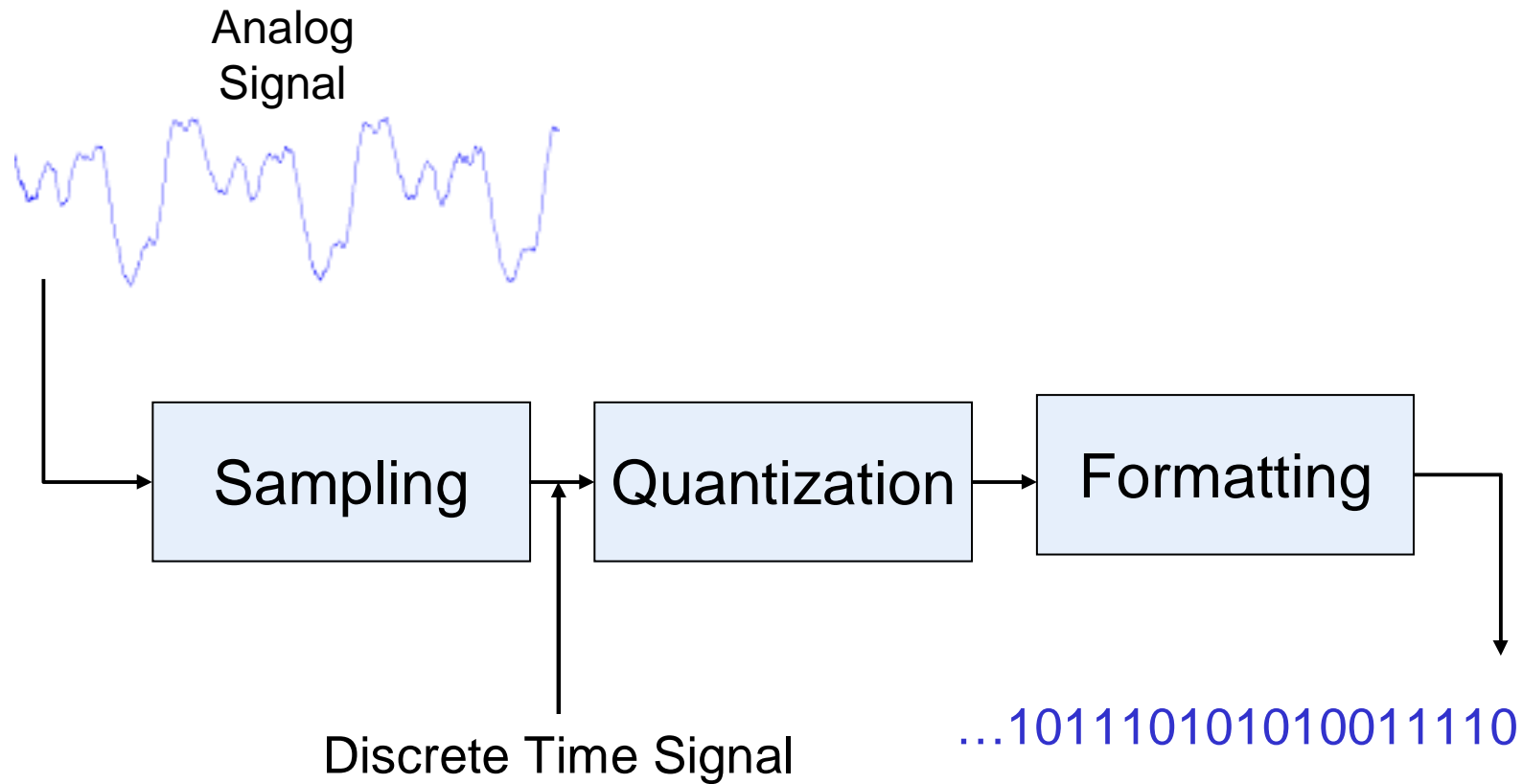


Analog-to-Digital



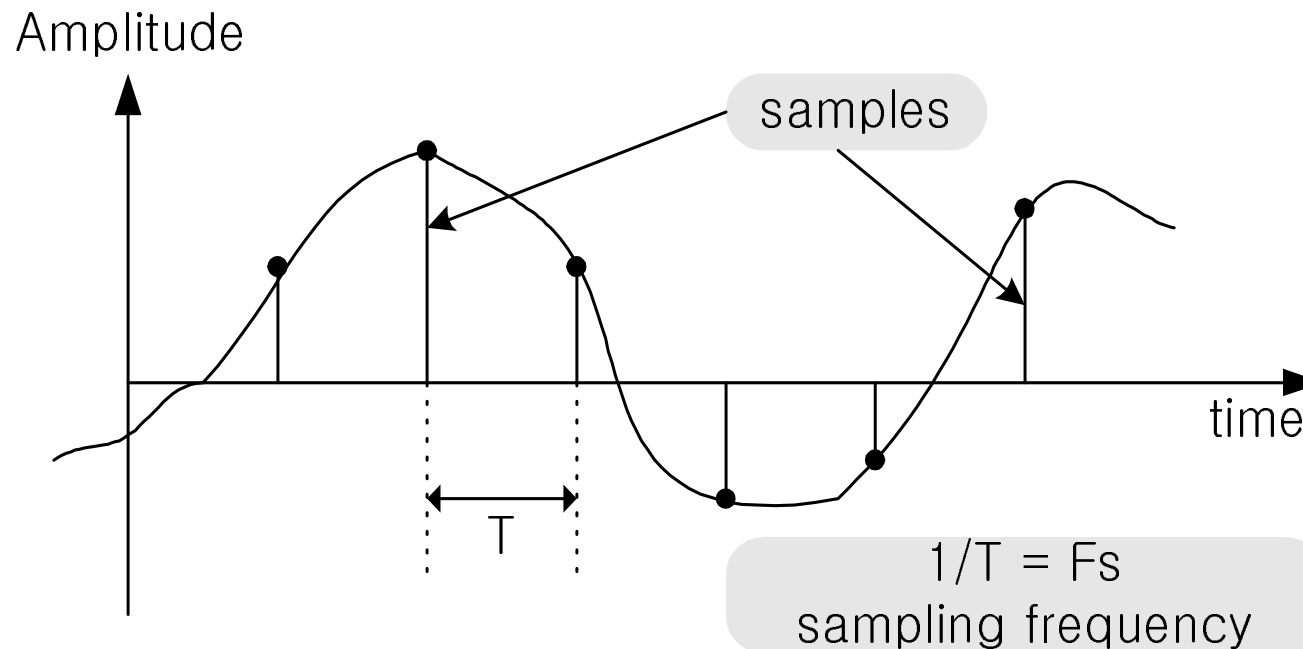
Hoon Yoo, Ph.D.

