Source : France, Sweden

Title : Forced updating

1 - INTRODUCTION

Forced updating can be used for the following purposes :

- To ensure that the receiver will reconstruct a complete picture quickly whenever it is switched on, or after a switch in multipoint.

- To achieve the maximum possible resolution on the background parts which may have been encoded with impairments.

- To limit the accumulation of transmission errors and to cancel them, even if the basic compression method is able to provide basic error tolerance.

- To avoid buffer underflow when no movement is present.

2 - BASIC REQUIREMENTS

The strategy to implement a forced update method should respect the following requirements :

(i) Rapidity : the time to update a whole picture should not be too long (some seconds).

(ii) Quality : the maximum resolution should be obtained to avoid a recoding of the updated part.

(iii) Self-consistence : the coding method should not rely on previously transmitted information to avoid error

(iv) Compatibility with the coding scheme : no extra signalling should be required to warn the decoder,

.../...

3 - COMPRESSION METHOD

At the intermediate format (288 x 360 x 1.5) using 8 bit PCM would require 1.244 Mbit and would need 4 seconds at 320 kbit/s (ie full rate). At 10 % of the transmission rate (ie 32 kbit/s), 40 seconds would be necessary. Compression is then needed.

Requirements (iii) and (iv) lead to the use of intraframe coding, as a normal mode of the encoder. Requirement (ii) leads to disconnect the quality with which a block is encoded, from the buffer state. This means that even when the buffer is full, it should remain possible to encode a block with a good quality, ie with enough bits and with fine quantisers. This point is particularly important since it **influences the encoder strategy as well as the video multiplex structure.**

As to requirement (i), some computation has to be made : let us consider an example: if 256 bits may be considered sufficient to encode a 16 x 16 block intraframe with a good quality, that will make 384 bits per block including colour. At 10 Hz, with one block being forced-updated every 2 luminance line-of-blocks (LLB), and with 16 x 16 blocks (ie 18 LLB per field), we have 10 x ½ x 18 x 384 = 35 kbit/s, which may be considered as acceptable, as a refresh rate of 11 %. As a line contains 22 blocks, it would take 44 fields to update the whole picture, ie 4.4 seconds.

To improve this refresh time, it would be necessary, although not compulsory by compatibility reasons, to implement a refreshment strategy, taking into account the fact that the block is moving, or not moving, is background or not background, has been lately refreshed or not, etc...

At full rate, ie for a fast update (eg in multipoint or for full picture recovery), a supplementary factor of 9 may be assumed (320/35) and the refresh time would be ½ second (5 frames at 10 Hz). This time could be improved by using progressive quality improvement.

Two other points are to be considered. First, the error resilience of the updating information; but it seems difficult to introduce some kind of error protection, which would infringe the compatibility with the normal coding scheme. Second, the updating pattern: random or structured? This has to be determined by subjective tests either by simulation or by trying different schemes on the hardware testbed. The best solution might be to give freedom to each country to implement its own technique and then compare the results...

4 - CONCLUSION

From the considerations above, some conclusions may already be drawn for the future work of the group :

- Forced update is necessary and should not require a special mode or extra signalling.

- Block encoding should be made using intraframe coding with a sufficient quality.

- In the coding strategy of the encoder, the potential quality and its corresponding coding parameters (ie number of bits per block, quantiser stepsize, scanning patterns) should not depend on the buffer state but be used and signalled independently.

For the strategy of implementation, compatibility is not concerned but different update patterns should be tried and advantage could be taken from the motion information.