

EC3400: Computer Project 3 The Discrete Cosine Transform and Signal Compression

The goal of this computer project is to understand the Discrete Cosine Transform and its capabilities for data compression.

Problem. The file OPERA8.WAV contains one channel (mono) of music digitized with 8 bits/sample, sampled at CD quality. The information on the sampling frequency is given in the file itself.

Q1) load the file into the matlab workspace using `wavread` (or other functions, according to the version of matlab). Subtract the mean to make it zero mean, then save the file as an 8 bit binary file, using the function `write8.m` given. This provides an 8 bit quantization of the values.

Q2) divide the data into blocks of length 4096 samples/block, using the `reshape` command. Then take the DCT within each block. Reshape it back to a vector and plot the signal and its DCT.

Q3) Save this vector as an 8 bit binary file using `write8`. Also using WinZip compress both files and compare the sizes.

Q4) Read back the DCT file using `read8.m` provided. Reconstruct the original signal by reshaping it again into 4096 blocks and take the IDCT of each block. Reshape it back to a vector. Listen to that and make sure that it sounds the same. Before playing it on the sound card, you might want to rescale the signal so that it is all between -1 and +1. Larger values are going to give you distortion.

Q5) Repeat Q1-3 using a zero mean white noise file of the same length. Comment on the results.

Matlab Commands

`dct / idct` to compute the DCT and IDCT

`reshape` to rearrange an array into another array of different dimensions

`write8 (read8)` to store (read) an array as a pure 8bit binary sequence, without headers (provided).

