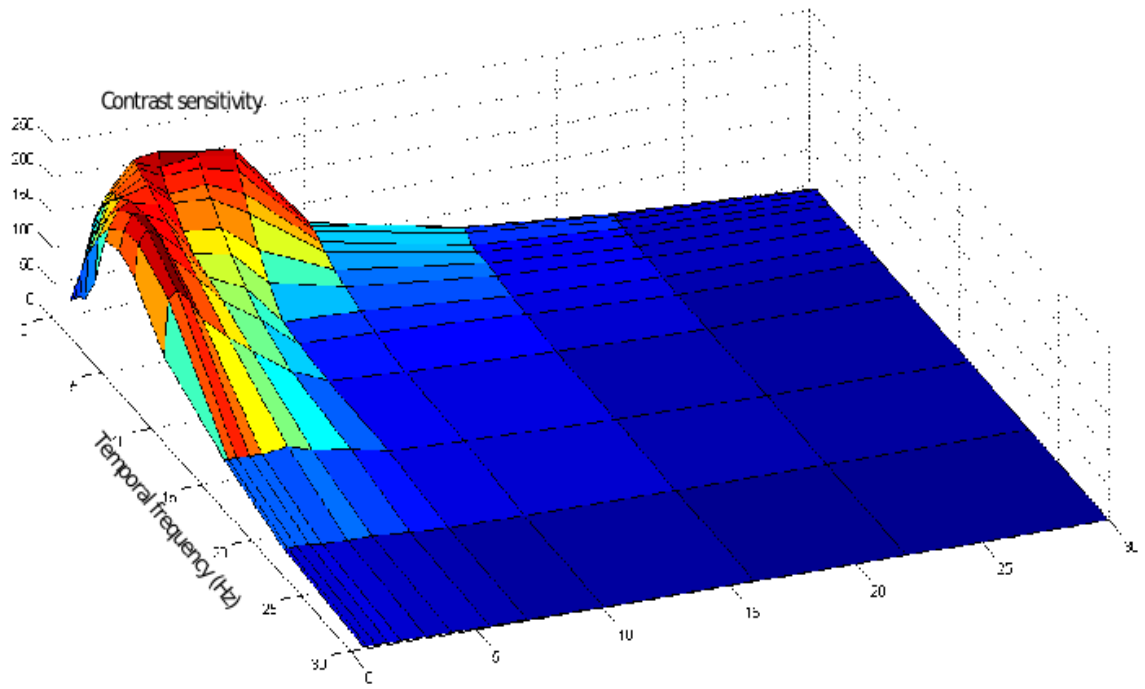
Sampling grids for: a) progressive and b) 2:1 interlaced video.

Spatiotemporal image content

$$f(x,y) = \sin(20\pi x + 8\pi y)$$

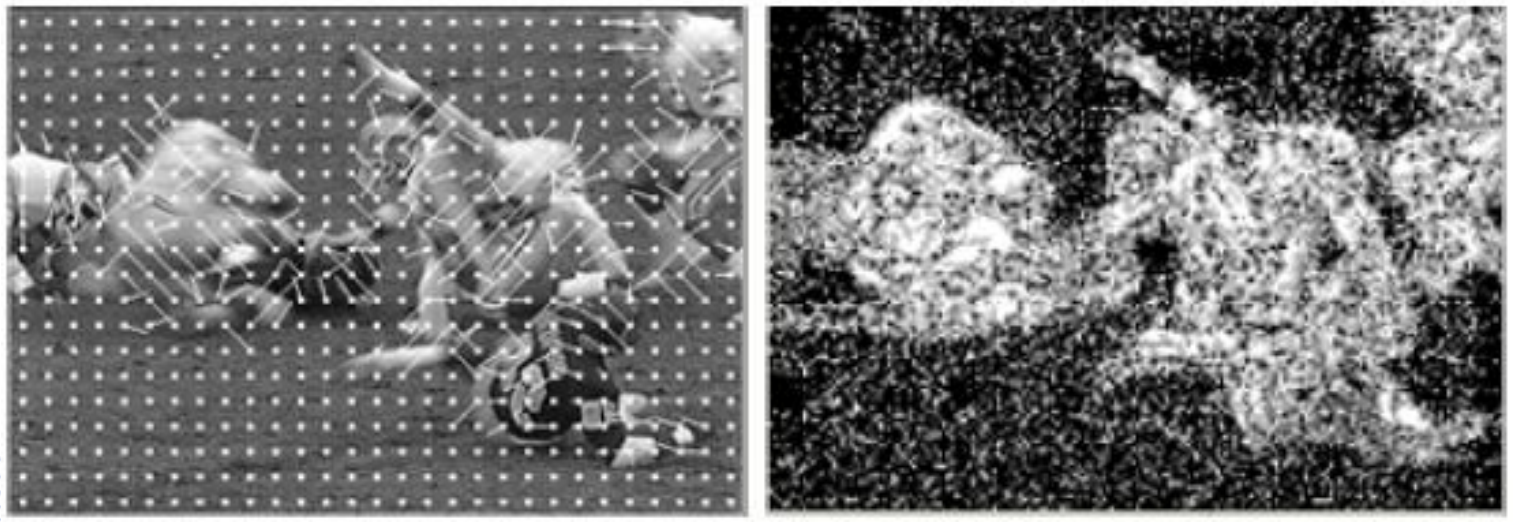
$$(\Omega_x = 20\pi, \Omega_x = 8\pi).$$

