CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

Document AVC-23
Dec. 20, 1990

SOURCE : CHAIRMAN
TITLE : REPORT OF MPEG BERLIN MEETING
PURPOSE: Report

MPEG (ISO/IEC JTC1/SC2/WG11) held the 13th meeting during 4 - 7 December 1990 at HHI in Berlin.

Here are reported discussion results on the Phase-2 work for up to 10 Mbit/s audiovisual coding which are closely related to the work of CCITT Experts Group.

1. Joint work with CCITT Experts Group

1) MPEG has approved to have joint meetings with the CCITT Experts Group as we proposed according to the decision at our Hague meeting.

2) Meetings of the two groups are synchronized from the next meeting which will be held in San Jose (California) during 4-8 March 1991 at the kind invitation of C-Cube Microsystems.

2. Work plan - see §3.2 and 3.3 of Annex 1

1) MPEG intends to complete CD (Committee Draft) in November 1992. Technical maturity of this stage is similar to the CCITT Experts Group "Flexible Hardware" specifications.

2) MPEG is planning to have a subjective test for proposed algorithms during 2-6 September 1991. It is noted that the date of this subjective test was delayed 8 weeks in response to the request of the CCITT Experts Group.

3) Purposes of this subjective test are to quantify the picture quality at 4 Mbit/s as well as 9 Mbit/s and to find promising candidates, leading to the definition of "Test Model (TM)" for further collaborative elaboration.

4) Members of the CCITT Experts Group are encouraged to prepare for and submit their proposals for this contest. The deadline for processed pictures is likely mid-July (to be confirmed by the host lab, JVC).

3. Technical requirements - see §3.1 of Annex 1

Requirements for the new video coding standard for higher bit rates were discussed. Some requirements from the communication applications were reflected based on the liaison statement from the Experts Group. Further clarifications are needed at the next meeting, awaiting contributions from members of the Experts Group.

4. Test procedures - see Annex 2 of this report

Test sequences were selected from the CCIR's library tape (see CCIR Report

1213) as summarized at the end of this page. Framework of the test methodology and conditions was also discussed and decided.

5. Evaluation of hardware complexity

It is anticipated that this aspect would be evaluated only by "experience and instinct." The method used for MPEG-1 to count chips is not repeated. Alternative method is for further study.

6. Request for proposals

Proposal Package Description (PPD) for the video coding algorithm proposal submission, including further details of the test procedures, will be finalized at the next meeting.

END

Summary of 5-seconds specifications (MPEG 90/310)

The following table summarizes the above specifications of 5-seconds cuts of test sequences. Time codes are given as hh:mm:ss:ff - ss:ff.

Sequence	50 Hz	60 Hz
Table Tennis frames of 10 seconds already used time code	1 - 53 + 74 - 102 + 121 - 163 01:28:00:00 - 02:02 + 04:17 - 05:20 + 12:15 - 14:07	1 - 67 + 90 - 119 + 149 - 201 01:28:00:15 - 02:21 + 05:07 - 06:06 + 13:04 - 14:26
Flower Garden	01:14:23:08 - 28:07	01:14:17:17 - 22:16
Susie	01:15:06:00 - 10:24	01:15:07:00 - 11:29
Popple	01:27:05:00 - 09:24	01:27:05:00 - 09:29
Mobile&Calendar	01:29:19:00 - 23:24	01:29:17:15 - 22:14
Tempete (a) without + with noise or (b) without + with noise or (c) without + with noise	01:43:07:00 - 09:12 + 44:07:00 - 09:11 01:43:07:00 - 09:12 + 44:09:13 - 11:24 01:43:07:00 - 09:12 + 44:11:00 - 13:11	01:43:07:00 - 09:15 + 44:07:00 - 09:13
Edited sequence: Table Tennis + Flower Garden + Susie + Popple + Mobile&Calendar	frames 1 - 23 1 - 29 1 - 23 1 - 29 1 - 21	frames 1 - 29 1 - 31 1 - 29 1 - 29 1 - 32

Annex 1 to Doc. AVC-23

Source : Sakae Okubo (NTT)
Title : Report of the REQUIREMENT subgroup
Purpose: Report

1. General

The requirement subgroup met on December 5 and 6 under chairmanship of Mr. S. Okubo. Before starting discussion, we confirmed the target outcome of this meeting be to clarify the following items to form a basis for the PPD (Proposal Package Description);

- technical requirements,
- time schedule, milestones, and
- work method for shifting from "competition" to "collaboration".

