39

CCITT SGXV
Working Party XV/1
Specialist Group on Coding for Visual Telephony

DOC # 435
December 1988

Source: NORWAY, FRANCE, UK, NETHERLANDS, SWEDEN, ITALY, FRG
Subject: 1D versus 2D VLC for coefficient coding.

1. Introduction.

The 2D VLC defined in RM6 works well, but for simplified implementation it has been questioned whether 1D VLC could be sufficient. It is tried to estimate what the differance in bitrate will be for the two solutions.

2. Why is 2D VLC superior to 1D VLC?

I: High density of zeroes.

Zero typically occurs with a probability of .6 (from the CLAIRE sequence and counting the occurance of coefficients as well as EOB). The probability of more than .5 indicates that a 2D VLC is slightly more efficient.

The use of adaptive threshold or other techniques will tend to reduce the number of zeroes. This further reduces the difference between the two approaches.

CONCLUSION: The bitsaving using 2D VLC instead of 1D VLC due to high zero density may be kept below 1 kb/s for 64 kb/s coding.

II: The code after zero cannot be EOB.

The main differance in performance between 1D and 2D VLC is the following:

In the 1D case we have two situations:

- The previous coefficient was not zero. In that case the present code may take any value including EOB.
- The previous value vas zero. In that case the codeword cannot be EOB. We can therefore use a VLC table with less bits for many of the values to be coded.

By using two 1D VLC tables instead of one 1D VLC table, one can typically save 3-4 kb/s for 64 kb/s coding (example with CLAIRE).

CONCLUSION: From a performance point of view, one obtains practically the same result using 2D VLC and two 1D VLCs depending on the previous coefficient. Possible candidates for two 1D VLCs are shown in Figure 1a-b. Since we need two 1D VLCs to replace the 2D VLC in RM6, the 1D solution does not seem to give any implementation gain over a 2D VLC solution.

3. Proposal.

It is proposed that the Hardware Specification should anticipate 2D VLC for implementation.

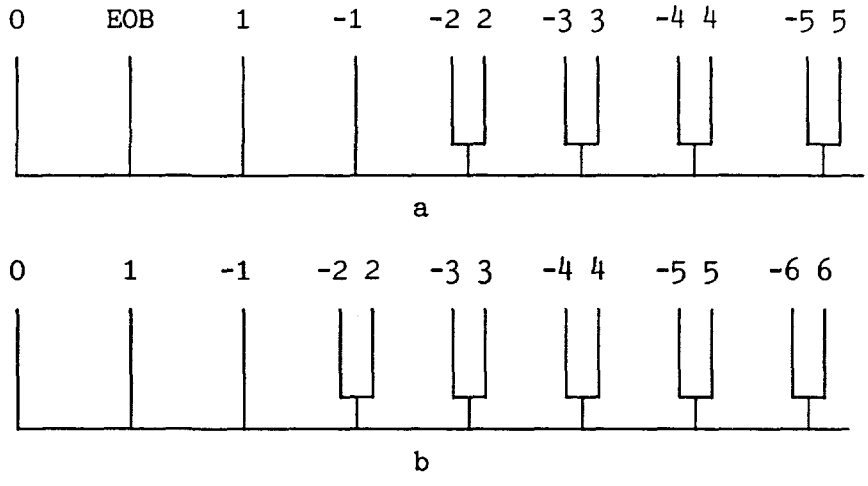

Figure 1. One dimensional VLCs. a) EOB is possible. b) EOB is not possible since the previous value was zero.