Error-Resilient Live Video Multicast Using Low-Rate Visual Quality Feedback

David Varodayan and Wai-tian Tan
Hewlett-Packard Laboratories

Low-Rate Visual Quality Feedback

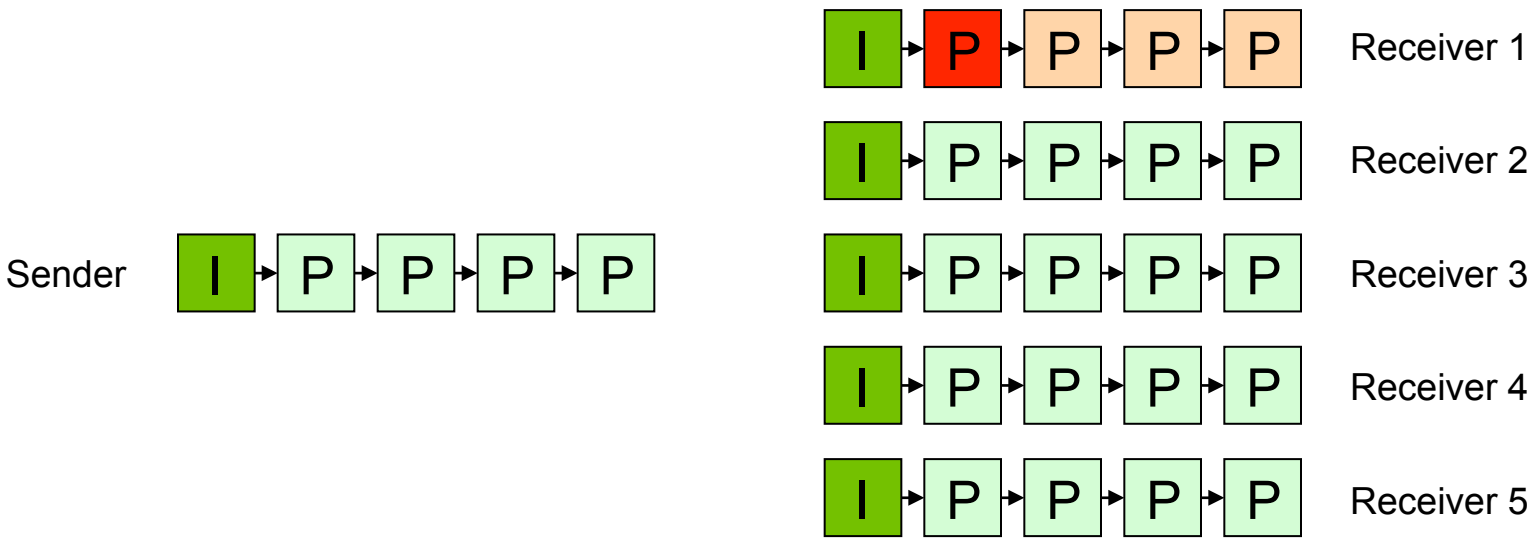
Outline

– Live video multicast and error resilience techniques