2. Available documents

MPEG 90/268 Santa Clara meeting report (Chairman)
MPEG 90/292 Suggestions for MPEG-2 standard (AT&T)
MPEG 90/300 European requirements for applications of MPEG Phase 2 (IBA)
MPEG 90/326 Requirements for MPEG-2 (Philips)
MPEG 90/332 Letter to Dr. Chiariglione (CCITT Experts Group)

3. Discussion results

3.1 Technical requirements

3.1.1 Picture quality

The target quality and corresponding bit rates for the MPEG Phase-2 work were summarized in the following two categories;

- NTSC/PAL/SECAM level: 3-5 Mbit/s
- "MAC" level : 8-10 Mbit/s

We may select test sequences appropriate for each category to relax the subjective test burden, e.g.

- lower bit rates : A,B,C,D
- higher bit rates: C,D,E,F

It is expected that the overlapping test sequences would provide information concerning bit rate dependency of proposed coding algorithms.

3.1.2 Compatibility

1) Guideline

The meeting discussed on how to relate the second generation standard for up to 10 Mbit/s and the first one for 1.5 Mbit/s, as a continuation of the discussion at the previous meeting in Santa Clara. A major problem seems to be whether we can achieve target quality by maintaining a close relation between the two generation standards.

After extensive discussion, the meeting agreed as a guideline to seek "compatibility" to the maximum extent.

2) Clarification of "compatibility"

During the discussion, however, it was found that the "compatibility" may mean different things according to the proponent. Clarification is required. Some attempt was made to list up possible approaches for achieving compatibility as illustrated in Figure.

There was a suggestion that we could study compatibility issues by evaluating additional transcoding boxes necessary for achieving forward- and/or backward-compatibility.

3) Requirement for the algorithm proposal

Each algorithm proposal for subjective tests is required to describe the "compatibility" aspect.

4) Weighting factor of "compatibility"

There was a remark that the weighting factor of this functionality be clarified before progressing to the request for algorithm proposal since this factor affects the choice of the first model. The matter is still under study as described in Section 3.3.3.

5) Conclusion

This issue should be further studied from various points of view. Contributions are awaited toward obtaining definite conclusions at the next meeting.

3.1.3 Other functionalities

The meeting considered a number of functionalities required for the second phase of MPEG work in terms of the following three categories. The objective was to maximize the efficiency and effectiveness of the "competition and collaboration process".

1) Require demonstration for proposal

- random access (see PPD of MPEG1 for the definition)
- fast forward
- fast reverse
- low codec processing delay

2) Check at the later stage

- repetition of coding-decoding
- protection against errors
- ATM network capability
- recovery of synchronization after an arbitrary point
- variable pel aspect ratio

3) Not consider at the moment

- normal reverse
- slow motion

Note: These functionalities are rather media dependent.

3.2 Time schedule - alignment of plans between MPEG bad CCITT Experts Group

The meeting compared the MPEG work plan and that of the CCITT Experts Group, and discussed possible alignment.

Firstly, the target date of freezing draft specifications was confirmed to be common; end of 1992. Though this is worded differently as

- completion of Committee Draft (MPEG), and
- completion of Flexible Hardware specification (CCITT EG)

the level of technical maturity is almost identical. It is noted that there was some comment that the hardware verification may go in parallel with freezing specifications, not that it follows serially the completion of specifications.

Secondly, the date of subjective test was discussed. MPEG has been planning to carry our this test in July 1991 and to take some time to define a simulation model (it took six months after the test to define SM1 in case of the MPEG Phase 1). CCITT Experts Group has planned to define a reference model around the end of 1991 after the "divergence" phase study using informal observation tests. In order to adapt to the MPEG method, CCITT Experts Group thought the subjective test in July 1991 is too early and hoped to defer it to a later date such as November 1991.

