



Comunicazioni

LAB #1

Simulate a PCM system based on uniform quantization with a transmission on a BSC channel. Evaluate the performance in terms of signal-to-noise ratio (S/N) as a function of main system parameters:

- Number of quantization bits: 4, 6 and 8 bits;
 - $p_b(e)$ of the transmission channel: from 10^{-1} down to 10^{-9} , at least one point per decade.
1. Test PCM using a signal with uniform pdf: adjust the ADC range exactly to the signal range to avoid clipping the signal.
Show the probability density function and the spectrum of the signal.
Compare SNR results with theoretical findings.
 2. Test PCM using at least two audio signals: one with voice recording and one with music.
Adjust the ADC range exactly to the signal range to avoid clipping the signal.
Show the probability density function and the spectrum of the signal.
Compare SNR results with theoretical findings.
 3. For the cases based on audio signals, try to improve performance using a non-uniform quantization: compare SNR results with respect to uniform quantization.
 - Apply the Lloyd algorithm to find an optimized quantization distribution
 - Apply the companding technique (use μ -law)