14. MPEG-4[1]

MPEG-4 Visual Overview: MPEG-4 allows high compression at all bit rates as well as interactivity.

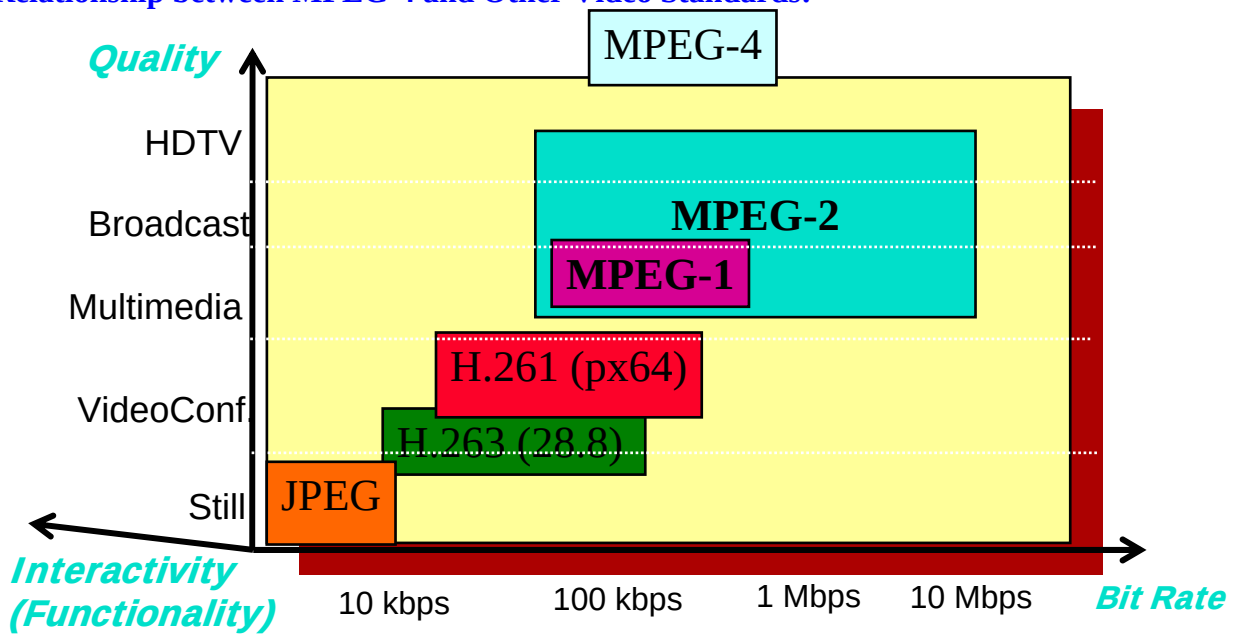
- Compression Efficiency Tools
- Arbitrary Shape Video Coding Tools
- Error-Resilient Coding Tools
- Scalable Coding Tools
- Rate Control and Post-processing Capability
- Video Profiles
- Face and Body Animation Tools
- 2D / 3D Mesh Coding and Visual Texture Coding Tools
- Animation Extension Framework (AFX)
- Visual Profiles

Goals and Scope:

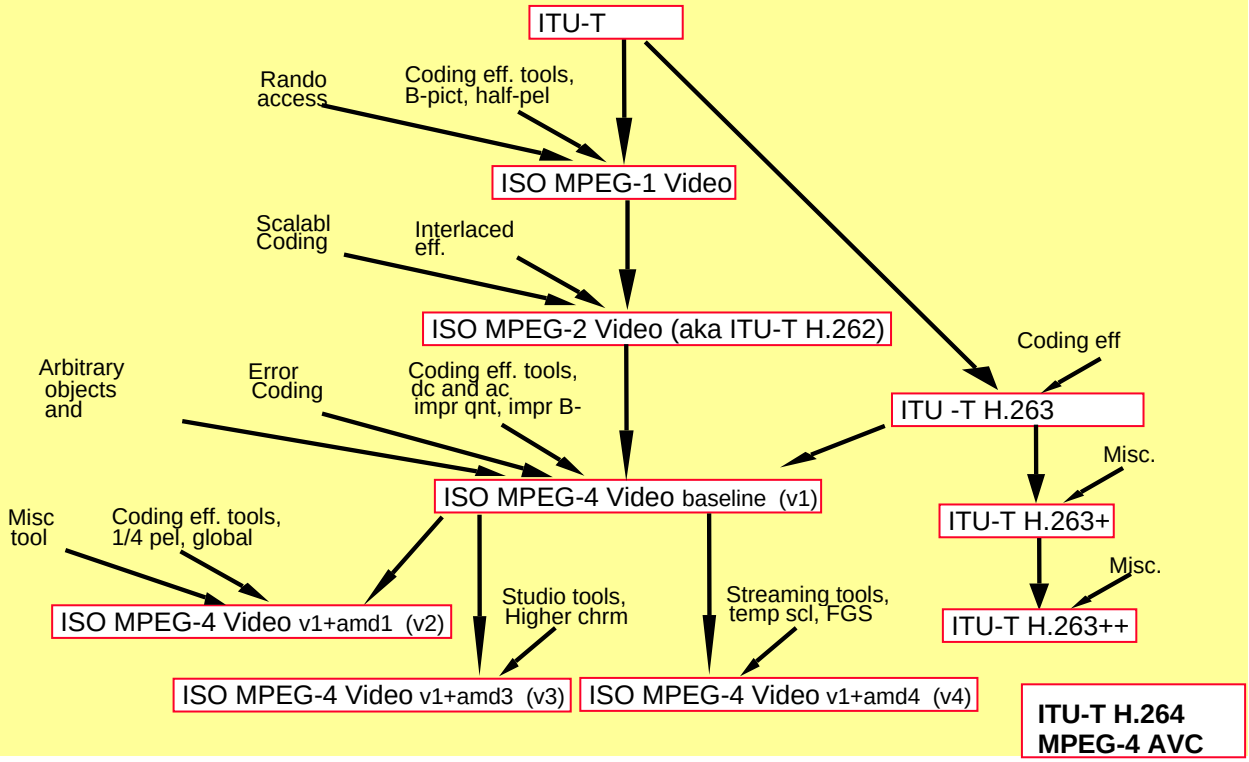
1. Rectangular Video Coding
   - Improved compression efficiency
     - » Bitrates: 5kbps to 50 Mbps (or higher)
     - » Resolution: videophone to TV (or higher)
     - » Progressive and interlaced formats
   - Error resilient coding
     - » Robustness to channel errors

