

SOURCE: Japan
TITLE: Video Multiplex Scheme
PURPOSE: Proposal

1. Introduction

A video multiplex coding scheme is proposed in this document. Considering hardware and specification simplicities and coding efficiency, the GOB layer has been removed from the scheme described in Doc.#386. A simple macro block scanning order is also proposed.

Section 2 describes the general scheme of proposed video multiplex structure. Section 3 proposes a macro block scanning order. In section 4, considerations of coding efficiency, coding control unit, multipoint application, bits stuffing and others are discussed. Section 5 shows the precise video multiplex coding scheme in the style of Doc.#386.

2. General Scheme

The proposed video multiplex coding scheme mainly consists of two layers, which are picture and macro block layers. Figure 1 shows the general structure of the scheme.

3. Macro Block Scanning Order

A macro block scanning order, which is proposed in this document, is shown in Figure 2. This scanning order is the simplest one for laster-scanned images and applied to any macro-block-based format including QCIF and 4/9CIF. The increase of latency due to a scanning order is minimum with the proposed method.

4. Discussions

4.1 Coding efficiency

From coding efficiency view point, considerable number of bits can be saved by removing GOB headers. The number of saved bits depends on a coding control strategy. If the number of GOBs is 12 in the scheme of Doc. #386 and control unit of stepsize is a frame, the number of saved bits is about 400 bits/frame. This number is considerable when a value of p is small.

4.2 Coding control unit

Using TYPE3 codes described in Doc.#386, quantization characteristics can be changed by any unit (in any macro block). This means that manufacturers can choose a coding control unit according to their own coding control strategies. In the proposed video multiplexing structure, quantization characteristics can be specified in picture headers(QUANT1) and in macro blocks(QUANT2) with the rule, in which macroblock level overwrites the picture header level.

4.3 Multipoint application

In multipoint application, combining 4 QCIF into a FCIF is an attractive way. This application can be achieved by the following steps:

- 1) Decode QCIF video data into macro block elements, which are quantization characteristics index for the macro block, macro block type (including FIX), DC coeff. (when INTRA), MCV, CBP and block data.
- 2) Arrange the macro block elements on FCIF. When frame dropping occurs in a QCIF channel, the corresponding macro blocks on the FCIF are assigned to FIX macro blocks.
- 3) Multiplex the macro block elements again. Here, MBA, DMV and TYPE2 must be recalculated.
- 4) In TYPE1, split screen mode is not allowed in this operation and no MC mode is set as logical AND of 4 QCIF no MC flags.

This operation allows that coded frame synchronization of QCIFs is not maintained. Some more considerations are needed to cope with this type of multipoint applications.

4.4 Stuffing codeword

Bits stuffing can be realized by several methods. A method is inserting zero TCOEFF codes before EOB as the one used in 384 FH. Unfortunately, the methods (#387) using non valid picture and GOB start codes can not be used because the PSC is a 16 bits unique word (GN is not used). Using an indication bit of stuffing in the picture header is a possible method. When FEC is implemented, bits stuffing to prevent transmission underflow can be achieved in FEC frame. This method has an advantage that video multiplexers are not stressed by bits stuffing.

4.5 Other considerations

A video multiplex coding is one of the most complex part in a video coding recommendation. The specification should be simple as far as possible and at the same time allow various implementations and flexibility. TYPE3 codes in Doc.#386 provide a good flexibility of coding control unit and seem to be sufficient specification for the flexibility. This means the original QUANT1 in GOB header is redundant.

When a GOB header has a unique word and the last run of FIX blocks is not coded (RM6 specification), a process for searching the unique word must run on every bits in a decoder. This may affect hardware complexity or stress processors.

A drawback of removing GOB header is decrease of error resilience possibility. In any case, FEC is required for existing transmission lines. A chip for FEC is expected to simplify hardware.

5. Video multiplex coding specification

Figure 2 shows the precise specification. Currently, 'DMV=0' is indicated by DMV. When 'DMV=0' is included in macro block type (TYPE2), the structure is changed. For saving macro block type bits in case of successive INTRA, an INTRA SUCCESSIVE mode can be added. After the macro block type, a VLC indicating 'number of successive intra blocks' is followed. These two items are for further study.

6. Conclusion

A video multiplex coding structure and a macro block scan order have been proposed for the px64kbps FH as well as final recommendation.