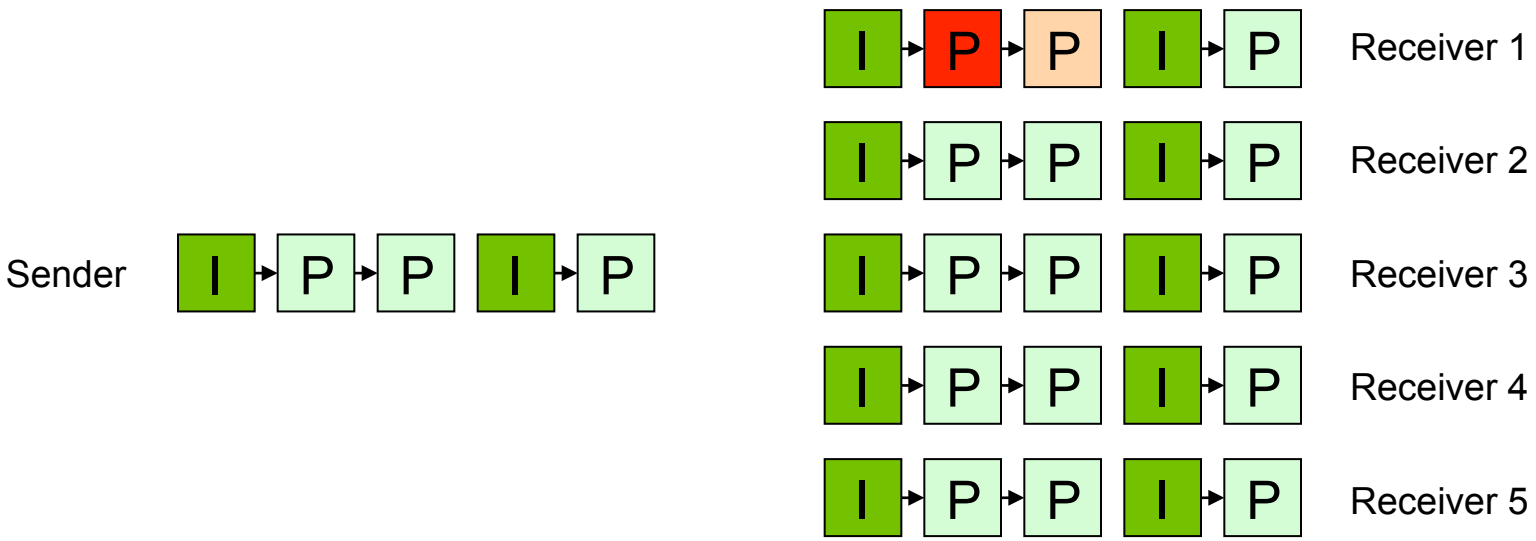
– Visual quality feedback system

– Live video multicast experiment

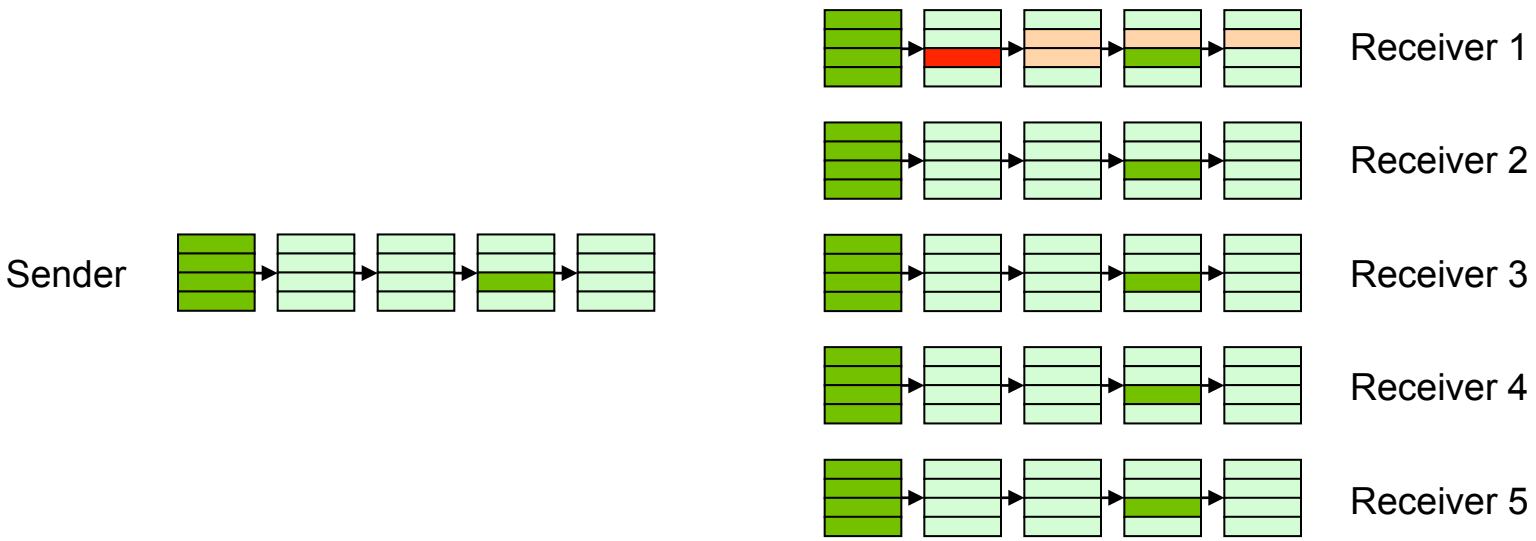
Live Video Multicast