2.Arbitrary Shape Video Coding
   - Object-based interactive video
   - Object-based scalable coding

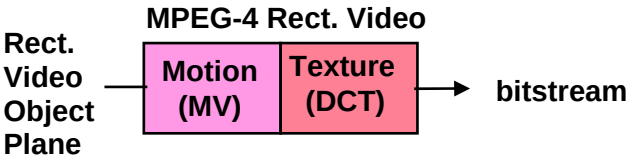
Relationship between MPEG-4 and Other Video Standards:



[1] The material in this chapter has been provided by Prof. A. M. Tekalp at Koc University, Istanbul, Turkey and A. Puri of the University of Rochester.

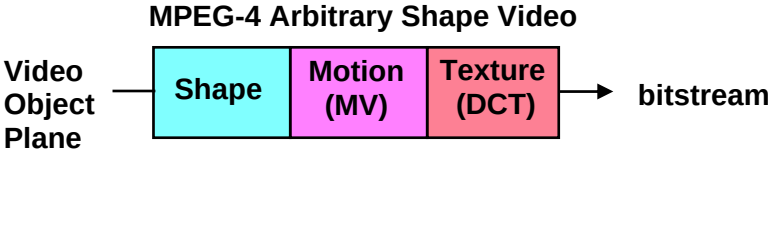


MPEG-4 Video: Basic Principles:



Baseline H.263 is a valid subset of MPEG-4 Rect. video

Rectangular



Object-based

Object-Based Video Coding Concepts:

1. Video Objects (VO's): Correspond to semantic arbitrary shape objects in the scene and may be obtained by segmentation
2. Video Object Planes (VOP's): Correspond to snapshots in time of arbitrary video objects, a generalization of the concept of frames
3. Alpha channel represents shape - binary or gray-level (transparency of objects)

Frame VOP 1 VOP 2

Each VO is compressed and transmitted or stored as an independent bitstream.

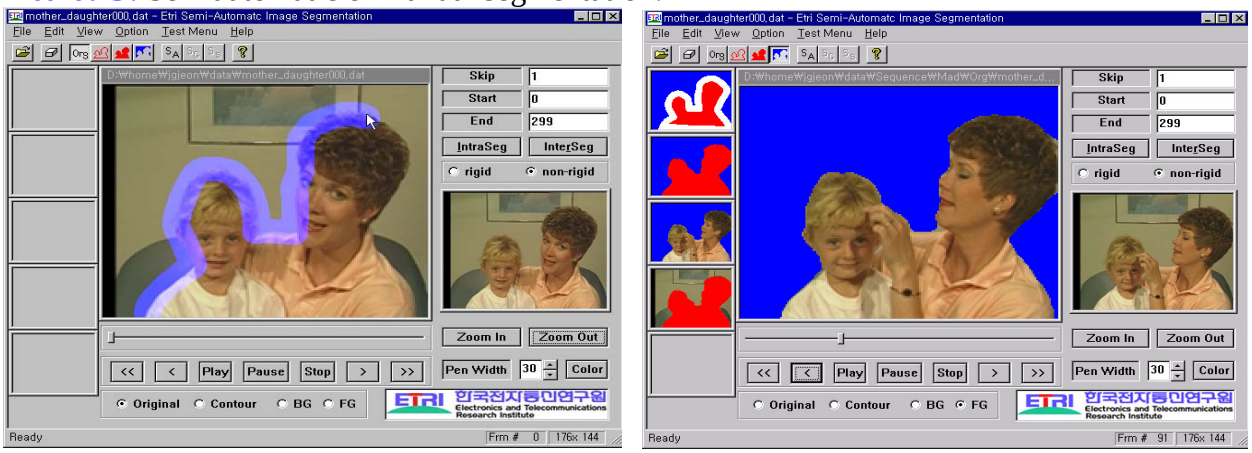
Segmentation of Video Objects:

1. Segmentation tools are in an **INFORMATIVE** annex.
2. At least three methods, best depending on the application.

***Method 1*:** Chromakey scene generation for flexible composition already used in the studios to provide segmented video objects.

***Method 2*:** Background subtraction and object motion tracking:

***Method 3*:** Semiautomatic or manual segmentation:



PreProcessing:

1. Noise Filtering
   - removal of high frequency noise increases compression efficiency
2. Format Conversion
   - if needed

MPEG-4 Video Encoder: