Overhead-Constrained Rate-Allocation for
Scalable Video Transmission over Networks

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Forward error correction (FEC) based schemes are use widely to address packet loss problem for Internet video. Given total available bandwidth, finding optimal bit allocation is very important in FEC-based video, because the FEC bit rate limits the rate available to compress video. We want to give proper protection to the source, but also prevent unwanted FEC rate expansion. The rate of packet headers is often ignored in allocating bit rate. Actually, this packetization overhead has significant influence on system performance in many cases, as we show in this paper. Decreasing packet size will increase the rate of packet headers, thus reducing the available rate for the source and its FEC codes. On the other hand, smaller packet size allows a larger number of packets, in which case it can be shown the efficiency of FEC codes improves.

We show that packet size should be optimized to balance the effect of packet headers and the efficiency of FEC codes. We develop a probabilistic framework for the solution of rate allocation problem in the presence of packet overhead. We implement our solution on the MPEG-4 Fine Granularity Scalability (FGS) mode. To show the flexibility of our technique, we use an unequal error protection scheme with FGS.

Experimental results (see Fig. 1) show that our overhead-constrained method leads to significant improvements in reconstructed video quality.

![Graph](image)

Figure 1: Results for Coastguard (CIF, 10fps), PSNR (left) and optimal packet size (right)