END.

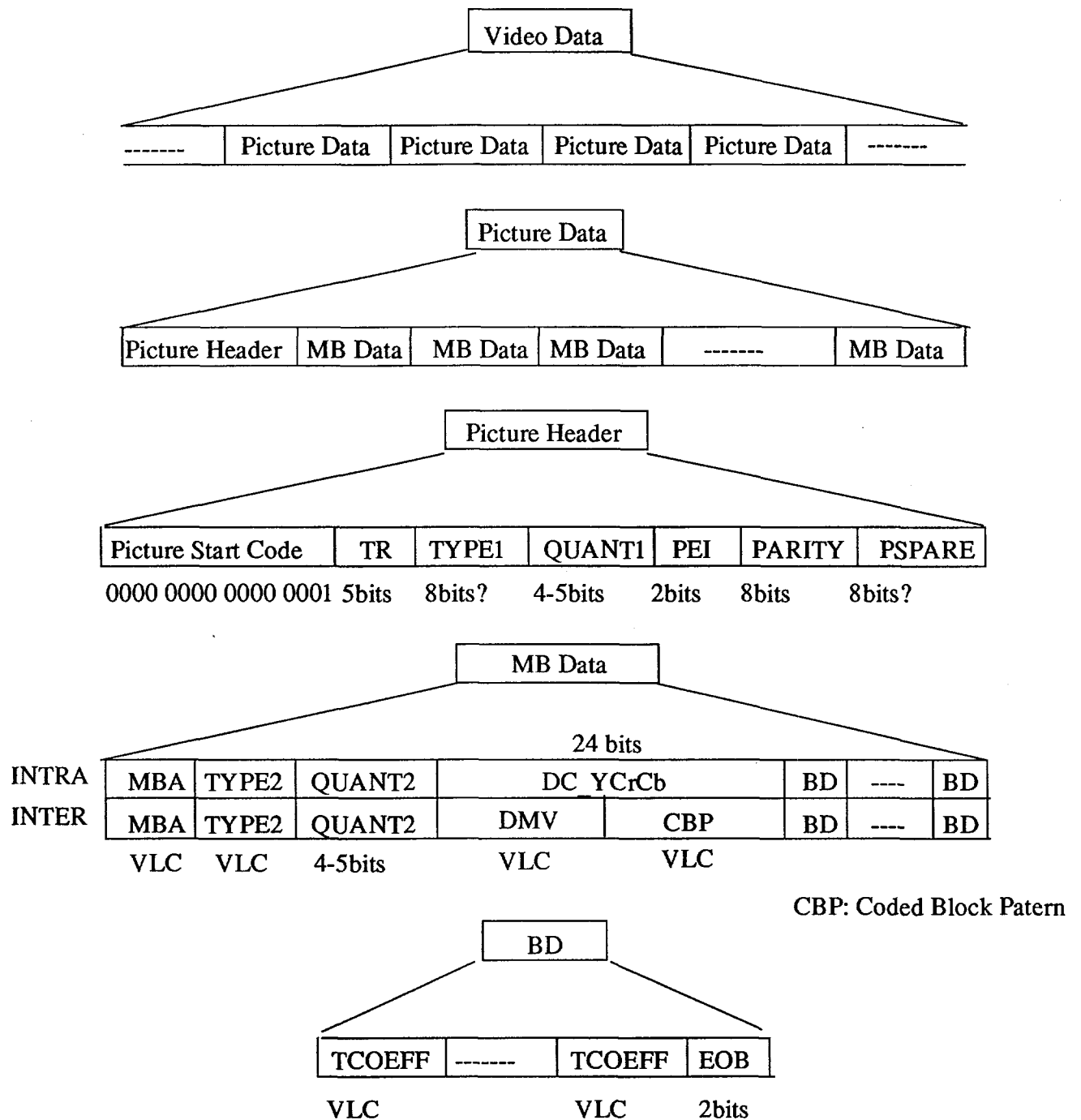


Figure 1. Video Multiplex Coding Scheme

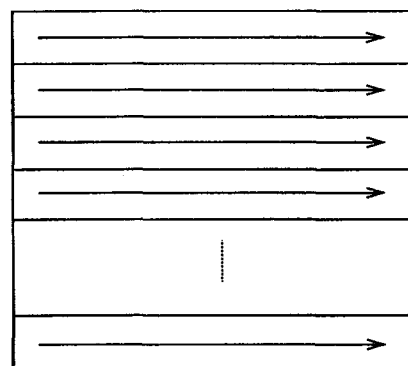