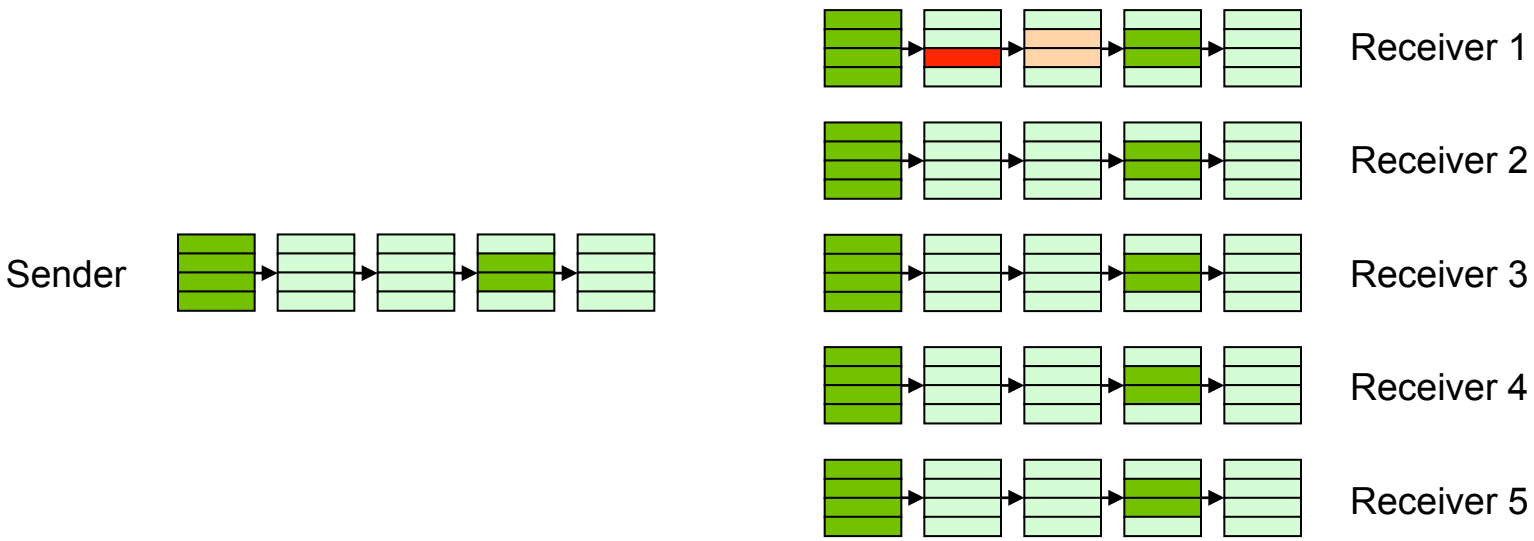
Intra-Frame Error Resilience



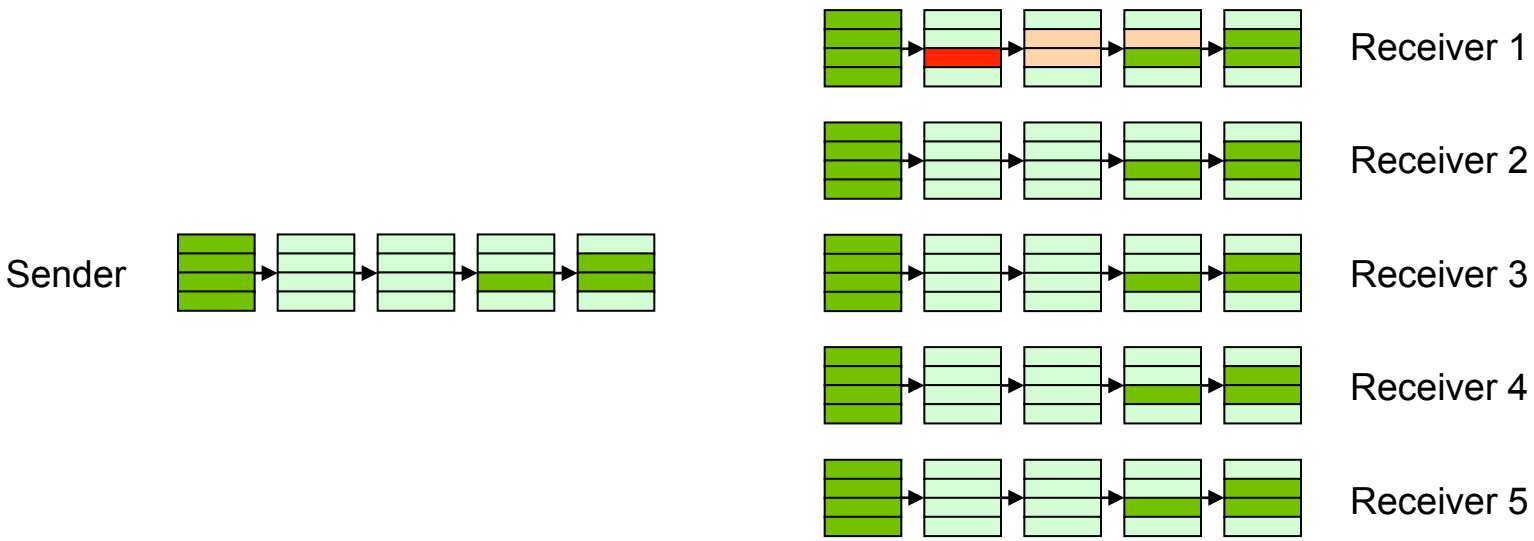
Intra-Slice Error Resilience



