Quantization Noise Analysis

- Example
  - 3-bit quantization
  - 25.2 dB SNR (not accurate with this waveform)

diff() matlab script

- Very useful in finding the character of the differences in two waveforms
  - Works with complex data
- Example
  - 3-bit quantization
  - 25.2 dB SNR (not accurate with this waveform)
Quantization Noise Analysis

- Example
  - 4-bit quantization
  - 31.5 dB SNR (more accurate)

EEC 281, Winter 2011, B. Baas

Quantization Noise Analysis

- Example
  - 5-bit quantization
  - 37.7 dB SNR (more accurate)
% quant_plot.m
% 2011/01/11 Written (BB)
% Set class
NumSamples = 1000;
NumBits = 5; % resolution of quantization of input signal
PrintOn = 1; % print plots to .tiff files

% Calculate some things
MaxValue = 2^NumBits -1;
x = 0:(NumSamples -1);
y = (MaxValue+0.4) * cos(0.5 * pi * x /NumSamples);
y_quantized = round(y);
y_quant_noise = y - y_quantized;

% Print and plot
fprintf('Valid range of output values = %i - %i

', 0, MaxValue);
figure(1); clf;
plot(x,y);
ylabel('Arbitrary input signal');
grid on;
axis([0 NumSamples-1 -0.8 (MaxValue+0.8)]);
if (PrintOn)  print -dtiff 1.tiff;  end

figure(2); clf;
plot(x,y_quantized);
ylabel('Quantized input signal');
grid on;
axis([0 NumSamples-1 -0.8 (MaxValue+0.8)]);
if (PrintOn)  print -dtiff 2.tiff;  end

figure(3); clf;
plot(x,y_quant_noise);
ylabel('Quantized noise');
grid on;
axis([0 NumSamples-1 -0.8 (MaxValue+0.8)]);
if (PrintOn)  print -dtiff 3.tiff;  end

figure(4); clf;
diff(y, y_quantized, 'Input signal', 'Quantized signal');
if (PrintOn)  print -dtiff 4.tiff;  end

• Matlab code that generated the plots on the previous slides