Diagram for AD Conversion



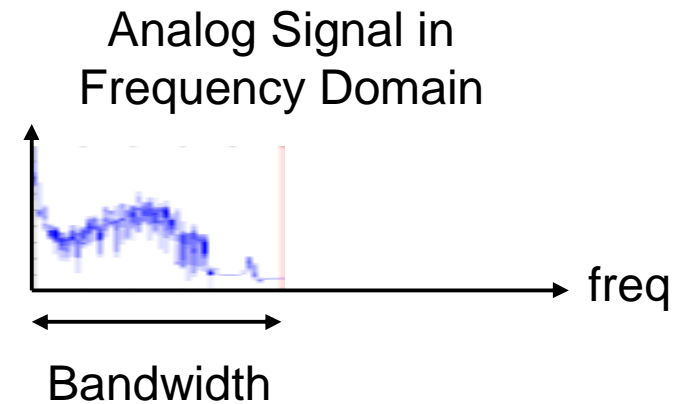
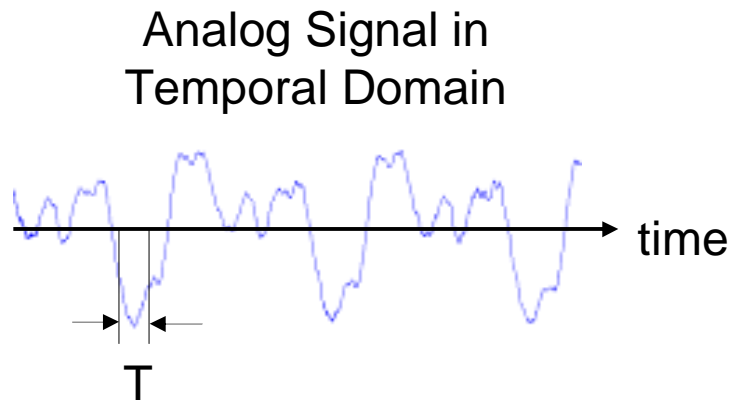
Sampling