Figure 2. Macro Block Scanning Order

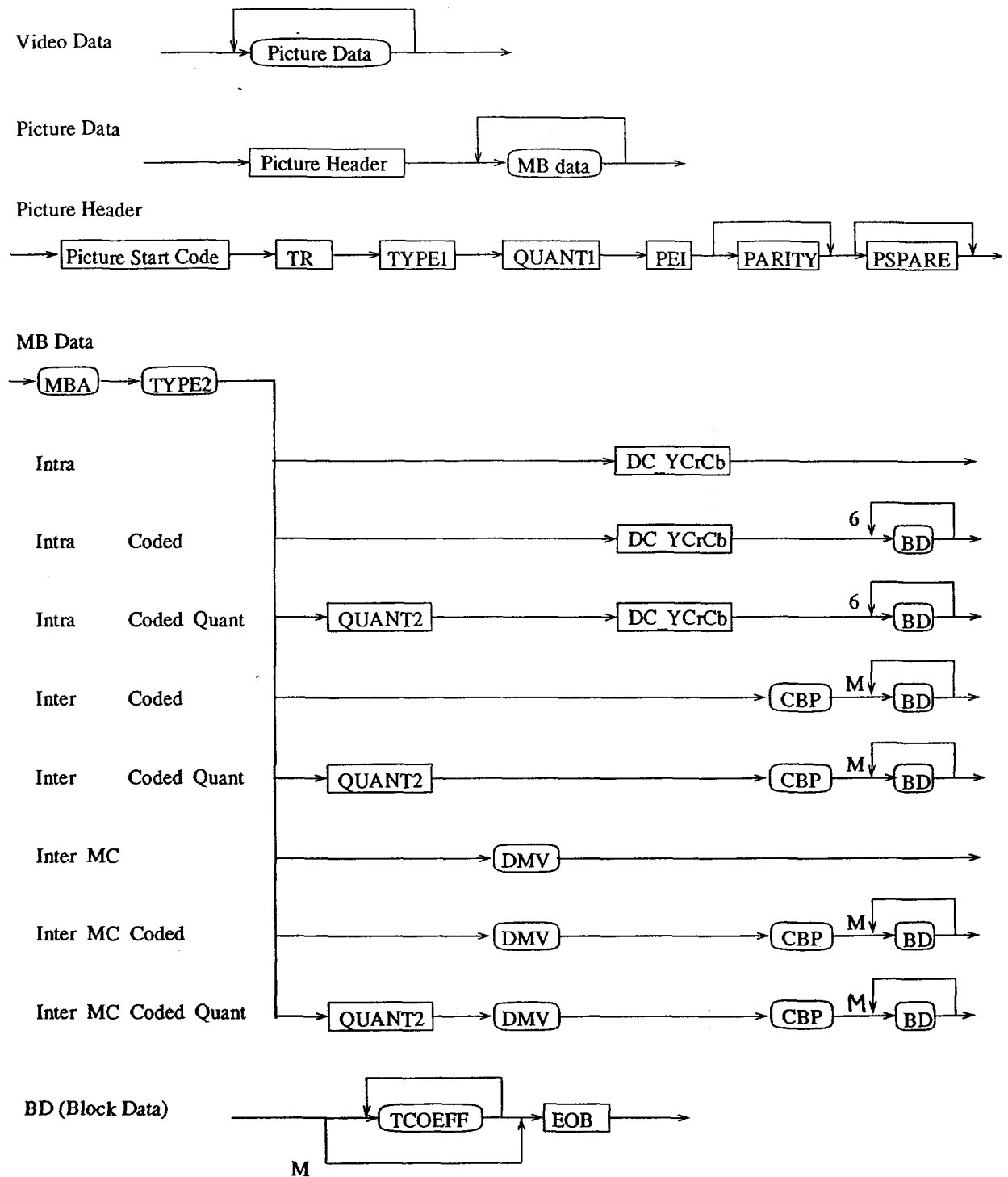


Figure 3. Video Multiplex Rule