

CENG290 Data Communications

Labwork 6

Noise Analysis

Assume a square signal with a height of 1 and period of 2 Hz is sent over a noisy channel. The limited bandwidth property of the channel does not allow us to send more than 5 harmonics. During the transmission, noise is added to the signal. The receiver receives the signal by sampling it at its middle and assigning a '1' to it if the signal level is higher than 0.6, and '0' if the signal level is less than 0.4.

1. Create a series of square waves and send them over the channel using their first 5 harmonics only.
2. Add noise to the signal.
3. Plot the noisy signal.
4. Detect the signal value after the noise and count the number of bits received incorrectly.
5. Increase the power of noise and repeat the experiment.

To add noise to your signal, you can use **awgn** function from MATLAB. The function includes a parameter to define SNR level. Example below from Mathworks show how the function works.

```
% awgn function adds white Gaussian noise to the vector signal x. The scalar
% snr specifies the signal-to-noise ratio per sample, in dB.
t = 0:.1:10;
x = sawtooth(t); % Create sawtooth signal.
y = awgn(x,10,'measured'); % Add white Gaussian noise.
plot(t,x,t,y) % Plot both signals.
legend('Original signal','Signal with AWGN');
```