Spatiotemporal Frequency Response of HVS



Spatiotemporal frequency response of Human Visual System.

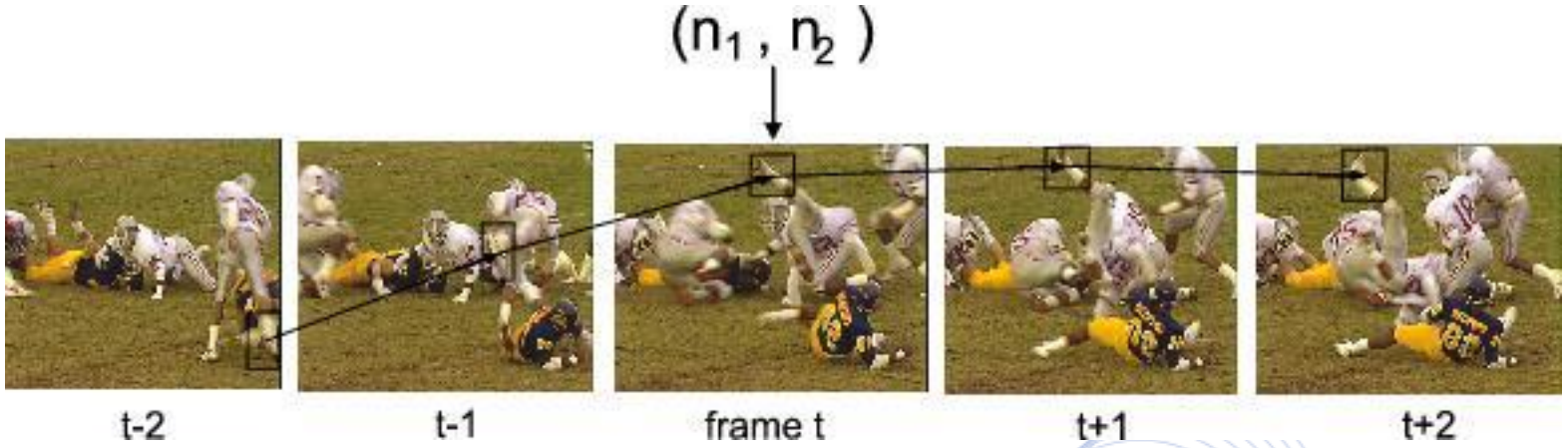
Motion estimation



Sparse and dense motion field.

Visual Object Tracking

Motion Compensated filtering



Object moving object trajectory in five successive video frames.

