Lab 2

The coder I used is a **Discrete Cosine Transform:**

The transform matrix **C** is defined as:

$$[C]_{ij} = \begin{cases} \sqrt{\frac{1}{N}} & ;\ i = 0 \\ \\ \sqrt{\frac{2}{N}}\cos\frac{(2j+1)i\pi}{2N} & ;\ i = 1, \ldots, N-1 \end{cases}$$

And implemented in matlab as following:

```
N = blockSize;
   C = zeros(N);
   R_x = zeros(N);
   for i =1:N
       for j = 1:N
           C(i,j) = sqrt(2/N)*cos( (2*(j-1)+1)*(i-1)*pi/(2*N) );
           R_x(i,j) = acf(abs(i-j)+1);
       end
   end
   C(1,:)=1/sqrt(N);
```

The signal **y** is divided by blocksize and quantized uniformly:

```
y_DCT = C*reshape(y, blockSize,[]);

%% Quantisation
%Uniform quantization
yQuant = round(y_DCT/quantStep);
```

For reconstructing the original signal the quantized signal is multiplied by the quantization step and multiplied by the transform matrix and then vectorized:

```
%% Re construct
output_quant = quantStep*yQuant;
output = transpose(C)*output_quant;
```

```
output = reshape(output,[],1);
```

These are the parameter for the coder:

```
%% Parameters
blockSize = 512; %  256-2048 are typical
quantStep = 0.03;
```

The signal is coded using the huffman coding algorithm given for Lab 1:

```
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```

The stats for the coder is as following:

	SNR	R	R + side info
'heyhey'	30.140635	6470320	6473205
'nuit'	31.254074	10272440	10274326

* The rates are unreasonable, but I don't know where I make the mistake.

Where sideinfo is calculated from the following formula:

$$L \cdot \lceil \log L \rceil$$

The coder works well. The song can be heard and understood well