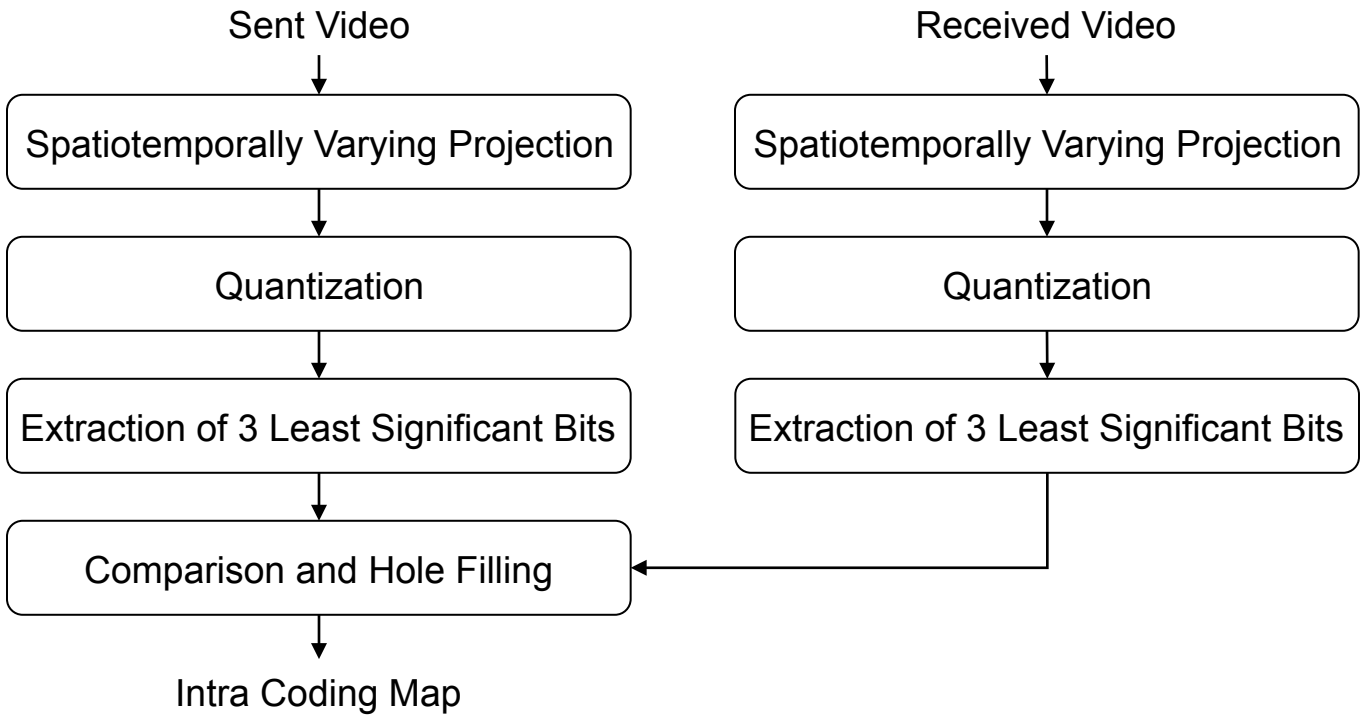
Error Tracking



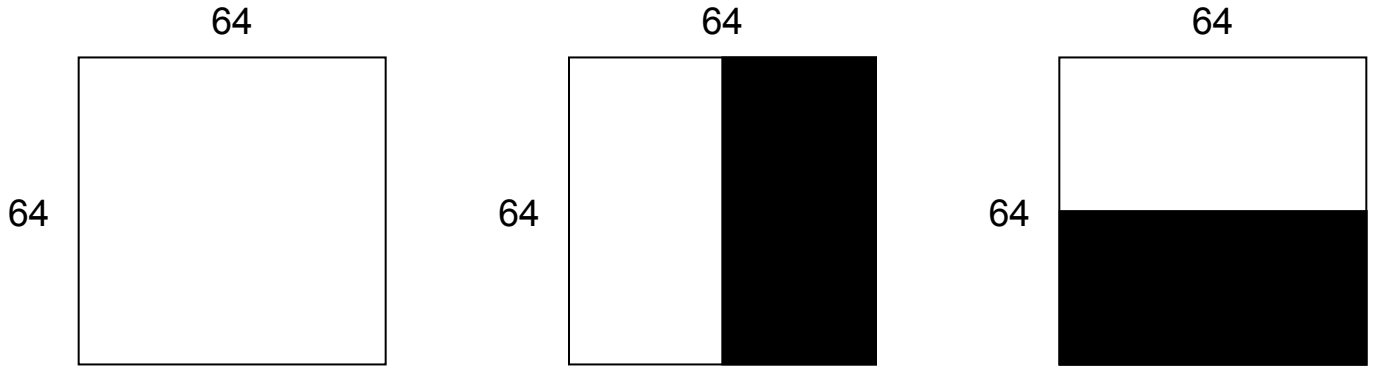
Visual Quality Feedback Error Resilience