Video compression

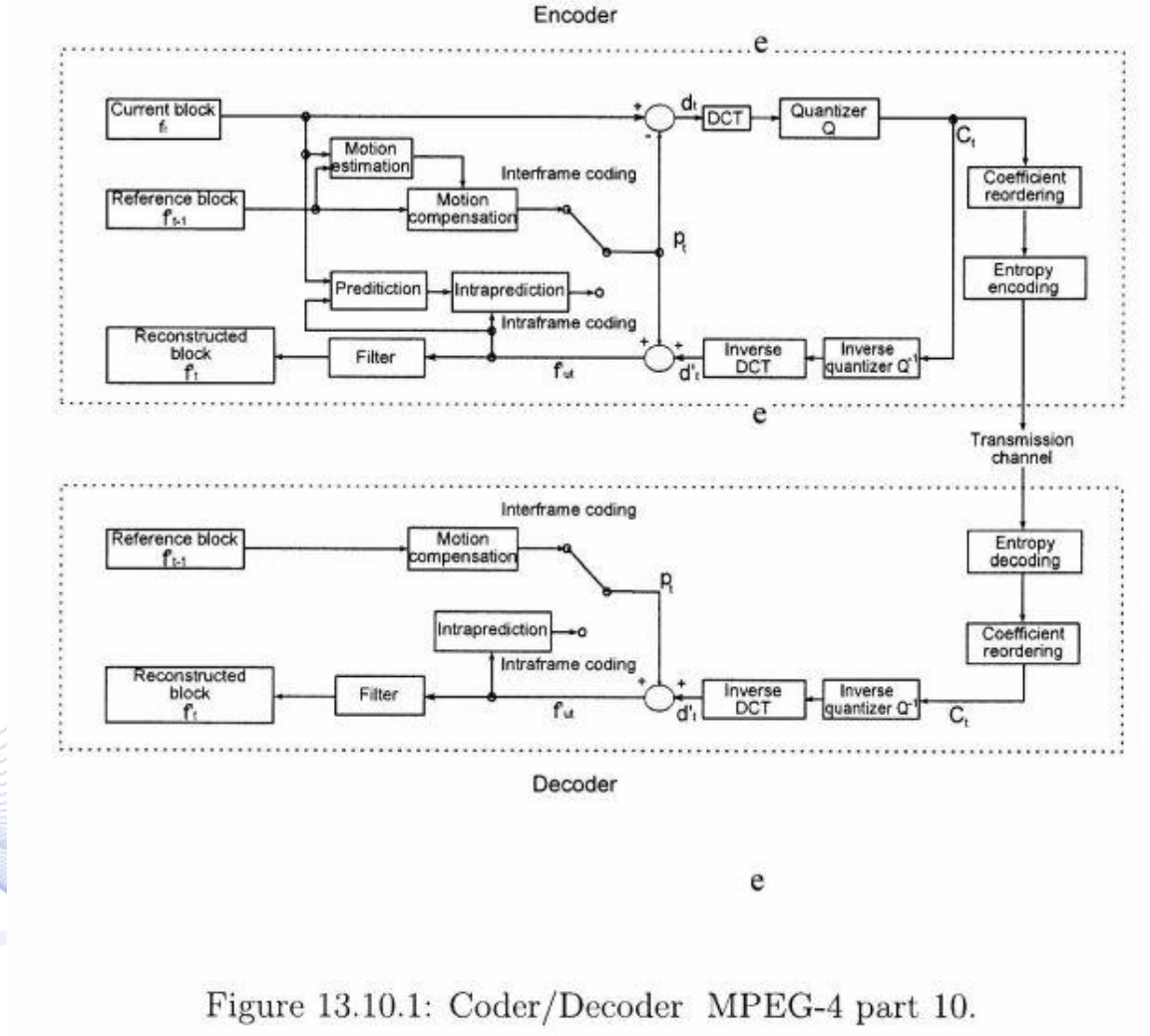
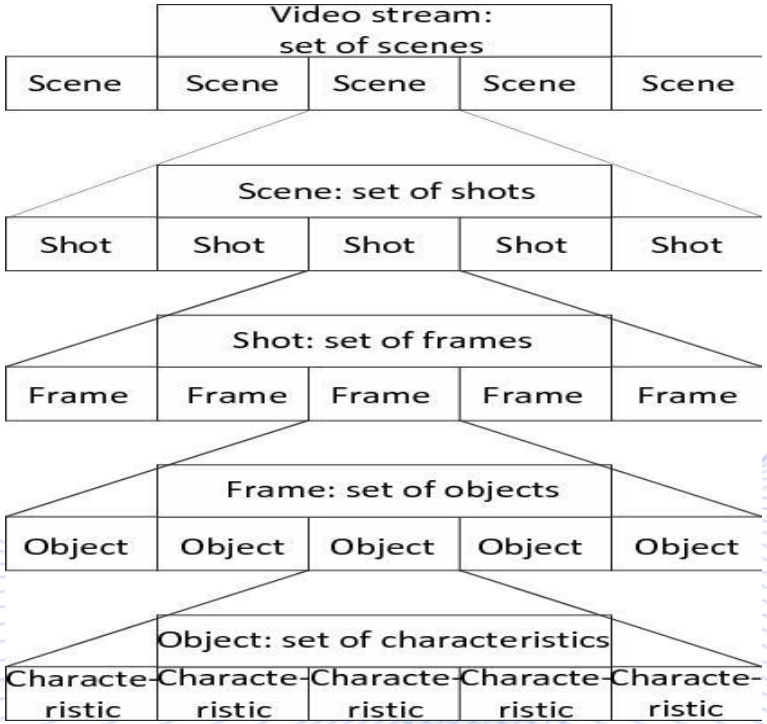


