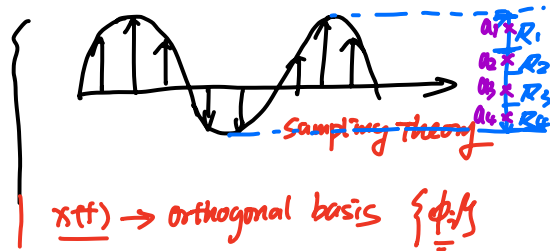


$x(t)$ \longleftrightarrow $\{x_k\}$ \longleftrightarrow $\{a_1, a_2, \dots, a_k\}$
 Analog signal \longleftrightarrow Analog symbol sequence \longrightarrow Discrete symbol sequence



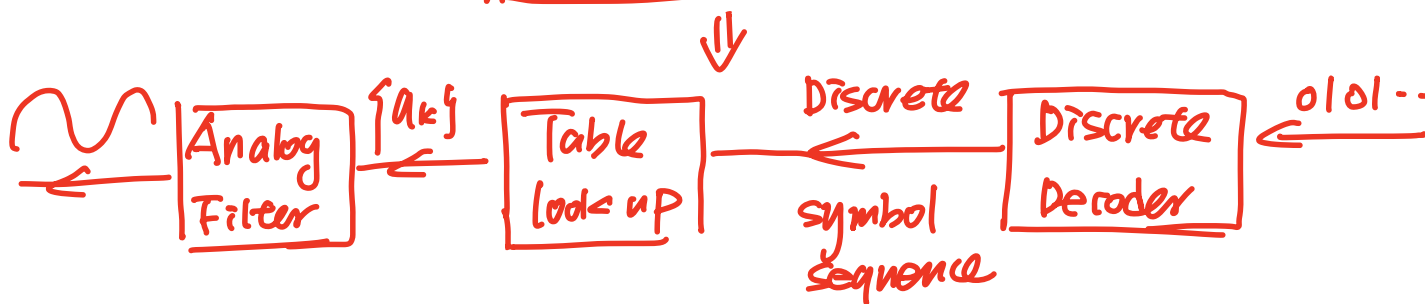
goal: Lossless

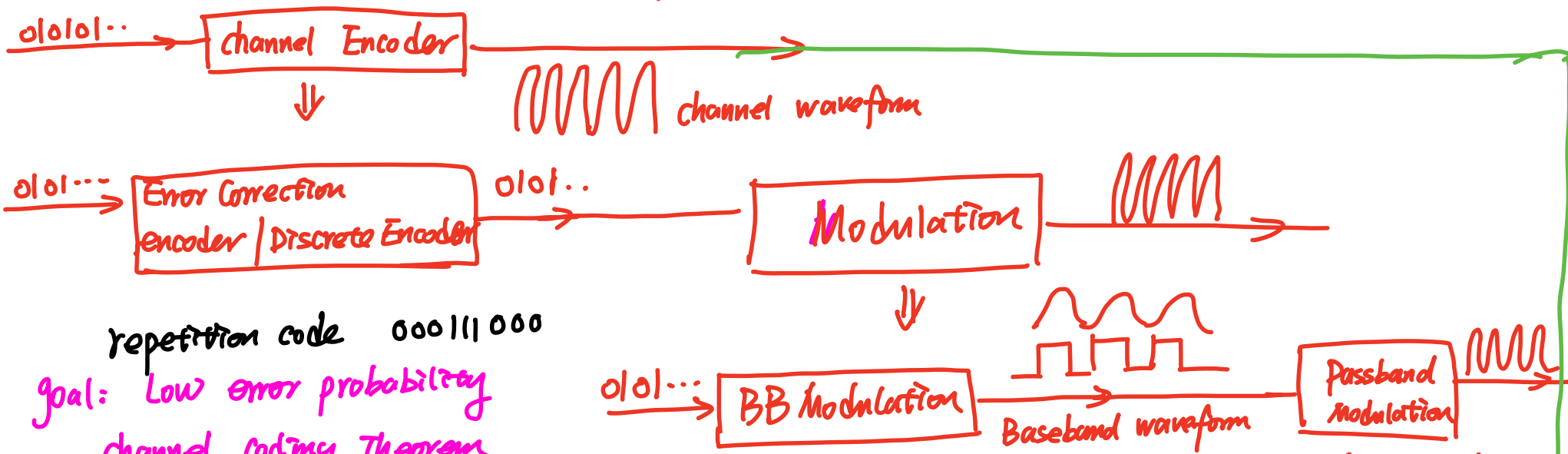
Quantization level (M)
 Quantization Region $\{R_j\}$
 Representation point $\{a_j\}$

goal: minimize mean-squared error

fixed length code
 { A B ... } $\lceil \log_2 6 \rceil = 5$ bits
 ASCII code
 variable length code \Rightarrow optimal source code
 { a, i, e, o } (Huffman code)
 { q, z } $\min E(L)$

goal: { ① Data compression
 min # of bits per symbol
 ② Unique decodable
 (Source coding Theorem)



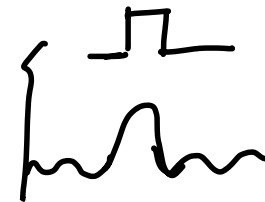


repetition code 000111000
 goal: Low error probability
 channel coding Theorem

$$R < \text{Channel Capacity}$$

- goal: ① satisfy frequency constraints
 ② reliable detect binary digit at Receiver

elementary waveform $p(t)$



Analogy Mod.
 { AM
 FM
 PM

binary bit sequence: u_1, u_2, \dots, u_k

$$u(t) = \sum_k u_k p(t - \frac{k}{R}) \quad R: \text{bitrate}$$

Signal *
 space