- Sampled signal is discrete time signal



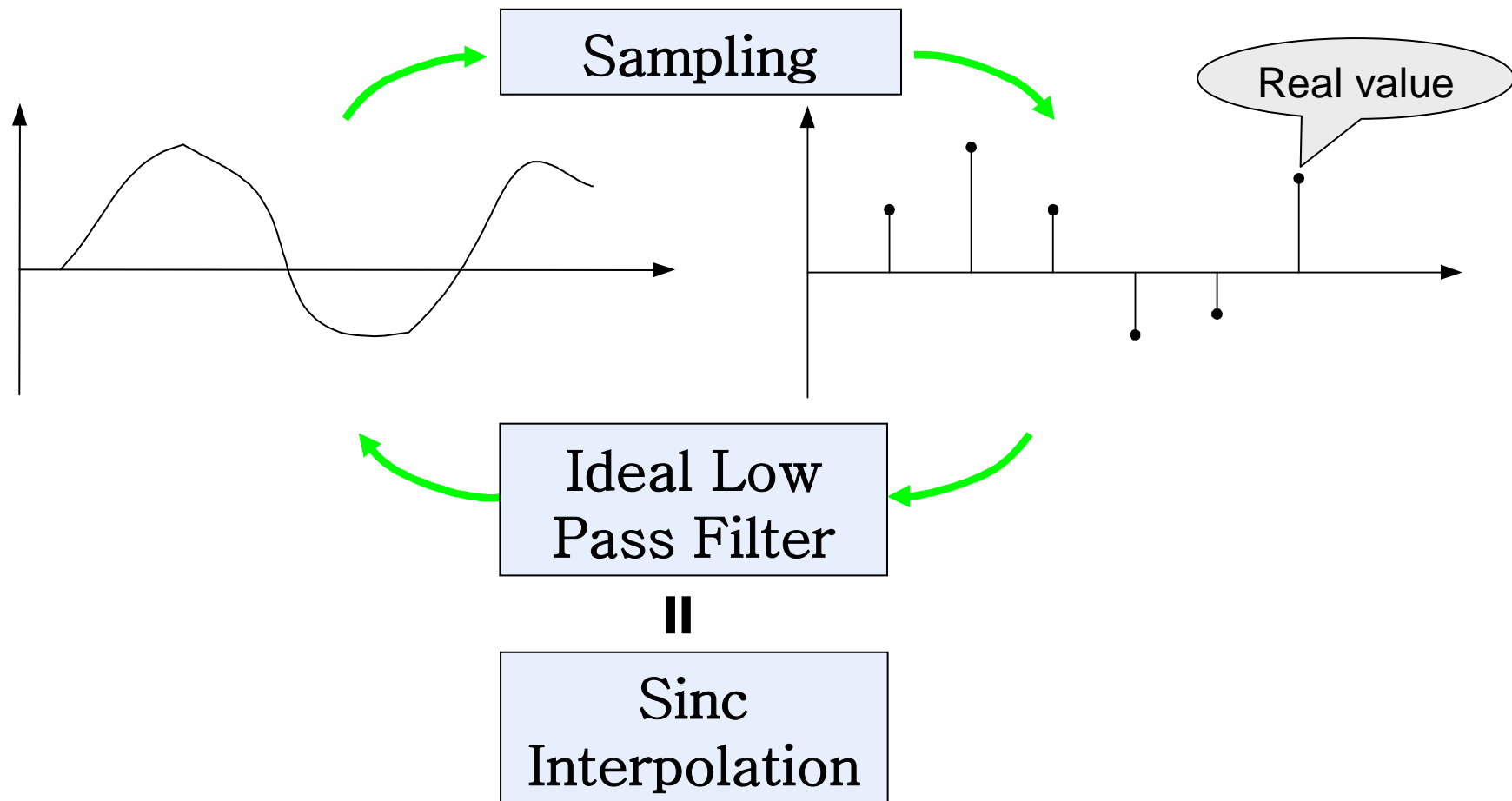
Sampling Theorem

- The Nyquist–Shannon sampling theorem

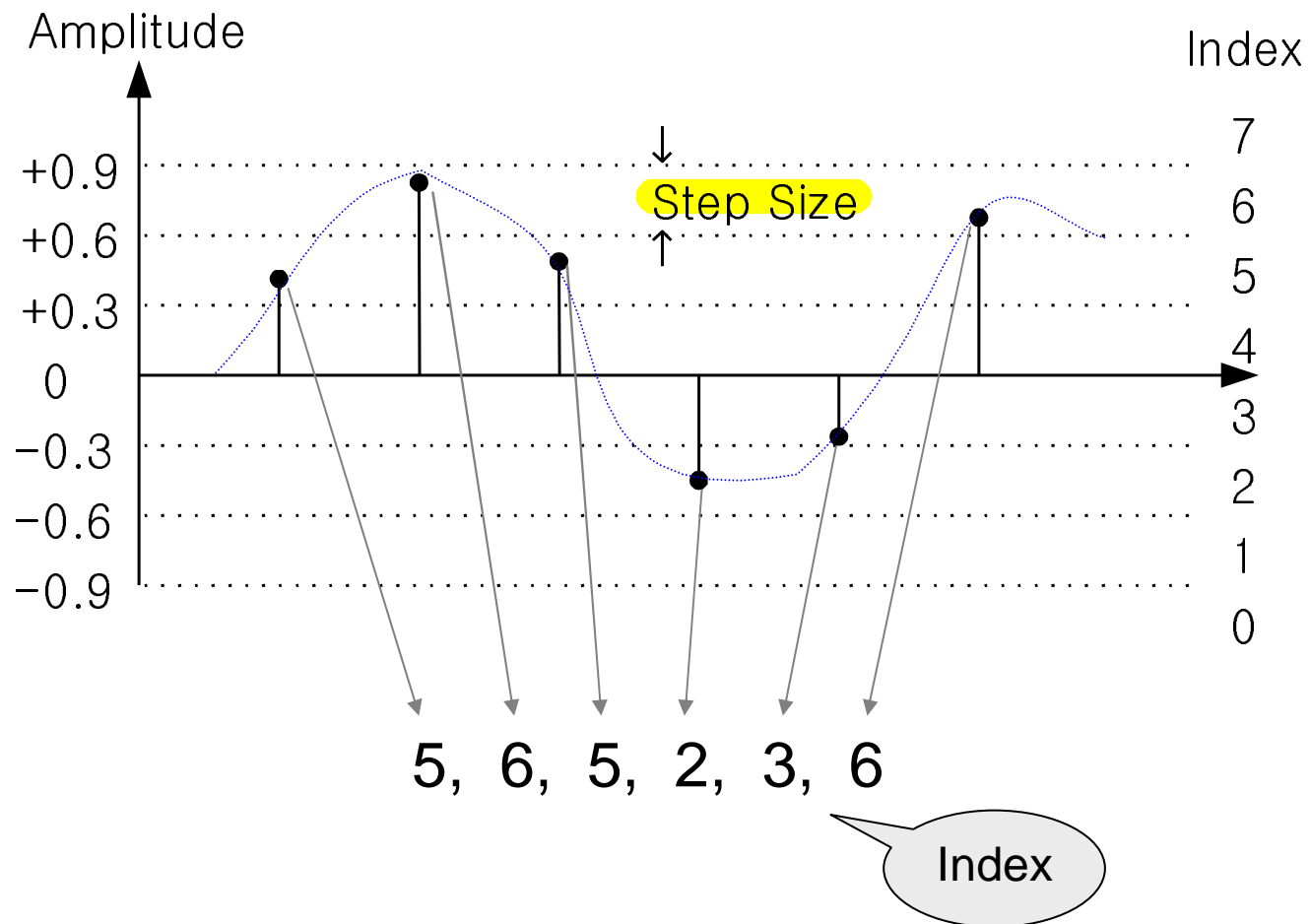