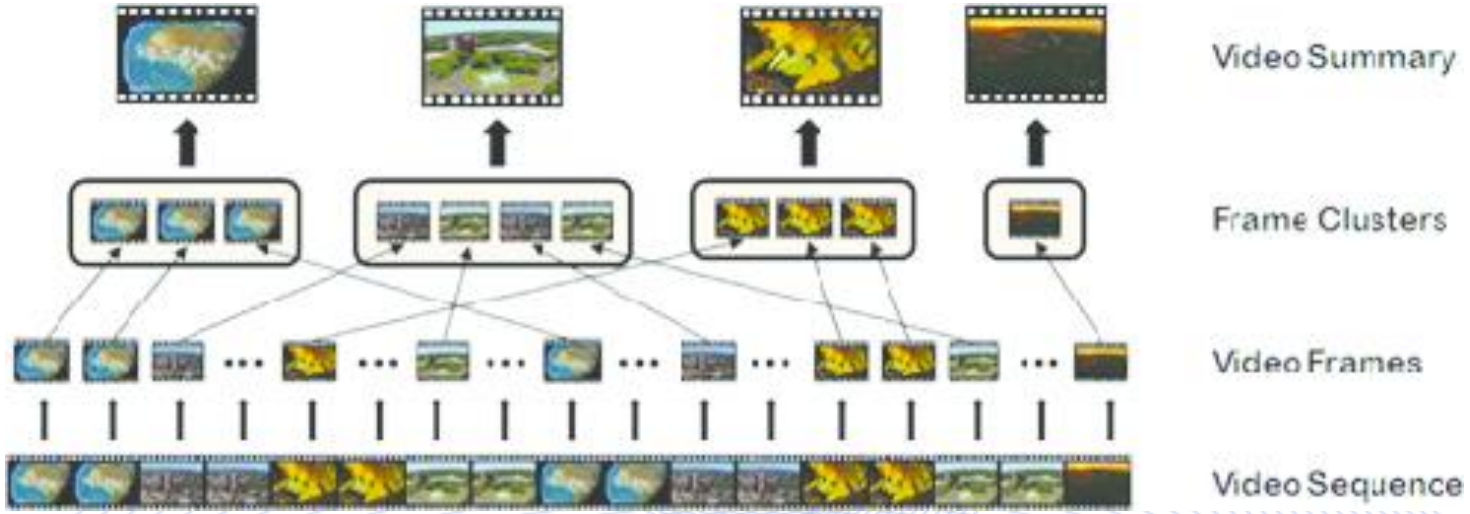
Figure 13.10.1: Coder/Decoder MPEG-4 part 10.

Video indexing and retrieval



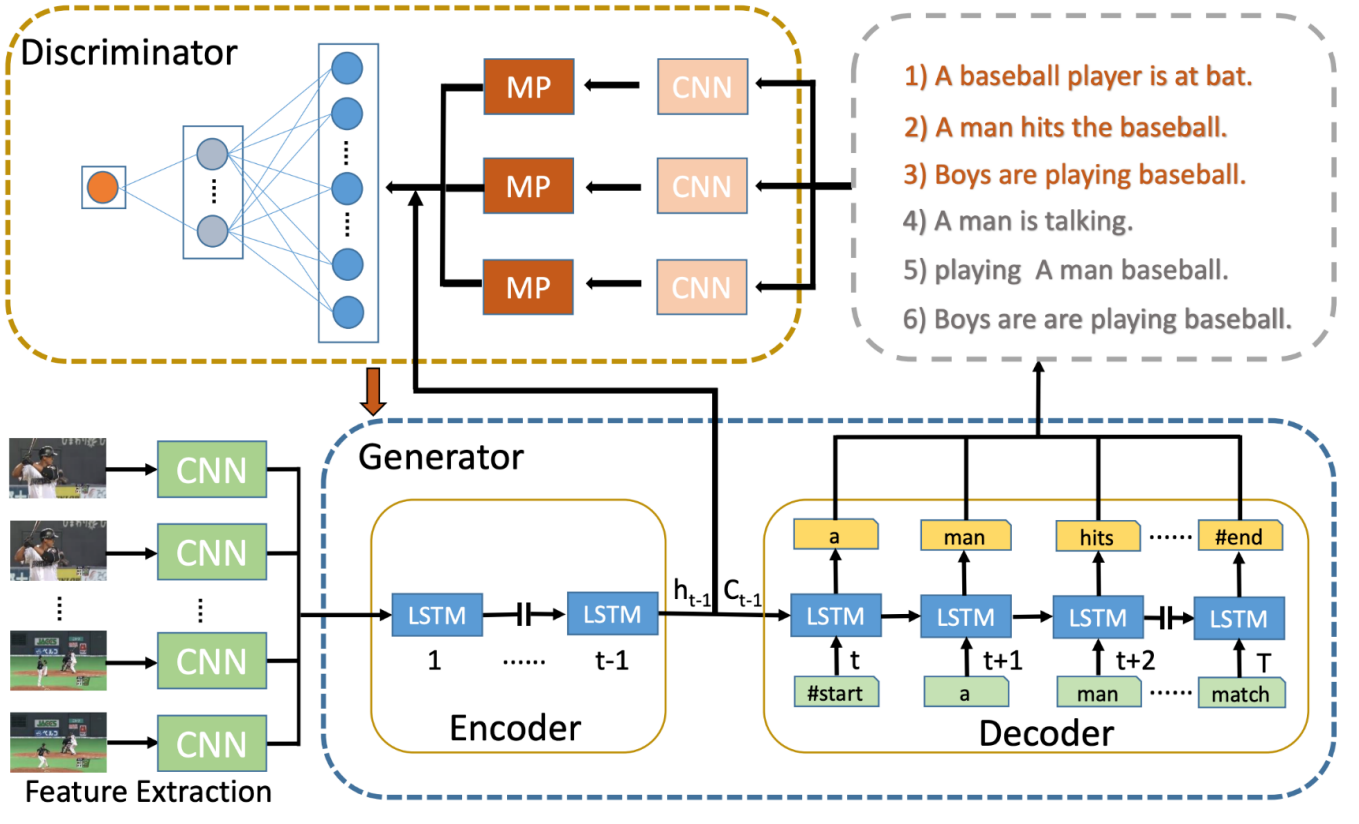
Hierarchical video segmentation.