Visual Quality Feedback System



Blockwise Projection Units

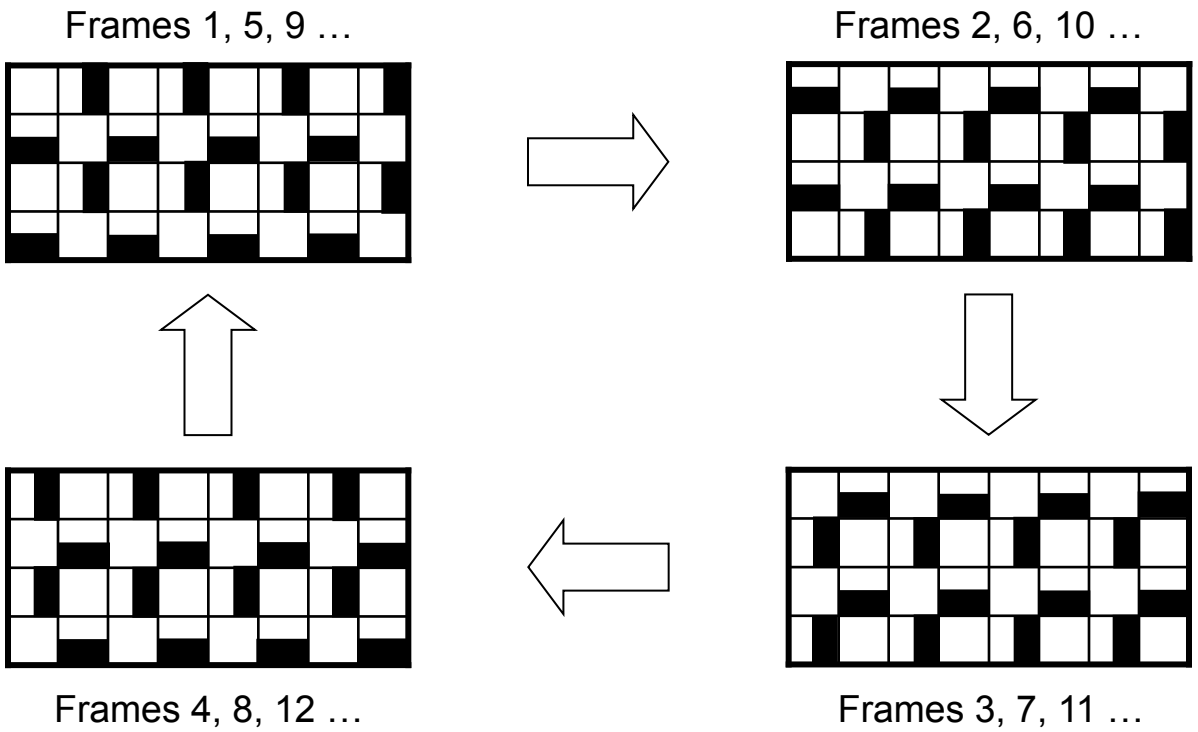


Mean

Horizontal Difference of Means

Vertical Difference of Means

Spatiotemporally Varying Projection



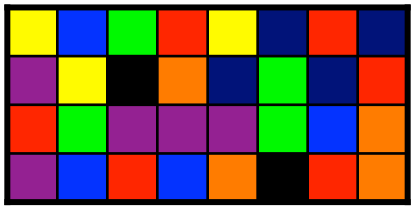
Quantization and Extraction of 3 LSBs

Fine Quantization

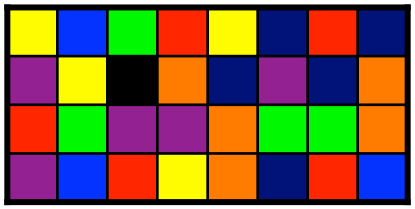
Coarse Quantization

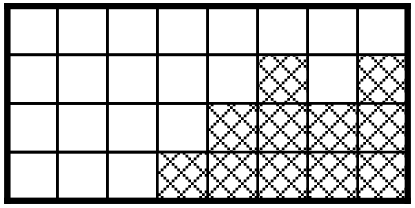
Comparison and Hole Filling