$$F_s = 1/T \geq 2 * \text{Bandwidth}$$

Sampling and Its Inverse



Quantization



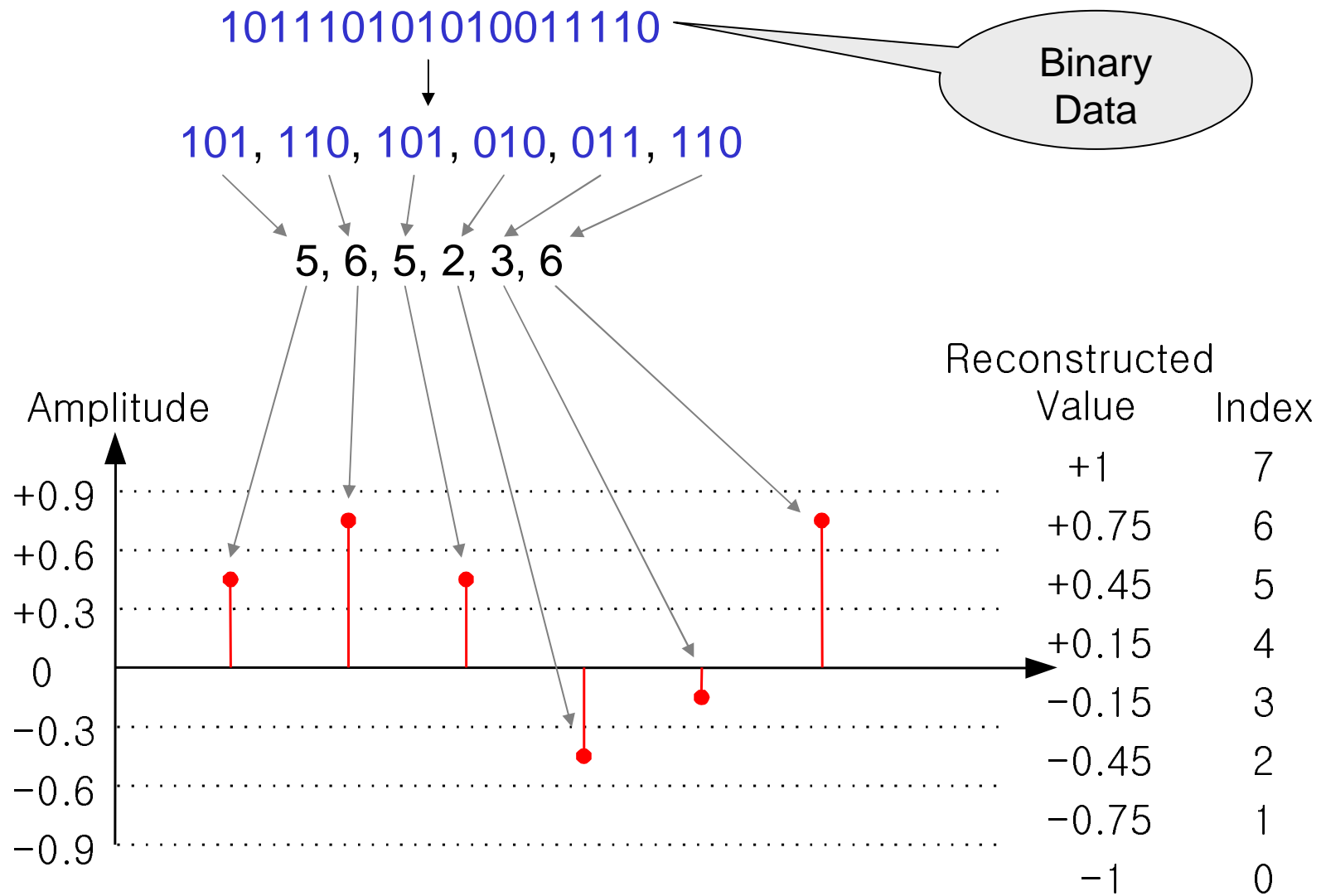
Formatting Quantization Index

- Binary form of the index

Actual Value	Index	Binary Form A (unsigned)	Binary Form B (signed)
+1	7	111	011 (+3)
+0.75	6	110	010 (+2)
+0.45	5	101	001 (+1)
+0.15	4	100	000 (0)
-0.15	3	011	111 (-1)
-0.45	2	010	110 (-2)
-0.75	1	001	101 (-3)
-1	0	000	100 (-4)