The Requirement subgroup did not support the change of date due to

- that it may increase the burden of the host lab,
- that it may make difficult to shift from competition to collaboration,
- that the work schedule alignment was not felt necessary.

Note: This point was reconsidered in the plenary session on December 7, and the date of subjective test was deferred 8 weeks as recorded in the main body of this meeting report.

3.3 Work method for shifting from competition to collaboration

3.3.1 Collaboration phase work

It was a consensus to define "Test Model" and refine it in the collaboration phase according to the previous practices in MPEG and CCITT.

3.3.2 Objectives of the subjective test

The meeting confirmed that the objectives are;

- to quantify the picture quality of candidate algorithms, and
- to find promising schemes for further collaborative elaboration.

3.3.3 Weighting for requirements

We are going to develop a video coding standard which meets several requirements including picture quality and functionalities. Picture quality is expected to be measurable with the subjective test method. The problem is how to evaluate the functionality as well as the mixture of picture quality and functionality.

It was a general opinion of the meeting that the scoring to weight each performance/capability as was practiced for the MPEG Phase-1 need not be repeated. The meeting agreed that for the competition purpose we will initially concentrate on the picture quality.

If we succeed to narrow down the number of candidates as intended from the comparison of picture quality, then we may apply such criteria as compatibility, complexity toward defining TM1. Appropriate criteria for this purpose are to be studied further.

3.4 Items to be discussed in other subgroups

Requirement subgroup awaits input on the following items from other subgroups;

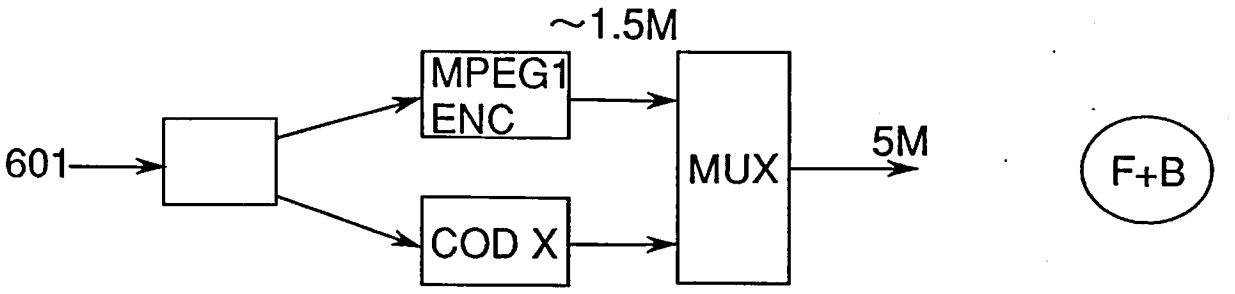
- how to evaluate the complexity of candidate algorithms --- VLSI
- whether bit stream file and executable code are required for submission of candidate algorithms --- VIDEO

4. Major task at the next meeting

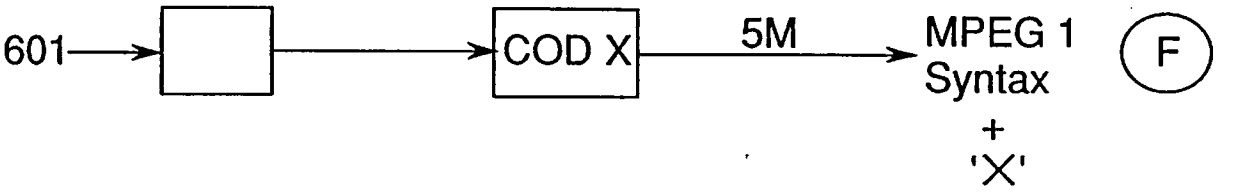
To complete PPD.

