Video Coding with Lifted Wavelet Transforms and Frame-Adaptive Motion Compensation

Markus Flierl
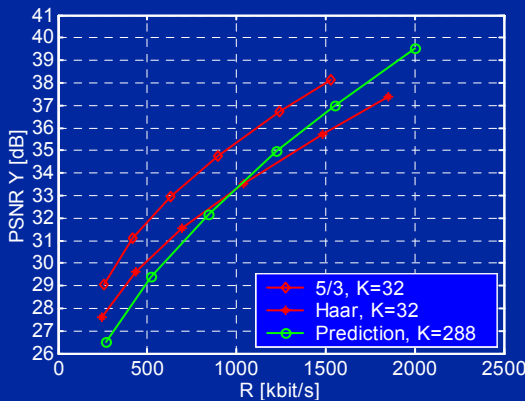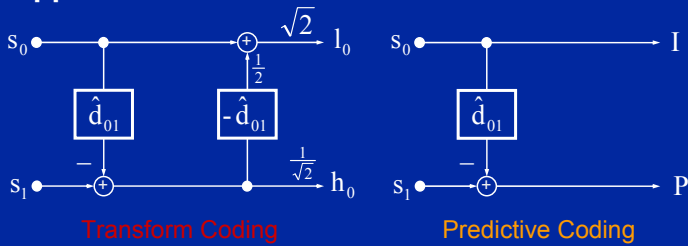
markus.flierl@epfl.ch

1 Introduction

Problem
- Efficient video coding with motion compensation

Approaches

Transform Coding   Predictive Coding

Mobile & Calendar [2]

QCIF, 30 fps

288 pictures

5/3, K=32
Haar, K=32
Prediction, K=288

Advantages of MC Lifted Wavelets
- "Open-Loop" approach
- Obtain multiresolution decomposition

Goal
- Improve efficiency of motion-compensated lifted wavelets

2 Transforms with Frame-Adaptive Motion Compensation

- More flexible transform structure on a block basis
- Up to M "reference pictures" (even pictures in a GOP) can be used for motion compensation

Foreman

QCIF, 30 fps

288 pictures

Haar, K=32

M=1
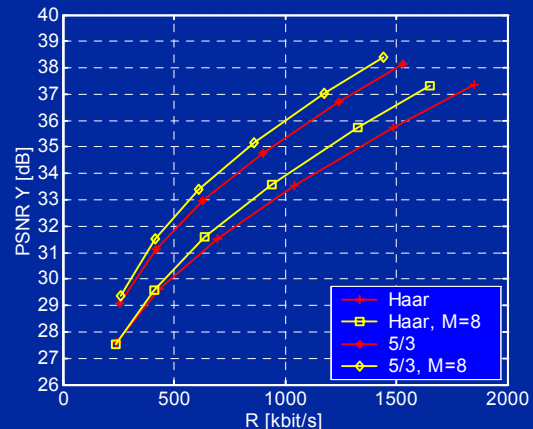M=2
M=4
M=8
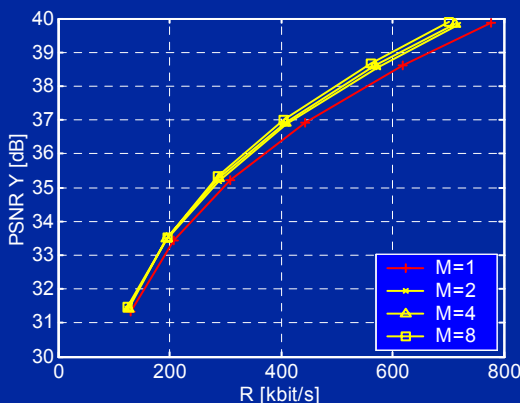
- Example: Frame-adaptive 5/3 wavelet transform
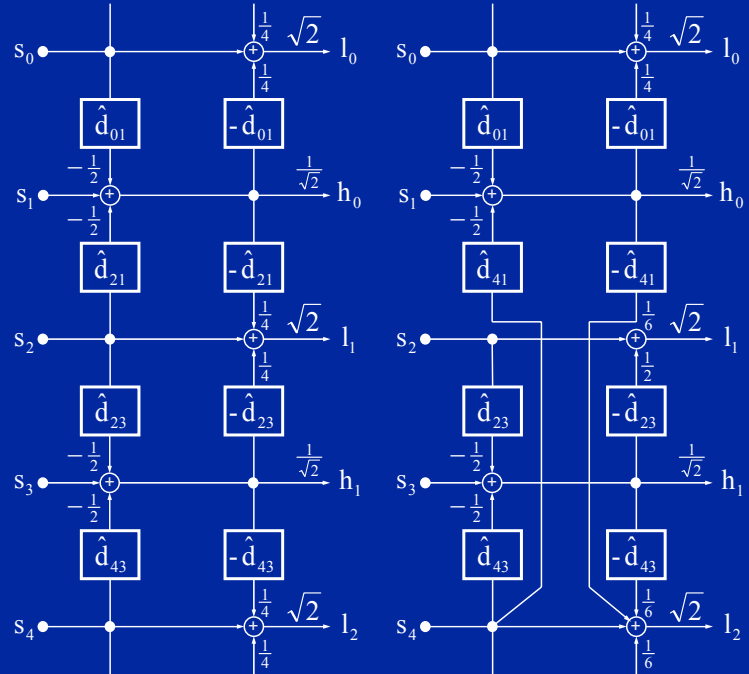
3 Experiments

Coding Scheme
- Dyadic decomposition for groups of K=32 pictures
- Motion compensation with 16x16 blocks & half-pel accuracy
- Intra-frame coding with 8x8 DCT and run-length coding

Results

Mobile & Calendar

QCIF, 30 fps

288 pictures

Haar
Haar, M=8
5/3
5/3, M=8

Acknowledgement

References

[1] A. Secker and D. Taubman, "Motion-compensated highly scalable video compression using an adaptive 3D wavelet transform based on lifting," in Proc. ICIP, pp. 1029-1032, Thessaloniki, Greece, Oct. 2001.

[2] M. Flierl and B. Girod, "Investigation of motion-compensated lifted wavelet transforms," in Proc. PCS, Saint-Malo, France, Apr. 2003.

Signal Processing Institute
Swiss Federal Institute of Technology, Lausanne