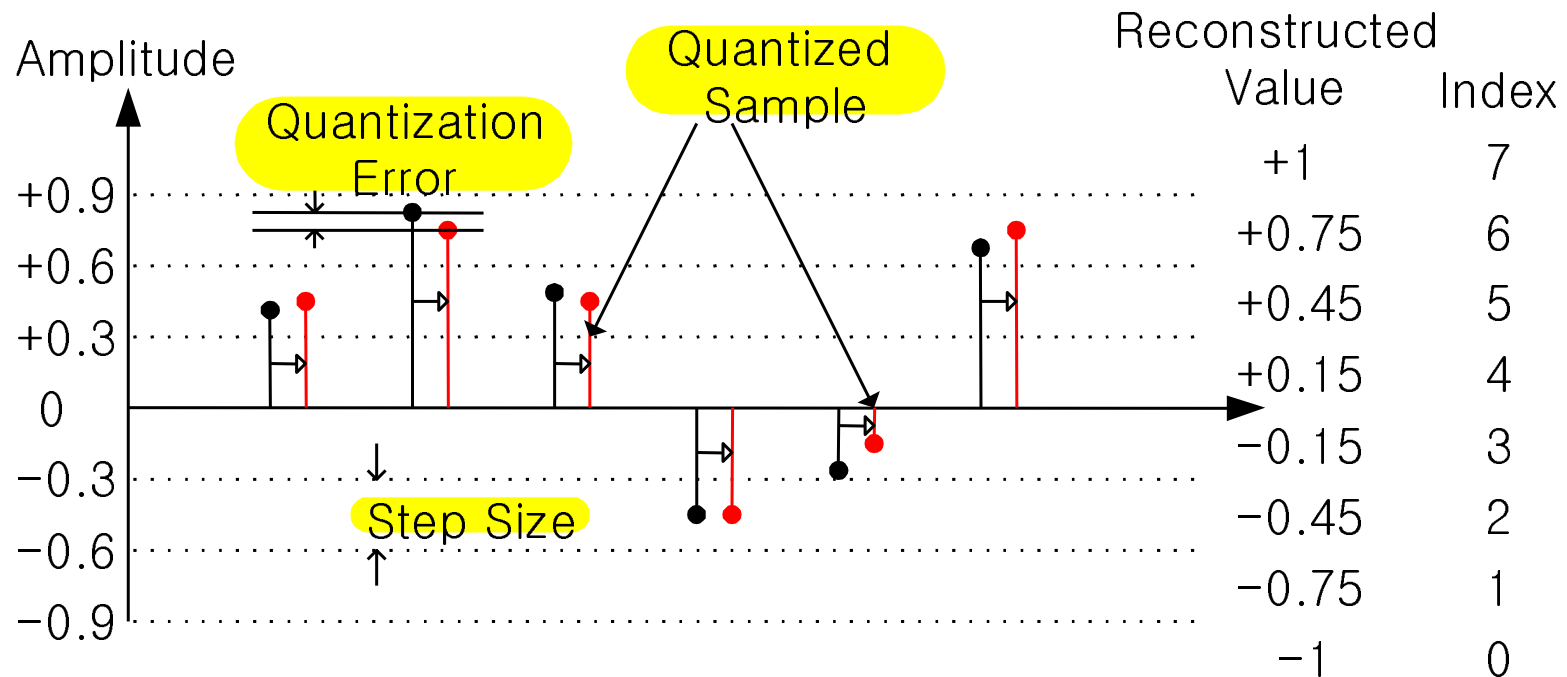
5, 6, 5, 2, 3, 6 \longrightarrow **101, 110, 101, 010, 011, 110**

