Advance Image Processing Lab

Lab. 3 - Image Coding: Predictive methods

Study of DPCM as a predictive coding method.

3.1. In 1-D one-sample prediction, prediction error is found as $\varepsilon_k = a_k - h_1 a_{k-1}$, where $\{a_k\}$ are image samples and k is sample index. Write a program for determination of optimal weight coefficient h_1 for the 1-D one-sample prediction. Using different test images, determine optimal h_1 for individual images and on average for several images. Write a program for computing horizontal, vertical and 2-D prediction errors. Generate corresponding images (use program **conv2.m**). Compare horizontal, vertical and 2-D prediction error histograms and variances for different images (use program **dpcmtest.m**).

3.2 Using program **dpcm1d.m,** investigate 1-D DPCM coding efficiency for different test signals and images and different coding parameters (max for quantization dynamic range and P for P-th low quantization). Observe image degradations and investigate the sensitivity of the coding to the channel noise added to the quantized prediction error.
Investigate 2-D DPCM coding efficiency for different images and different coding parameters (use program **dpcm2d.m**). Observe image degradations and investigate the sensitivity of the coding to the channel noise.

Recommended test signals and images: **lenna, barbara, jerus, text256, brain, ecg1.mat**.

Submit:

1. A program for determination of the optimal prediction weight coefficient and the obtained results
2. Results of optimization of the nonlinearity index P for quantization of the prediction errors.
3. Evaluation of the admissible compression rate for 1-D and 2-D DPCM for different images.
4. Obtained results of comparison of 1-D and 2-D DPCM coding immunity to the channel noise for different number of quantization levels.