

Docket 87-268

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VIDEO COMPRESSION

AGENDA

- **BASELINE VIDEO COMPRESSION SYSTEM**
- **RATIONALE**
- **VIDEO ENCODER OPTIONS**
- **OPEN ISSUES**
- **COMPRESSION PARAMETERS**
- **ANSWERS TO SOME QUESTIONS OF GENERAL INTEREST**

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BASELINE SYSTEM

- **THE GRAND ALLIANCE DEFINES A BASELINE SYSTEM CONSISTING OF TWO ELEMENTS:**
 - **CUSTOM COMPRESSION ALGORITHM**
 - **MPEG-2 SYNTAX**
- **THE BASELINE IS AN IMPORTANT CONSOLIDATION OF WORK IN PROGRESS AND REPRESENTS A MINIMUM LEVEL OF PERFORMANCE**
- **IMPROVEMENTS TO THE BASELINE ARE UNDER CONSIDERATION**

BASELINE SYSTEM

- **The Grand Alliance baseline system will use MPEG-2 syntax with the following features:**
 - **Frame/field coding**
 - **I and P frames**
 - **Progressive refresh**
 - **No B frames**
 - **Additional syntax element for frequency dependent leak**

Rationale

- **The baseline system blends together key features from each of the four proponent systems**
- **Use of MPEG-2 syntax**
 - **makes the system more acceptable as a worldwide HDTV standard**
 - **helps IC manufacturers develop video decoder VLSI**
 - **enhances interoperability of compressed bit streams**
- **Allows the implementation of key algorithms and features from each of the four proponent systems with a minor additional syntax element**

Rationale (cont'd)

- **B frames are not included in the baseline system because they add complexity and channel acquisition time**

Video Encoder Options

- **Encoder implementation features being considered include:**
 - **VQ for non-zero DCT coefficient selection with perceptual coding**
 - **Predicted frame motion estimation**
 - **Large range hierarchical motion estimation**
- **These features do not affect transmitted syntax or decoders in any way**
- **These and other encoder implementation features do affect picture quality**

Open Issues

- **The following proposed improvements to the baseline system will be evaluated by computer simulation:**
 - **B frames**
 - **Coefficient selection coding**
 - **Non-uniform quantization with new VLC's**
- **A Grand Alliance specialist group on compression has been formed to assess system performance and proposed improvements**
- **The Grand Alliance will decide whether the improvements are justified for inclusion in the final system by September 30, 1993**

Compression Parameters

- **horizontal_size**
vertical_size
pel_aspect_ratio
frame_rate
Will allow picture transmission formats to be decided by format specialist group
- **vbv_buffer_size**
8 Mbits max
- **chroma_format**
4:2:0
- **Picture_coding_type**
B pictures and D pictures are not allowed
- **forward_vertical_f_code**
Vertical motion vector range is limited to ± 128
- **picture_structure**
Only frame-picture structure is allowed (field-picture structure is not allowed)
- **extension_start_code**
AC leak extension is allowed

Answers to Some Questions of General Interest

- **With progressive refresh, I frames are not needed except for editing purposes.**
- **Frequency dependent leak attenuates AC components in the feedback loop of motion compensation on P frames, as defined in MPEG test model. It helps error recovery.**
- **Compatibility with MPEG-1 and CDI will be up to receiver manufacturers.**

Answers to Some Questions of General Interest

- **The Grand Alliance plans to submit a proposal that defines a proposed profile of U.S. HDTV standard in July. The baseline system does not require any new syntax elements except the AC leak which is already in consideration.**
- **The system will not have any seams.**

Answers to Some Questions of General Interest

- **I-frame and progressive refreshing will not be mixed in the same sequence except the fact that I frames can be used in addition to progressive refreshing for editing purposes.**
- **The system will conform to MPEG-2 syntax including sequence headers and extensions.**
- **The end-to-end system delay depends on the refreshing techniques used. It will be approximately 0.5 seconds with I-frame and 0.1 seconds with progressive refreshing or AC leak.**

AUDIO

June 30 - July 1, 1993

Three 5.1 Channel Audio Surround Sound Systems are being evaluated:

- ① **Dolby AC-3**
- ② **MIT-AC**
- ③ **MUSICAM 5.1**

- **The Dolby AC-3 system comprises a composite coding algorithm using a Modified sine/cosine Transform, also known as TDAC, (Time Domain Alias Cancellation).**
- **The MIT-AC system comprises an independent coding algorithm for each of the 5.1 channels, using an adaptive transform scheme.**
- **The MUSICAM 5.1 system comprises a composite coding algorithm using subband coding.**

- **Evaluation is proceeding with:**
 - ① **Complexity analysis.**
 - ② **Comparison with the ATSC T3/186 document recommendation.**
 - ③ **Subjective test comparison planning.**
 - ④ **Compatibility with existing audio systems**

- **Complexity Analysis of each 5.1 channel system algorithm flow diagram emphasizes three decoding situations:**
 - ① **5.1 Loudspeaker reproduction**
 - ② **2 Loudspeaker reproduction**
 - ③ **1 Loudspeaker reproduction**
- **Complexity is analyzed in terms of number of Multiply-Accumulates per second plus RAM, ROM, ALU etc., for each reproduction situation.**

● **The ATSC T3/186 document serves as reference to analyze support for:**

- ① **Composite Coding Modes**
- ② **Independent Coding Modes**
- ③ **Uniform Loudness Reference**
- ④ **Dynamic Range Control**
- ⑤ **Error Concealment**
- ⑥ **And other audio related items**

● **Subjective Test Comparison Planning**

- **We are working with Audio Advocates to define tests and acquire suitable surround sound test material**
- **The test process will be Expert Observation and Commentary (EO&C)**
- **The Scope of the tests will be consistent with the ACATS Test Plan**

- **A decision / recommendation is expected by the Audio Specialist group August 31, 1993.**

TRANSPORT

June 30 and July 1, 1993

TRANSPORT

*"A Packetized, Prioritized Data
Format Will be Employed"*

Details to be Finalized by 8/31/93

OBJECTIVES

- **Flexibility of Services**
- **Accomodate Prioritization Usage**
- **Support Conditional Access**
- **Interoperability with Alternate Media
(e.g. ATM Networks)**
- **Low Overhead**

BACKGROUND

- **All Parties in Agreement on Objectives**
- **ATSC T3/186 Defines Functional Requirements**
- **Excellent Basis From First Round of Testing and System Improvements**
- **Excellent Feedback from PS/WP-4 Report**

PROCEDURE

- **MPEG 2 Systems Working Draft (June 12, 1993) as Reference Point**
- **Functional Requirements and Supporting Data Structures are Being Evaluated**
- **Currently Reviewing Several Proposals to Modify Syntax**
- **Detailed Definition - August 31, 1993**