Inverse Quantization

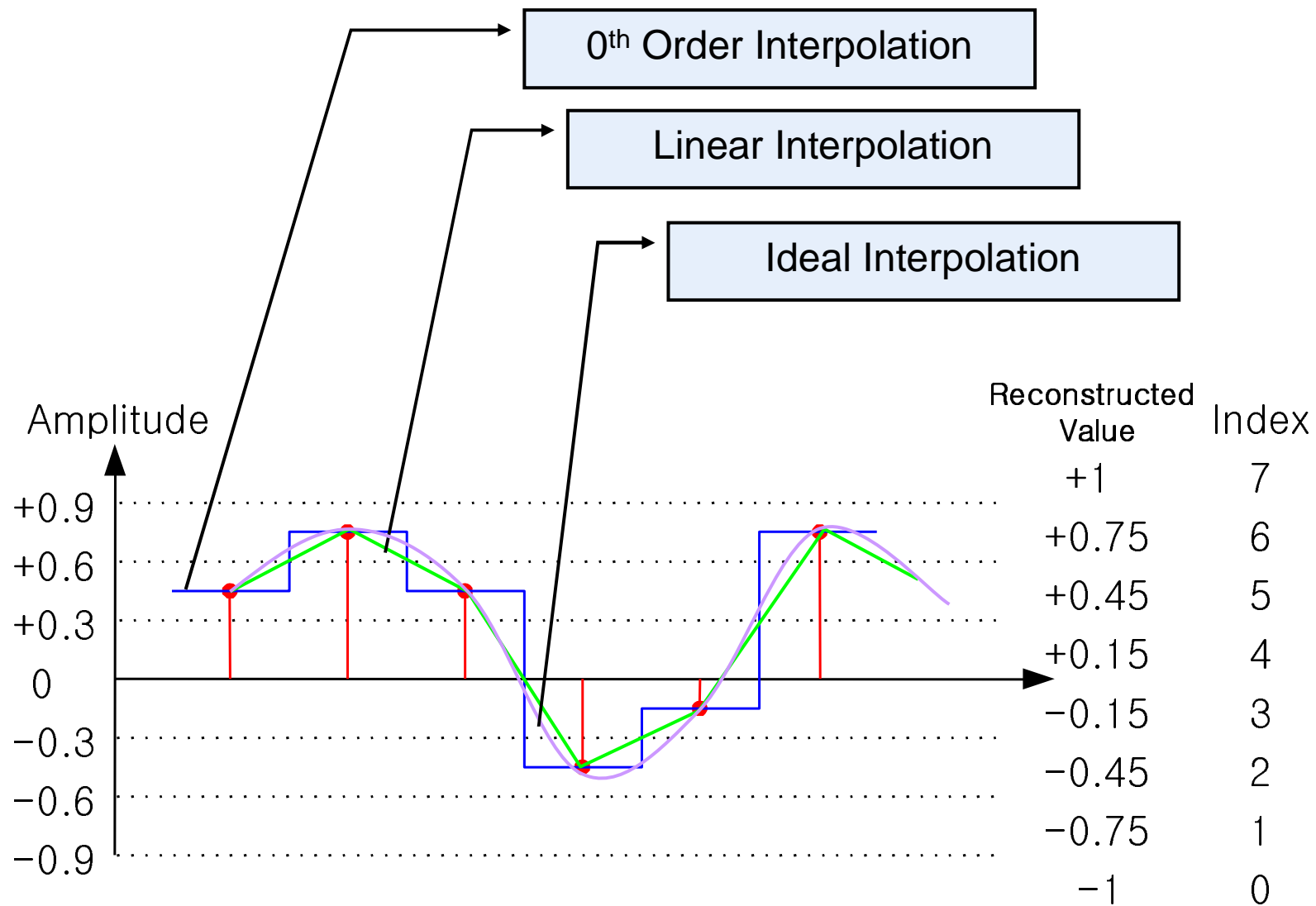


Inverse Quantization

- Quantization is a non-invertible transform which converts a real valued sample into finite valued one

