Problem 5.10

The best that a linear delta modulator can do is to provide a compromise between slope-overload distortion and granular noise. Justify this statement.

Solution

(a) In linear delta modulation, if we make the step-size Δ too small, then the system suffers from slope overload distortion.

(b) On the other hand, if we make the step-size Δ too large relative to the local slope characteristic of the message signal $m(t)$, then the system suffers from granular distortion.

For a *fixed* sampling rate $1/T_s$ and with Δ *as the only variable*, the best that the linear delta modulator can do is to choose a step-size Δ that will provide a compromise between these two forms of quantization noise.