Figure 2. Block diagram of simple vector quantizer.

The collection of vectors $\mathcal{Y}$ — a codebook — is obtained with the help of special algorithm named k-means. VQ allows exploiting dependencies among vector components. This fact is rather a big advantage over the scalar quantization.

VQ algorithms are divided into several subtypes. The main of them are: multistage VQ (MSVQ) and variable dimension vector quantization (VDVQ). VDVQ has become very popular recently because of its ability to work with input vectors of different length and this fact improves the efficiency of quantization.

The quantization is a very powerful tool for signal compression tasks. It can reduce data amount with rather small quality loss. The main problem of this tool utilization is to choose which type of algorithm is needed for specific information.

Bibliography:


CARBON NANOTUBE BASED DETECTOR OF MODULATED TERAHERZ RADIATION

Belarusian State University of Informatics and Radioelectronics
The Republic of Belarus, Minsk
Anton Yermalovich  Liathushech S.I. – Associate Professor

Due to recent success in development and visualization of nanosized clusters and other metallic nanoparticles, a new branch of nano-optics and nanotechnology quickly develops — nanoplasmics. The most important feature of nanoplasmic devices is the combination of strong electromagnetic oscillation localization combined with high frequencies of these oscillations, which in turn leads to a gigantic amplification of local optical and electromagnetic fields [1]. The localized plasmons parameters depend on the shape of the nanoparticles, which allows to fine-tune their resonance system to effectively interact with light and other quantum systems (quantum dots, molecules) [2].

Some of the possible applications of these effects are highly effective tunable fluorophores and nanosized light sources as well as surface plasmon amplification by simulated emission of radiation. It is also possible to create micromechanical oscillators (Fig. 1), using highly conducting microcantilevers and carbon nanotubes as mechanically floating gates [3]. Such devices exhibit not only mechanical resonance, but also resonance at frequencies of plasma oscillations.

Fig. 1. General view of device under consideration
In detectors, such as the one presented above, it is possible to induce a parametric balance if the amplitude of the input signal exceeds some threshold value. When this happens, low frequency mechanical vibrations are induced in the resonator even in the absence of the carrier frequency modulation [4]. Presenting the plasma and mechanical distributions of the resonators as lumped parameters it is possible to write out a set of equations for associated resonators, the solution of which will allow evaluating the threshold value of the input signal: Eq. (1):

\[
\begin{align*}
\gamma + \gamma_m y + \omega^2 y &= -\frac{2\eta \rho}{M_d} \\
\rho + \gamma_e \rho + \omega_e^2 (1 + \xi \frac{V_{ph} y}{V_{ph}^2}) \rho &= \frac{4}{\pi} \omega_e^2 C_l \delta \varphi(t)
\end{align*}
\]

This paper is an attempt to estimate the threshold amplitude of the AC input signal, exceeding which will result in self-induced mechanical oscillations.