END

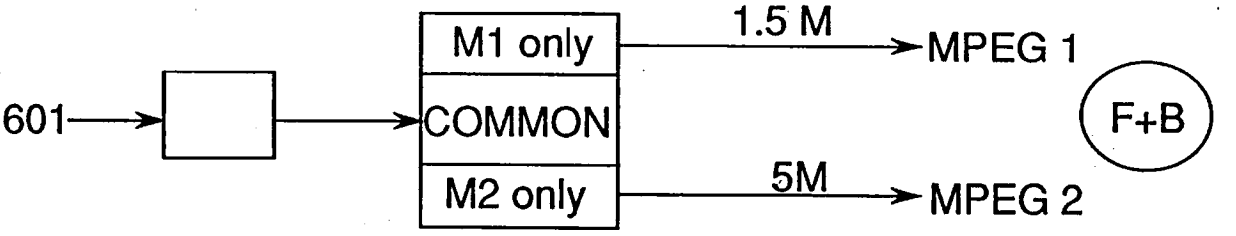
a) Multiplexed multiple bit stream approach



b) MPEG1 superset approach



c) Switchable equipment approach



Note 1: Bitrates are for example.
Note 2: Definition of forward- and backward compatibility is as follows.

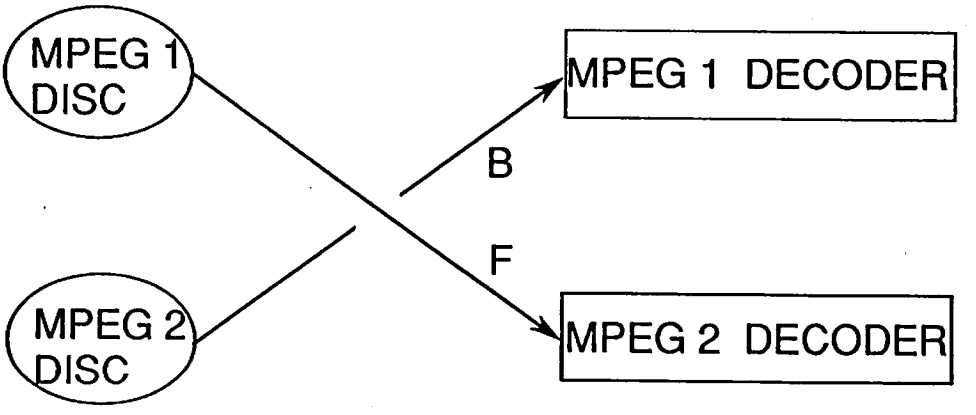


Figure Examples of approach to "compatibility"

Annex 2 to Doc. AVC-23

Source : D. Westerkamp (TCE)
Title : Report of the discussion on test procedures in TEST subgroup
Purpose: Report

1. 27 organizations on provisional list of entries.

2. Test sequences

Test sequences limited to ones with 625 and 525 versions -- short list of 8 sequences.

Additional sequences will be used for further verification during the cooperative phase.

Tape of test sequences has been compiled by JVC/TCE:

5 second sequences from

- Flower garden
- Susie
- Popple
- Table Tennis
- Mobile & Calendar
- Tempete (with/without noise)
- Edit

2 seconds of

- Football (50 Hz version will be produced by LER)

Selection from the short list will be made at San Jose.

Test sequences will be supplied on D1 or Exabyte. Those requiring the test sequences should contact their area coordinator:

North America: Hughes - D. Mead
(free on Exabyte, small charge for D1)

Asia : JVC - T. Hidaka

Europe : RAI - G. Dimino
(D1 only, send tape)
Dutch PTT - A. Koster
(Exabyte)

3. Test methodology

Formal subjective test will be carried out only for normal play.

CCIR Rec. 500 test method will be followed.

Pre- and post-processing will be allowed only as a complementary pair of forward and inverse operations - no "polishing" of output to hide artifacts.

Pre- and post-processing will be included in any complexity calculations.

4. Test conditions

Test at 4 Mbit/s and 9 Mbit/s - different parameter values but not fundamental change of algorithm allowed.

Delay for random access less than about 2/5 second (10 frames at 25 Hz, 12 frames at 29.97 Hz). Fast forward/reverse must be possible - give demonstrations. State encode/decode delay.

5. Optional items

Any claims for additional features should be supported by demonstrations:

If MPEG-1 compatibility is claimed, a demonstration of an MPEG-1 decoder working from the MPEG-2 bitstream should be given.

If applicability to interpersonal communications is claimed, a demonstration of the algorithm working with encode-decode delay of not more than 150 ms should be given.

END