Video Summarization



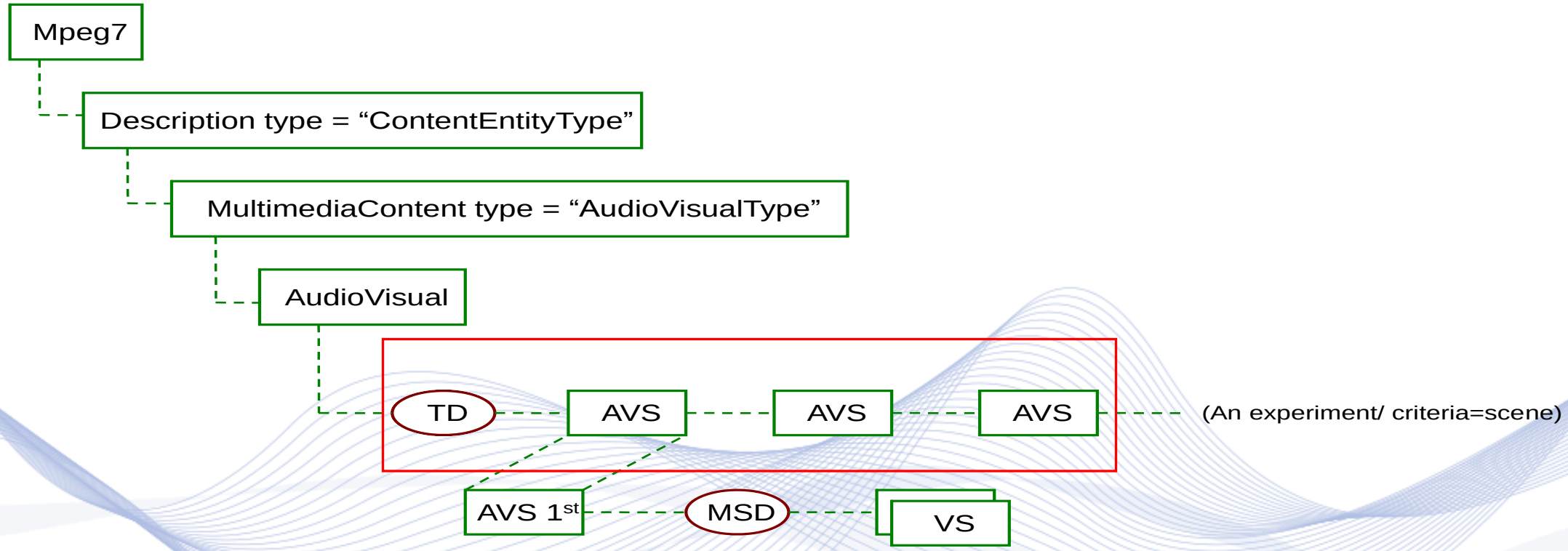
Video summarization.

Video Captioning



Video Captioning.

XML Video Description



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Q & A

Thank you very much for your attention!

More material in
http://icarus.csd.auth.gr/cvml-web-lecture-series/

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