

ECEN4532, DSP Laboratory

Homework

Jeffery Lim
Jeffery.Lim@colorado.edu

The first few lines are loading the audio file and then running the discrete cosine transform.

```
1 %Load the speech file
2 load('lab3speech.mat');
3
4 %Conduct a DCT
5 basis = dct(x);
```

The next steps to sort the result were not followed. I did not find them necessary to follow. Instead, a threshold was determined and tested to find at what threshold the resulting reconstruction would give a .1% rate.

```
1
2 %Look for values below a certain threshold
3 y2 = find(abs(basis) < .0004);
4 pointsTakenOut = size(y2,1)
5
6 %Set those values to 0
7 basis(y2) = zeros(size(y2));
8
9 %Inverse DCT
10 z = idct(basis);
```

The number of coefficients removed due to the threshold is 321. The remaining coefficients are 4578, or 93.45%.

The resulting plots are as following. The image is when the amount of energy is 99.9%.

```
1
2 figure(1);
3 subplot(1,2,1);
4 plot(x);
5 title('Original Signal');
6 subplot(1,2,2);
7 plot(z);
8 title('Reconstructed Signal');
9
10 %Calculate the error
11 error = norm(x - z)/norm(x);
12 energy = 1 - error
```

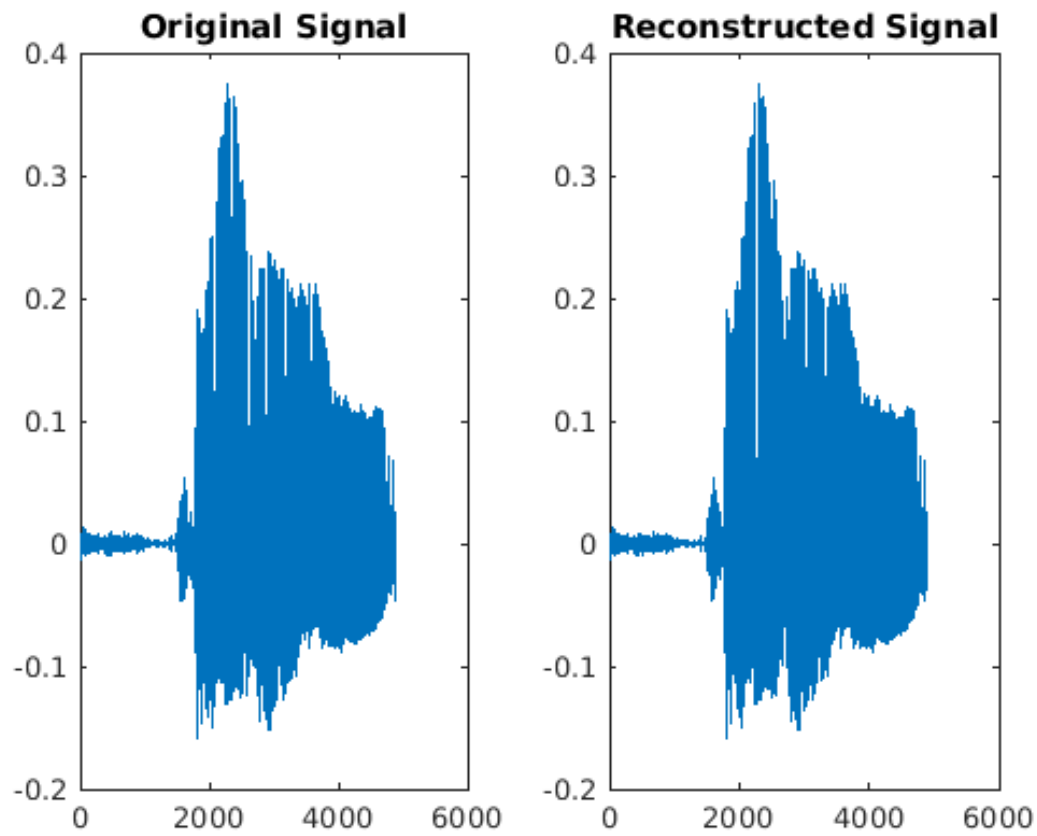


Figure 1: Reconstructed Song with .0004 Threshold

As evident in the image, there is a visibly exact match between the original and the reconstructed image. The other thresholds that were tested before have a visible difference and a significant difference.