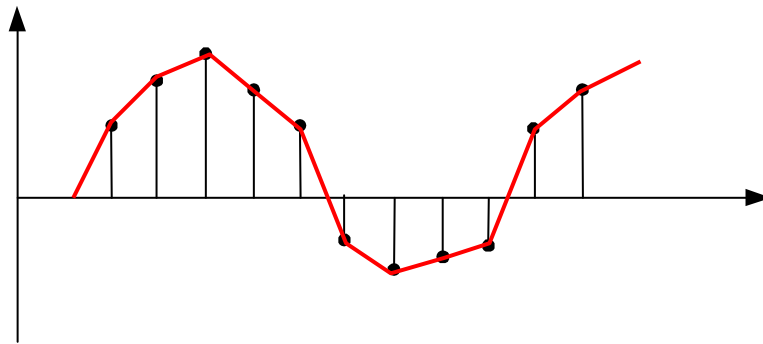


Conversion Digital to Analog

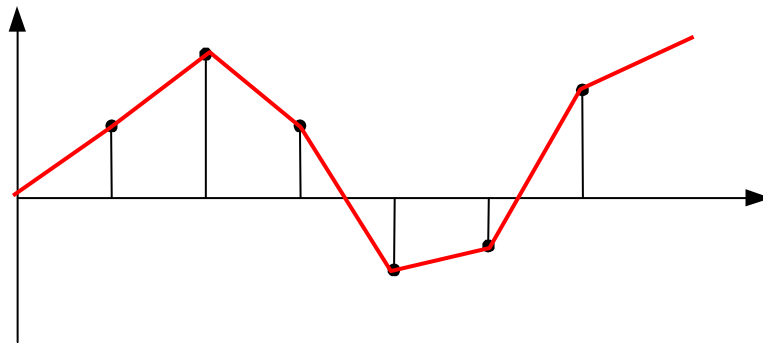


AD Conversion Parameters

- Sampling Frequency



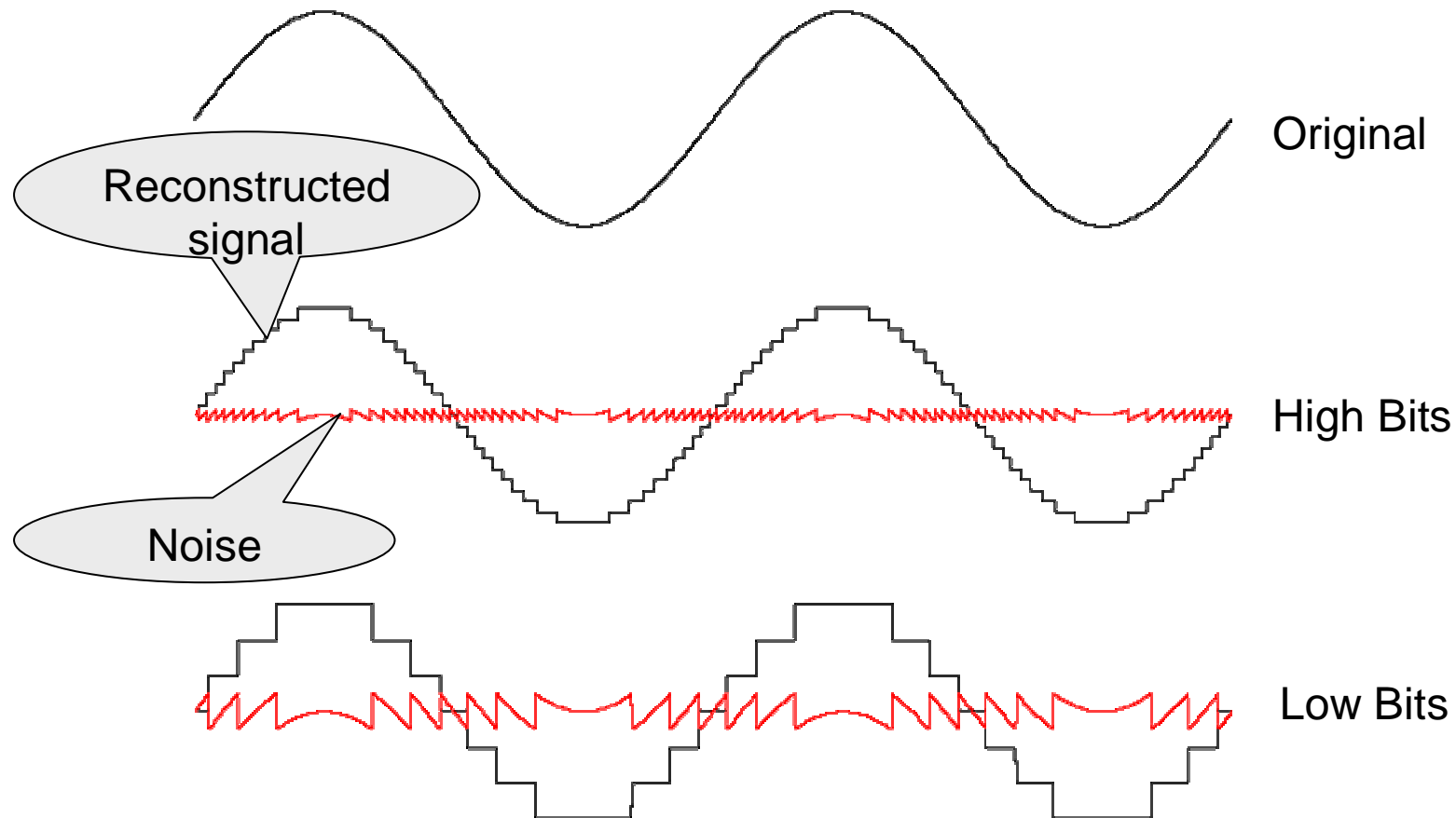
High Sampling
Frequency



Low Sampling
Frequency

AD Conversion Parameters

- Bits for quantization index



Summary