Quantization Indices of Sent Video



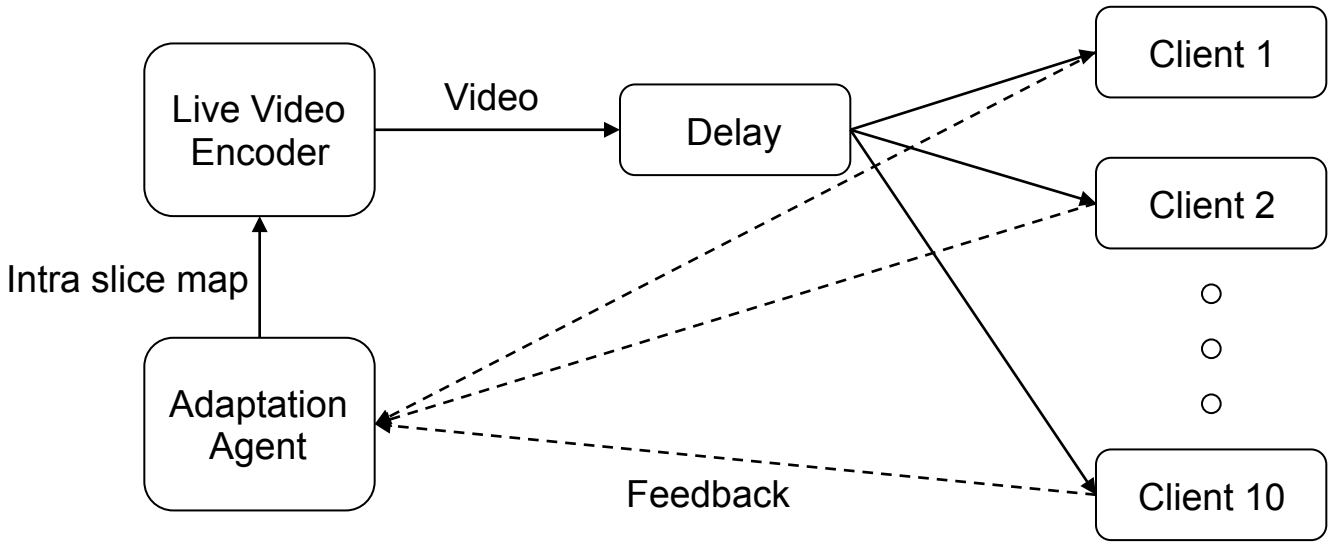
Quantization Indices of Received Video



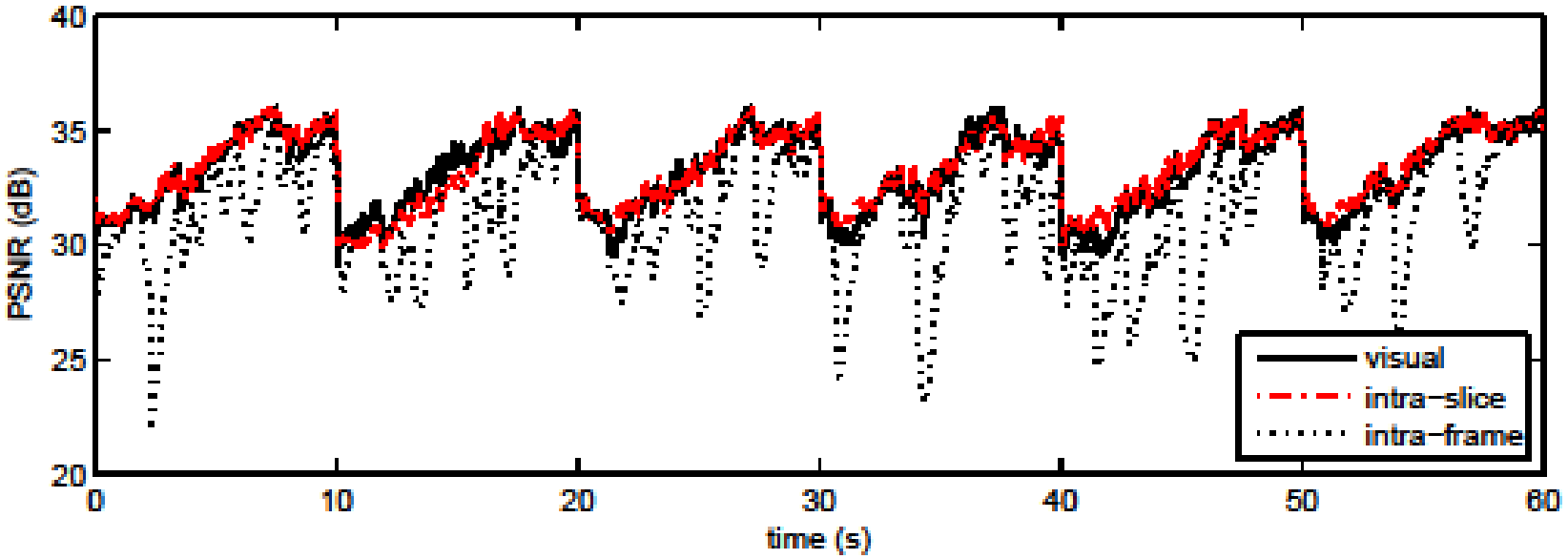


Intra Coding Map

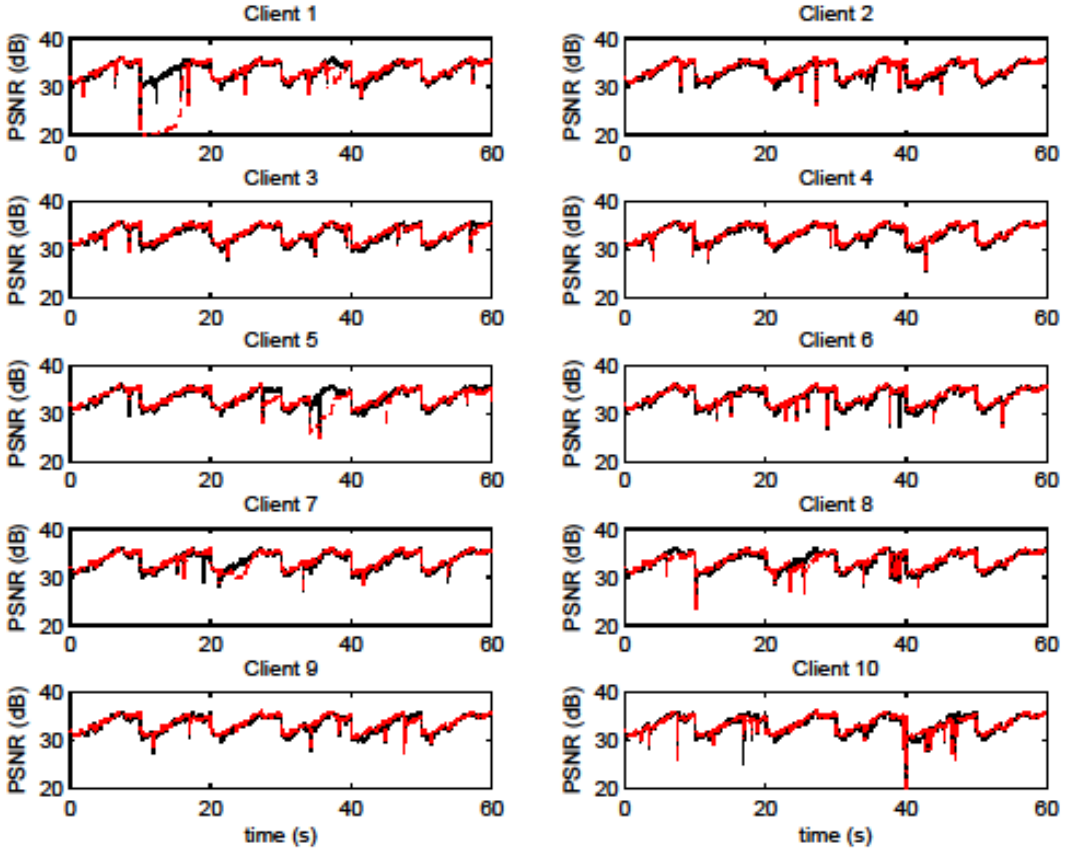
Live Video Multicast Experiment Setup



Average PSNR Traces



Individual PSNR Traces



Conclusions

- Low-rate visual quality feedback is a new error resilience tool
  - Bit rate = 3 bits per 64x64 block ≈ 1% of the encoded video bit rate
  - Extracts 3 least significant bits of spatiotemporally varying projection
  - Enables adaptive intra encoding on a slice or block level
- Live video multicast experiment
  - Visual quality feedback avoids the severe error events of intra-slice coding
  - Performance can be improved by adapting encoding at the block (not slice) level
- The technique may be applied in other settings, e.g. feedforward