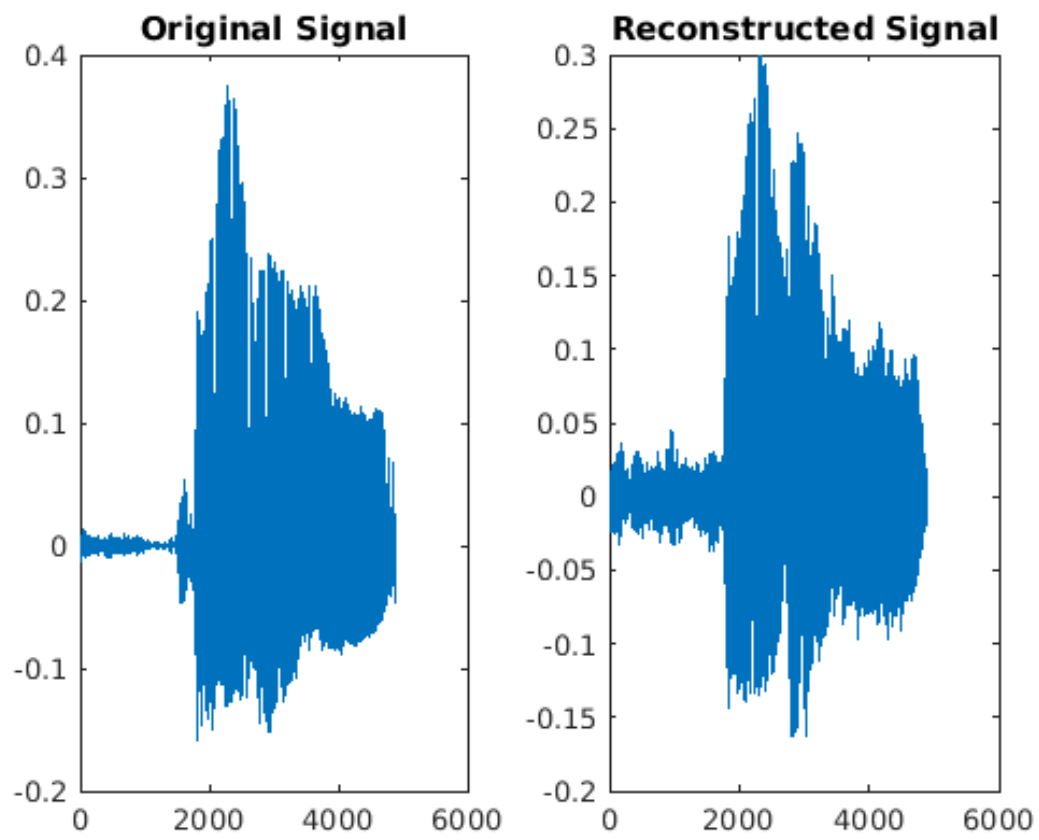


Figure 2: Reconstructed Song with .1 Threshold

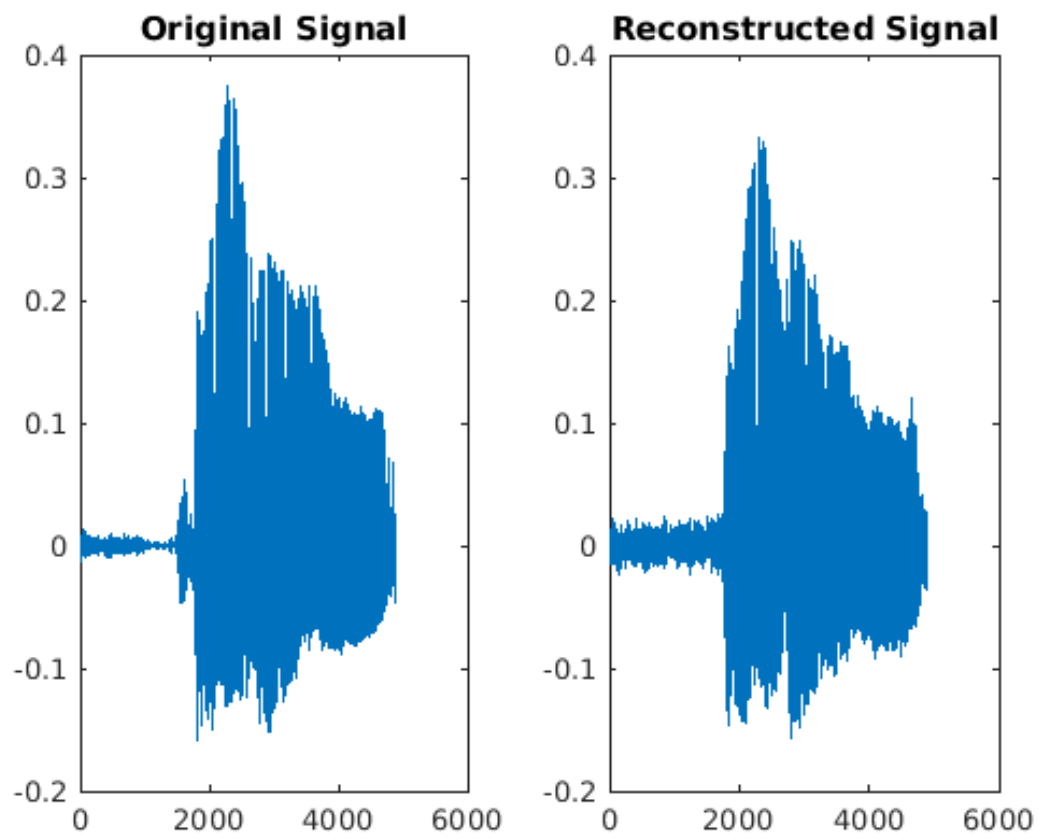


