

Image Compression and Packet Video
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Laboratory Assignment #3
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Purpose:

The lab will introduce you to the Lloyd Max Quantization equations, and the use of MATLAB to perform integration.

Problem:

Data compression involves a choice of what to keep, and what to throw away. Designing a quantization method is often an exercise in optimization: the data has some underlying statistics, and there is a method for measuring the result of the quantization. Your class notes, and text (Page 369) go into detail on the Lloyd-Max Quantizer. Use this information to create a 8 element table. You may assume that the initial starting quantization is uniform. For the purpose of the lab, the underlying probability density distribution is assumed to be Gaussian with a standard deviation of 30 ($\sigma=30$). Since the Lloyd-Max equations is solved by an iterative process, you should record the number of iterations that results in an difference between the decision levels between iterations of 0.0001.

The program should:

- Plot all of the decision levels (for all iterations on the same plot).
- Plot all of the reconstruction levels (for all iterations on the same plot)
- Output the final decision and reconstruction levels.

Extra credit: Rerun your program assuming a Laplace probability density. The sigma should also be assumed to be 30.

Hints:

The equation for a Gaussian Probability Density is:

$$p(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\left\{\frac{x^2}{2\sigma^2}\right\}}$$

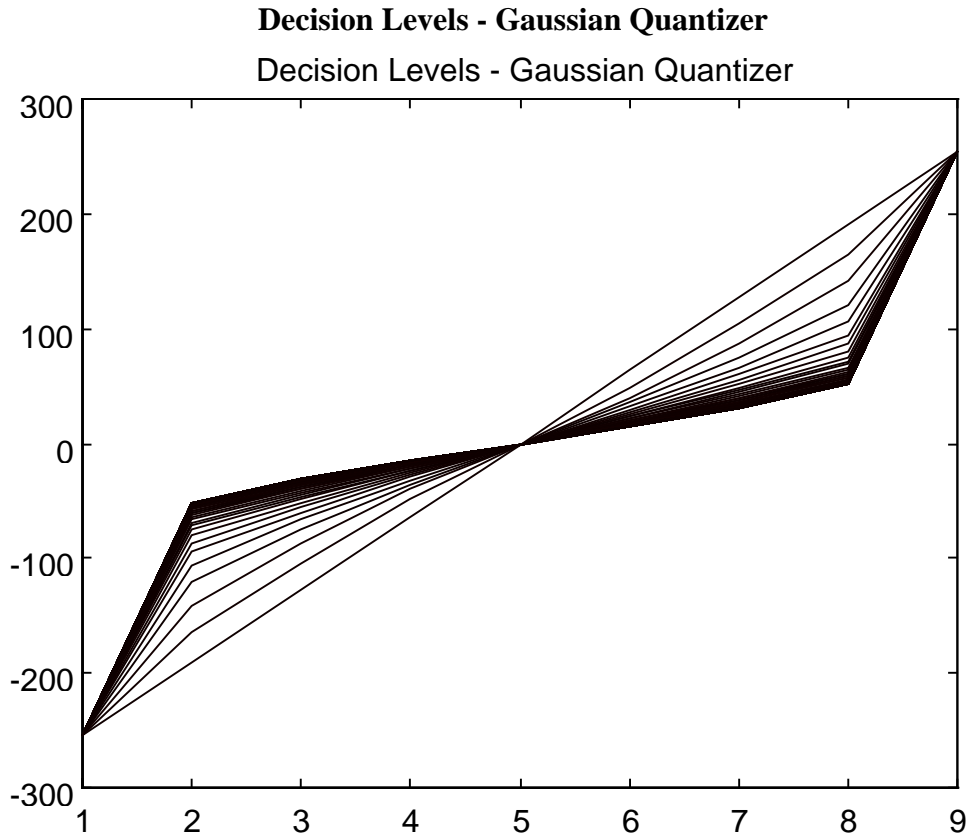
The equation for a Laplacian Probability Density is:

$$p(x) = \frac{1}{\sqrt{2}\sigma} e^{-\left\{\frac{\sqrt{2}}{\sigma}|x|\right\}}$$

MATLAB contains a integration function (quad). You must define a function in a file (as a MATLAB function), and call it using the following syntax:

```
result = quad('Gauss',lowerlimitvalue,upperlimitvalue);
```

You can plot all values by defining an array to store all iterative results of the quantizer algorithm. Your plot should look like:



Convergence within 0.0001 in 84 iterations

Reconstruction Levels - Gaussian Quantizer

Reconstruction Levels - Gaussian

