CCITT SG XV
Specialists Group on Coding
for Visual Telephony

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Title: **A Structured Video Multiplex Scheme**

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In the past different ways were presented to extend the video multiplex scheme. Mostly TYPE1 bits were used to signal different coding strategies, e.g. filter signalling by motion vector or explicit, the number of classifiers, or differential versus absolute coded motion vectors. Utilization of TYPE1 bits has the following disadvantages:

- Combination of four Quarter CIF pictures from different sources to a single Full CIF picture becomes impossible.
- To find the right way to decode the block data some bits from the picture header (TYPE1) must be combined with bits from the group of blocks header (TYPE2) to get the correct TYPE3 table. This makes the video multiplexer and video demultiplexer more complex.
- Signalling of parts of block types on different coding levels might cause inconsistency, e. g. in the existing flexible hardware: TYPE2= '000' (Not MC, No Filter) and TYPE3='5c' (MC,Filter); is not allowed but can occur due to transmission errors.

To avoid these drawbacks the following clarifications are proposed:

- TYPE1 is used only for service indications (e. g. split screen, document camera) or signalling on the application level (e. g. freeze frame release).

- TYPE2 is the highest level for coding informations. In this layer the picture area belonging to a TYPE3 codeword and the way of addressing is defined. TYPE2 selects one of n possible multiplex schemes linked to a TYPE3 table and a specific way of block addressing, but never should denote particularities of the macro blocks or blocks. In the current situation only two TYPE2 items are specified - all blocks are coded intra and macro block type is signalled by TYPE3.
  In future more advanced coding schemes can be included on a TYPE2 level .The only requirements to meet are the size of a GOB and the maximum frame rate. To enable intercommunication between codecs of different kinds fallback modes must be provided and an initialisation should take place.

- TYPE3 denotes all parts transmitted for the macro block and the way of calculating the necessary data.For each TYPE2 item an own TYPE3 table is possible. TYPE3 is present when TYPE2 has not entirely specified the multiplex.

TYPE4 is an extension of the current multiplex and denotes particularities of a single block within a macro block. Its presence can be signalled by a TYPE3 escape code. By using TYPE4 for coding on a block by block basis within a macro block, it is possible to optimize the coding efficiency for higher bitrates without sacrifying the performance at lower bitrates. For simplification we assume that only one scanning class is used, and that the filter in the loop is signalled by the motion vector.

In the current situation only two TYPE2 items are defined:
With MC the loop filter is always on.

TYPE2	TYPE3	Short Characterization
A	-	All blocks are coded intra.
B	1	Intra
	1Q	New Quant, Intra
	2	Inter, no MC, Coded
	2Q	New Quant, Inter, no MC, Coded
	3a	Inter, MC, DMV=0, Not Coded
	3b	Inter, MC, DMV≠0, Not Coded
	4a	Inter, MC, DMV=0, Coded
	4aQ	New Quant, Inter, MC, DMV=0, Coded
	4b	Inter, MC, DMV≠0, Coded
	4bQ	New Quant, Inter, MC, DMV≠0, Coded
	Escape	

For a clear representation of the video multiplex scheme the following syntax diagrams can be used.
Fixed lenth codewords are represented by rectangles, variable lenth codewords by rounded rectangles. The sequence of the codewords is drawn from left to right. Special elements are shown in the figure below.