Figure 3: Reconstructed Song with .05 Threshold

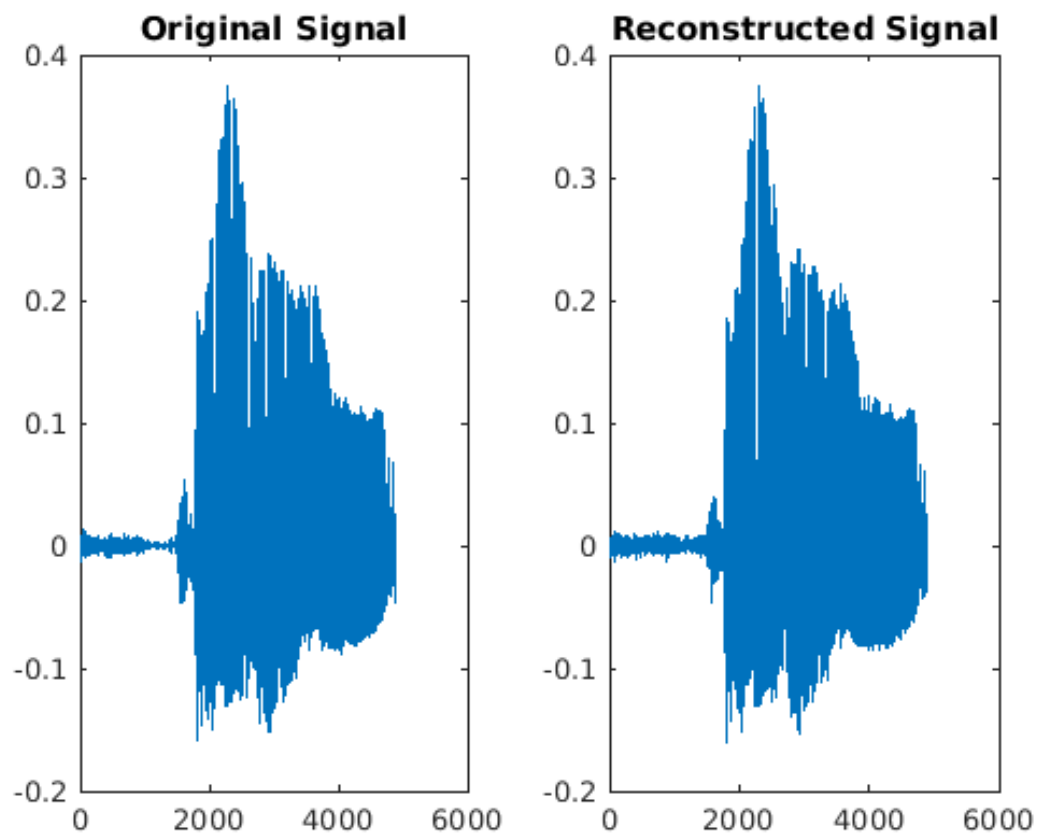


Figure 4: Reconstructed Song with .001 Threshold