AVC-173

Documents
CCIR Study Groups
Period 1990-1994

Document CMTT-2/TEMP/10-E only
11 November 1991
Original: English

MPEG91/329

Task Group CMTT-2

SPECIAL RAPPORTEUR OF TG CMTT-2 FOR SECONDARY DISTRIBUTION OF DIGITAL TV AND HDTV

PRELIMINARY FUNCTIONAL REQUIREMENTS FOR SECONDARY DISTRIBUTION OF TV AND HDTV SIGNALS

1. Introduction

CCIR Task Group CMTT/2 is charged in Question 25/CMTT with the development of Recommendations concerning the Secondary Distribution of Conventional (CTV), Enhanced (EDTV) and High Definition (HDTV) television to consumers.

The preliminary functional requirements for the equipment for secondary distribution are described in this document.

2. Area of Current Activity

CCIR Task Group CMTT/2 is developing Recommendations for the coding of television picture and sound signals (plus any ancillary data) for delivery, using digital transmission, to the consumers.

The objectives may be summarised as follows:

- Digital secondary distribution may use a variety of delivery media. Current work in TG CMTT/2 is concentrated on delivery over digital networks.

- A variety of CTV, EDTV and HDTV may be delivered: see Section 3 below for details.

- The quality of the image reconstructed in the receiver must be visually near-unimpaired by the delivery mechanism.

- Secondary transmission coding/decoding must operate in real-time, with minimum delay and any optimisation related to picture content, network performance, or the like, must be automatic and without outside intervention. Quality objectives are detailed in Section 4 below.

- In its work, CMTT/2, in conjunction with WP 11B and WP 11E, will make final judgements of quality using hardware implementations operating in real-time and under the condi-

tions of CCIR Rec. 500, Reports 1206, 1211 and 1213, suitable for this activity. Preliminary selection may use other means, such as computer simulations.

- It is recognised that the standards for consumer equipment should have a long life-time, perhaps 20-30 years and hence the coding algorithms selected should be capable of further development and enhancement through compatible developments to accommodate future requirements and technological development.

3. Format of signal coded

The system to be devised should be capable to handle different formats. A list of possible formats is included in the following table. However, taken into account the compatibility and the related complexity problems, a limitation in the number of considered formats is necessary.

Ref.	Aspect ratio H:V	Dimension of Image: Horiz. [pels/ active line]	Vert. [lines/ active frame]	Temp. [fields/ second]	Inter-lace factor	Pel-rate [Mpel/ second]
HDTV-P	16:9	1920	1152	50	1:1	110
	16:9	1920	1035	60	1:1	120
	16:9	1920	960	59.94	1:1	110
HDTV-I	16:9	1920	1152	50	2:1	55
	16:9	1920	1035	60	2:1	60
	16:9	1920	960	59.94	2:1	55
EDTV-P	16:9	960	576	50	1:1	28
	16:9	960	480	59.94	1:1	28
EDTV-I	16:9	960	576	50	2:1	13.8
	16:9	960	480	59.94	2:1	13.8
CTV (Rec. 601)	4:3	720	576	50	2:1	10.4
	4:3	720	486	59.94	2:1	10.4

Note: Pel indicates the luminance information and the related chrominance information.

It is believed that coding algorithms producing approximately 1 bit/pel (where pel includes all bits representing the RGB or Y, C_R, C_B, signals) will achieve the quality levels described in Section 4.

4. Quality Objectives

The user of secondary distribution sources will require high levels of quality and low impairment levels, taking account of the viewing distance (4-6H for CTV/EDTV or 3H for HDTV), the entertainment value of the services and the lengthy viewing times. The following criteria concerning quality are considered desirable in the choice of the coding algorithm:

- For the majority of picture sequences representative of typical programmes, impairments shall be usually imperceptible (i.e. an impairment rating better than CCIR Grade 4.5 is to be achieved).

- For a small number of picture sequences that are very critical, there is a probability that some impairment may be visible, dependent on content.

- No picture sequence shall create a catastrophic failure of the coding algorithm, but a gradual, graceful and progressive raising of the level of the impairments may be visible as extremely critical sequences are introduced, that are above the activity level of typical, critical programme sequences.

5. Channel Constrains

While the channels used for the secondary distribution of television are generally near error-free, unusual circumstances may introduce significant levels of errors. In that situation, it is believed desirable that:

- in the presence of uncorrectable errors, the decoder should fail gracefully (progressive and gradual increase of impairment levels with increasing error-rate) and may resort to error mitigation techniques (e.g. error concealment) to maintain acceptable output.

- it should be noted that experience with practical links has shown that the error distribution is essentially bursty and not random.

- a priority must be placed on the maintenance on the recovery of synchronisation during error overloads.

6. Features

Secondary distribution of television programmes places a high priority on achieving and maintaining quality in the normal real-time delivery mode at realistic levels of complexity and cost. Possible compromises to this objective to achieve special features required for other applications, such as reverse play and random frame access, are considered undesirable.

It is required to provide a limited response time between selecting a channel and having the service fully operating. This response time is not currently specified, but a range from 0.3 to 1 second is presently considered.

7. Compatibility

Compatibility is the main issue that lead CMTT to consider jointly CTV and HDTV signals. An extensive definition of what is meant by compatibility is given in doc. CMTT-2/18.

It is clear that, in the future, programmes will have to be displayed on receivers of various resolutions. This requires a certain amount of compatibility between HDTV and CTV digitally encoded signals. There are several ways to solve this problem technically as mentioned in doc. CMTT-2/18.

It is stressed that digital distribution of television is a virgin field and that under these conditions backward compatibility has no meaning for digital TV distribution. Although for other video applications it may be desirable to have a video coding standard for CCIR-601 signals that is compatible with the H.261 or MPEG1 standards, such compatibility is not considered as a requirement for TV and HDTV distribution.

What is far more important for TV and HDTV distribution is compatibility between CTV and HDTV (and EDTV) digital distribution from the beginning of TV distribution coding algorithm studies, in such a way that further extensions to HDTV may be achieved in a consistent and compatible way.

8. Commonality

CMTT/2 believes that there will be significant advantages for viewers, telecommunications carriers, broadcasters and manufacturers, if the coding algorithms adopted for the delivery of television programmes have worthwhile degrees of commonality across delivery and recording media and across various levels of TV system performance (CTV, EDTV, HDTV). This can lead to economies of scale in devices and components and simplification of equipment, particularly at the consumer level.