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TITLE: Scalable Coding Architecture
PURPOSE: Proposal

Abstract

Scalable video coding apart from providing interworking between terminals of different capabilities, allows the introduction of features in the coding algorithm which are useful when transmission is over ATM networks. This document looks at the requirements of scalable video coders intended for use over the B-ISDN and proposes a suitable encoding architecture.

1. Introduction

Scalability is a desirable feature for a video coding system intended for use on the B-ISDN. It allows video sequences of resolution lower than that encoded to be extracted from the bit-stream. It can provide flexibility in displayed spatial and temporal resolutions and resilience to cell loss. In this document we discuss the requirements of a scalable system suitable for the B-ISDN, and we present an architecture that meets these requirements.

2. Scalable Coding Requirements

Scalable coders have a number of unique features which make them useful for the coding of video on ATM networks. These include:

- The ability to provide interworking between terminals of different capabilities.
- The ability to provide cell loss resilience.

The characteristics of ATM networks and some of the applications which might use scalable coding impose certain constraints on the way in which scalability is implemented. The requirements which result include:

- To provide useful terminal interworking the quality of all layers needs to be independently controlled to meet user requirements.
- To make use of the multiple priorities available on the B-ISDN the rate of each layer signal must be independently controlled.
- If a compatible bit-stream is to be generated as a lower layer , the rate of the component will also have to be controlled independently.

3 Scalable Coding Architecture

A scalable encoder architecture which meets the requirements described in section 2, is shown in figure 1 for a two layer system. This architecture incorporates multiple independent loops to give quality control of all layers and allowing rate control to be applied to each layer. Whilst the encoder differs from the current MPEG scalability proposal of Gonzales [1], its pyramid architecture results in identical decoders for the two systems.

4 Impact on Coding Performance

Imposing the additional requirements of independent coding loops and rate control on each layer will result in some loss in coding efficiency. Efficiency can be improved with the introduction of independent motion vectors and coding modes for each layer.

5 Conclusion

This document has discussed scalable video coding and requirements of such a coding system when transmission is via ATM networks. An architecture is proposed in which reconstructed signal

quality on each layer can be independently controlled, as well as providing some tolerance to cell loss, anticipated on the B-ISDN. To increase the coding efficiency independent motion vectors and separate coding modes (inter/intra/motion compensated) are incorporated at each layer. It is proposed that the features discussed in this document be included in the scalability core experiments, and it is noted that the requirements satisified by this architecture are recognised as a high priority by the CCITT experts group.

6 References

[1] Gonzales and E Viscito, *Suggestions for core experiments related to scalability*, ISO/IEC/JTC1/SC3/WG11 MPEG92/043, March 1992.

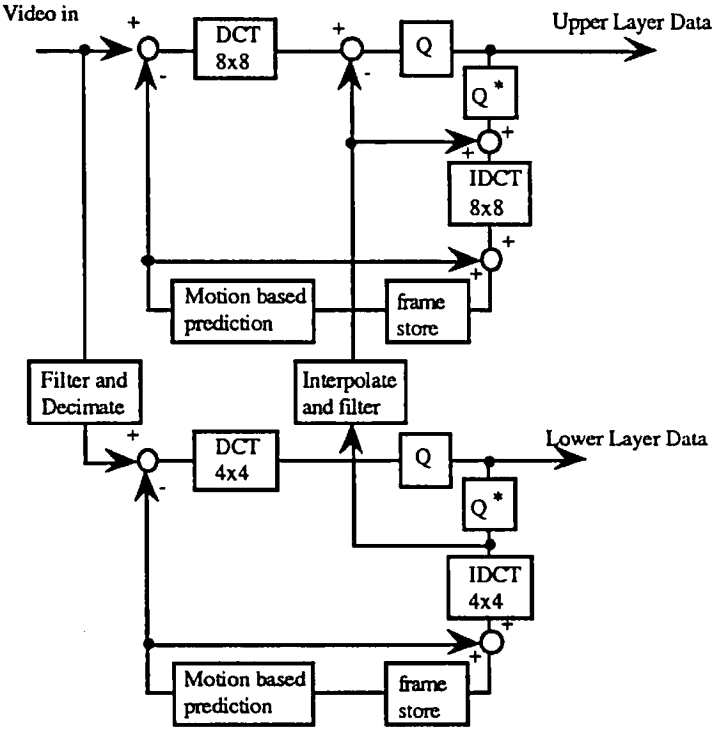

Figure 1 Scalable Encoder Architecture