Remark on Exercise 4

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This is the original formulation of the exercise. The one given in class was wrong.

1. Generate $N = 10000$ samples of a AR(1) random process

$$x(n) = \rho x(n-1) + z(n)$$

   with $\rho = 0.99$ and $\sigma_x^2 = 1$.

2. Clip the sample values in the range $[-20, 20]$ and round them to the nearest integer.

3. Compute the entropy $H(x)$ of the source assuming that there is no memory. Compare $H(x)$ with the maximum entropy of a source having the same alphabet.

Solution

Assume zero mean processes $x(n)$ and $z(n)$. The variance of the AR(1) process $x(n)$ is given by the formula

$$\sigma_x^2 = \frac{\lambda^2}{1-\rho^2},$$

where λ^2 is the variance of $z(n)$. Since the exercise prescribes $\sigma_x^2 = 1$, we have

$$\lambda^2 = 1 - \rho^2.$$

The complete solution of the exercise is provided in `mmsp2_lab1_ex4_sol.m`.