# Digital TV (DTV) and Compression Techniques (Three Day workshop)

## Course Summary

Digital TV (DTV) is the umbrella term used to describe the new digital television system adopted by the FCC in December 1996; DTV is a technology, and HDTV is just one subset of the DTV.

The objective of the course is to bring the participants gracefully through all the DTV structure, features, and theory...then give them more practical information on subjects such as decoding issues, display problems, conversion, baseband data stream handling, etc. The course will also provide an in depth and structured introduction to the technology, its uses, opportunities/possibilities, and limitations. Digital TV is not simply the numerical equivalent to traditional analog television: the issues of becoming digital are covered, as well as the relevant compression technologies.

## Course Objectives

- Provide background for understanding the DTV standards
- Discuss enabling technologies lying modulation techniques
- Discuss specifics of ATSC, DVB-B-C Systems
- Discuss critical design issues, technical aspects related to copy protection
- Discuss basic problems in the system integration

## Who Should Attend

The course is intended for video engineers who will have to use the technology, not compression designers. The mathematics of compression techniques are discussed briefly, but the focus of the course is on providing a qualitative understanding of the processes involved rather than their detailed analysis. If you are looking for real world answers and direction toward solutions, this course is for you.

## Course Outline

**Day 1**

**Introduction**

- Description of Course Structure and Content
- Course Objectives
- Standards Overview

Standard TV - Analog: Basic Concepts
Standard TV - Digital: Component vs. Composite
Introduction to DTV/ATSC
Theoretical Base for Compression/Decompression

- Need for Data Compression
- Information Theory Concepts
- Visual Psychophysics
- Predictive Coding
  - Motion Estimation
  - Motion Compensation
- Transform Coding
- Subband Coding
- Vector Quantization, etc.

**DCT xPEG**

- Baseline Processing
- Variable Length Coding

**MPEG Standards**

**Day 2**

**Satellite and Cable TV Distribution**
**(DSS, DVB - Broadcast/Cable, ATSC)**

- Critical Design Issues
- DSP vs. Dedicated MPEG-1-2 IC's
- Hardware vs. Software Solutions
- Clock Recovery and Synchronization Issues
- Sampling Strategies and Structures
- CCIR-601 4:2:2 and 4:2:0; Interlaced/Non-interlaced
- VLSI Implementation
  - MPEG Processing Architecture and Implementation
  - Architectural choices
- Format Conversion

**Limitations of Source Coding**
**Major Artifacts Associated with Video Compression**

- Subjective Evaluations of Digitally Compressed Video

**Day 3**

**MPEG-4 Algorithm and Practice in C**

Transform and Quantization
Arithmetic coding
Shape representation: binary and gray-scale (alpha) planes
Mesh (object plane) based presentation
Shape-adaptive DCT and DWT
Global and local motion compensation
RVLC, etc.
Single object and multiple object coding
Texture coding
Synthetic video

**H.264 Algorithm and Practice in C**

Transform and Quantization
Compression tools
Prediction of Intra Macro blocks
Reconstruction filter
Interlaced Video
Entropy coding
Content-Based Adaptive Arithmetic Coding (CABAC)
Enhanced motion estimation/compensation

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