

HW02: PCM for Sound Processing

Start from file pcmencdec_hw2.m. Run the code step by step make sure you understand how it works and then:

1. Compute PSNR

$$PSNR = 20 \cdot \log_{10} \left(\frac{MAX_Y}{\sqrt{MSE}} \right)$$

$$MSE = \frac{1}{n} \sum_{i=1}^n (\hat{Y}_i - Y_i)^2$$

Using the max of the reconstructed signal **rm** and the squared differences between original signal **m** and the reconstructed signal **rm**.

NOTE: keep in mind that in order to compute MSE, the arrays **m** and **rm** must be of the same size. You need to add code or modify this instruction (line 97):

```
rm = interpft(e,fs*upSamplingFactor);
```

You must insure that the recovered message, **rm** is the same size as **m**.

You can either modify upSamplingFactor in the line above or make a new call to interpft to make sure the new **rm** is the correct size. See Matlab help for interpft.

2. Optimize Reconstruction

Vary the number of samples of the reconstruction function starting at 2 (for upSamplingFactor) find the minimum for which the visual match is acceptable.

Show screen shots of the match and the optimal upsampling factor.

3. Use AM Input

Modify the input signal as follows:

- Introduce amplitude modulation using a 1Hz signal that modulates at +/-25% of the amplitude



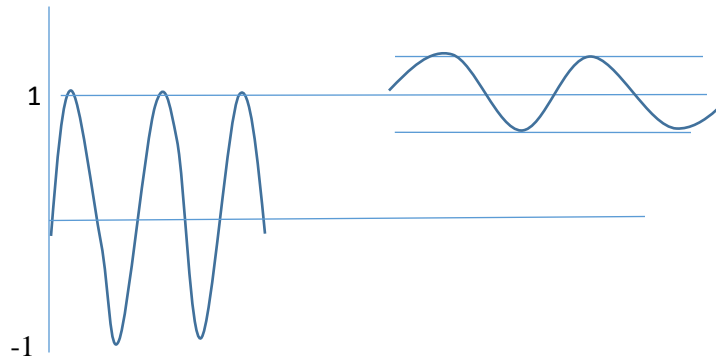
- Compute the new PSNR.

4. Repeat step 2 for the AM Input

Show screen shots of the match and the optimal upsampling factor.

Deliverables: Upload your code and report file to canvas. The report should be a pdf file (generated from word doc) including outputs from each task, and discussion of results as you see fit.

Help on AM part

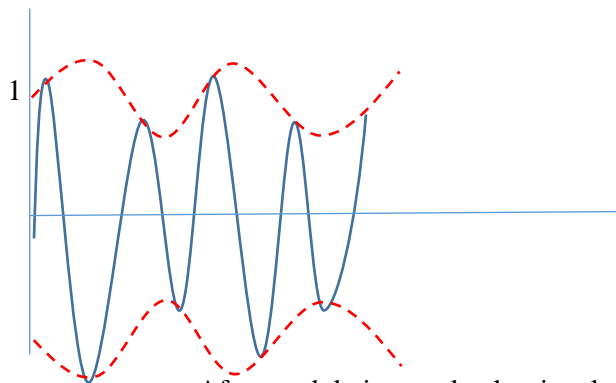


What is the equation of a 1hz sine function
That varies between 1.25 and 0.75?
 $1 + \dots$

Input
 $\sin(2\pi f t)$
is a 2Hz sine fun



Modulating signal:
1Hz sine function to drive the amplitude
Between $\pm 25\%$ of the max.



After modulating, make the signal positive by adding
A constant value of $0.1 + \text{max of the modulated signal}$.

In the first case it was 1.1, now it should be a bit more.