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Title: Approaches to Standards Conversion

INTRODUCTION

At the Tokyo meeting it was agreed that the burden of overcoming the
differences between television standards during inter-regional connections
should be shared between 525/60* and 625/50* codecs. This document examines
six general strategies by which this could be achieved.

The concept of sharing the burden is taken to imply that a codec at one end of
a link does not carry out all the standards conversion for both directions of
transmission, ie the concept of a codec which accepts and transmits both
525/60 and 625/50 standards and puts no special requirement for inter-regional
use on codecs at the far end of the transmission link can be discounted as an
arrangement for second generation codecs.

STRATEGIES FOR 'SHARING THE BURDEN'

1. Each codec always transmits at its own TV standard. The receiver then
decodes either standard.

2. Each codec can transmit using either TV standard as an input, but only
decodes its own standard.

3. Both 625/50 and 525/60 codecs include a pre-processing system that
produces a common intermediate video format which is used for processing and
coding purposes. This format is used on both inter and intra-regional
connections.

4. The common intermediate format is adopted, but an option provided where it
need not be used for intra-regional connections by local agreement.

5. The common intermediate format would be regarded as the option and used
only for inter-regional connections.

6. The input signal (either 625/50 or 525/60) is converted, prior to source
coding, into a dynamically variable format, where the spatio-temporal
resolution is one of a set of formats which can be easily derived from the
625/50 and 525/60 standards.

DISCUSSION

Strategy 1

The receiver would have to be able to decode a digital stream from both forms
of codec. It could either decode to the originating TV standard or use
standards conversion to form the local standard.

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*525 lines per frame, 2:1 interlace, 60 fields/sec
 625 lines per frame, 2:1 interlace, 50 fields/sec

Decoding to the originating TV standard could involve less hardware than carrying out standards conversion but would imply the use of additional or multi-standard display equipment. In Europe at least, multi-standard monitors are not a great deal more expensive than single standard. There could however be problems if the user wished to record the incoming pictures, as multi-standard video recorders (on the record side) are not readily available at present, but such devices could become more common in the future if such a strategy were developed. Also if there was a requirement for onward analogue transmission, it is known that in some countries it is not possible to transmit out of region TV standards on national transmission links. Local technical support for television equipment not operating to the indigenous standard could also be problematic.

Strategy 2

Each encoder can transmit to either standard. Like strategy 1, two video interface arrangements might be envisaged, local plus standards conversion or distant.   .

Use of the distant standard is likely to introduce technical as well as equipment availability problems (no source of multi-standard cameras is known). The use of say: 60Hz cameras in a 50Hz power and lighting environment will cause low frequency interference to the video signal unless special precautions are taken.

Both strategies 1 and 2 do however provide a means where a customer or a manufacturer could opt for intra-regional codecs only, with the inter-regional facility being an additional extra. The carrier on the other hand is not likely to find this an attractive proposition as the extra cost for the inter-regional facility could be a negative factor in the customer's use of long distance international services. In addition a master/slave protocol is likely to be required.

Strategy 3

Here both 625/50 and 525/60 codecs include a pre and post-processor which converts to and from a common intermediate pel matrix which is used for further processing and coding. There are many formats that could be chosen and the aim would be to select one that put an equal hardware burden on both equipments and that did not imply significant impairment to intra-regional connections.

One example is a format of 525 non-interlaced lines per field and 25 fields per second. In this case 525/60 codecs would always carry out a field rate conversion and 625/50 codecs a line rate conversion. Both codecs would also need to carry out a minor temporal correction for conversion between interlaced and non-interlaced field format. A second example is a format where both codecs carry out some temporal and spatial conversion, eg 512 lines/field and 20 fields per second.

The principle of a common intermediate coding format has a number of advantages:

    i.   The concept of an inter-regional option would no longer apply - all codecs would be to a common world standard and interconnectable.

ii. Much of the hardware in 625/50 and 525/60 codecs will be identical meaning that it will be simple for manufacturers to produce codecs for world markets. Greater volumes of the same will also be an incentive for investment in LSI.

iii. The practical problems of reaching agreement in the specialists group to details of the codec specification will be eased as there will be only one basic image matrix: no need for different addressing systems etc.

A possible disadvantage is that intra-regional connections may suffer from some unnecessary vertical or temporal impairment caused by the pre and post-processing to the common coding format. However current simulation work suggests that such impairment is extremely small and likely to be negligible compared with the impairments introduced by source coding or other pre and post-processing.

Strategy 4

The common coding format would still be adopted but an option provided where it need not be used for intra-regional connections. This would overcome any disadvantages with conversion related impairments, but care would need to be taken in defining the format if the hardware advantages of strategy 3 were not to be lost.

Strategy 5

Here the common format would be regarded as the option, the norm being intra-regional use with local formats. Much the same arguments with regard to hardware apply as in 4, but also the factors in providing an intra-regional codec only as in 1 and 2 are also applicable.

Strategy 6

The set of common formats would include both 525/60 and 625/50 standards and others of lower spatial and temporal definition. Depending on the amount of movement, the coder would choose at any time a particular element of the set. The decoder would perform the inverse filtering according to the output standard. The filtering operation would be performed by means of pre and post filters having variable coefficients. A particular case of this strategy is strategy 3 which corresponds to the case where the number of formats of the common set is reduced to one.

CONCLUSIONS

Of all the above approaches, a strategy which offers common "world" coding formats is desirable.

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