Quantization, SNR

Exercise 5 How does the *Signal to Noise Ratio (SNR)* change if the quantization changes from B to $B + 1$ bits with

$$f_{\min} = -k\sigma_{f'} \text{ and } f_{\max} = k\sigma_{f'} \text{ ?}$$

Here, $f_{\min}$ and $f_{\max}$ are the minimum and maximum quantized frequencies, as defined as in the lecture. $\sigma_{f'}$ denotes the standard deviation of the original signal f', and k denotes a constant.

Exercise 6 Show that the characteristic quantization curve is linear if the function values are uniformly distributed.

Exercise 7 **Programming Task (after k-means has been covered in the lecture):**

In this exercise, you will be introduced to image processing with Matlab. You may also use the freely available software environment Octave (http://www.octave.org) that is similar to Matlab. Matlab can be accessed from the CIP Pools in the computer science building. Of course, you are free to use whatever language you want in order to do the programming part.

(a) Load and visualize an 8 bit RGB color image (8 bits in each channel).

(b) Write a function that performs a k-means clustering on vector input data.

(c) Use the function in order to re-quantize the data to a 4 bit color image.