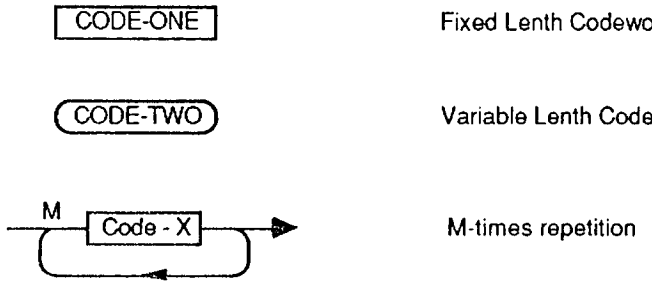
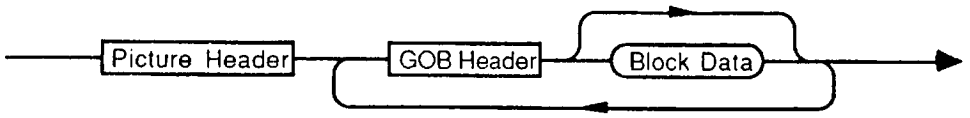
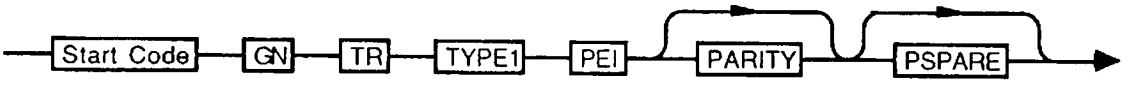


Figure: Basic Elements of the Video Multiplex Syntax Diagrams

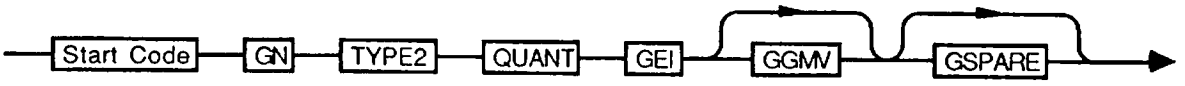
Picture



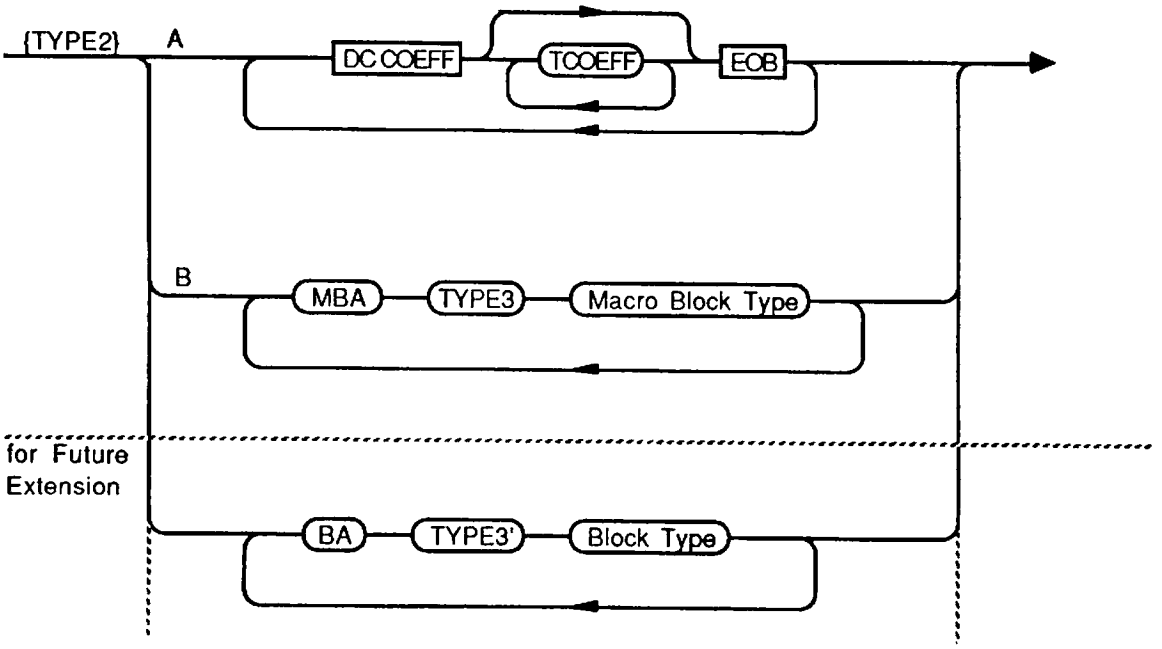
Picture Header



GOB Header



Block Data



Macro Block Types