EE 250 : Probability

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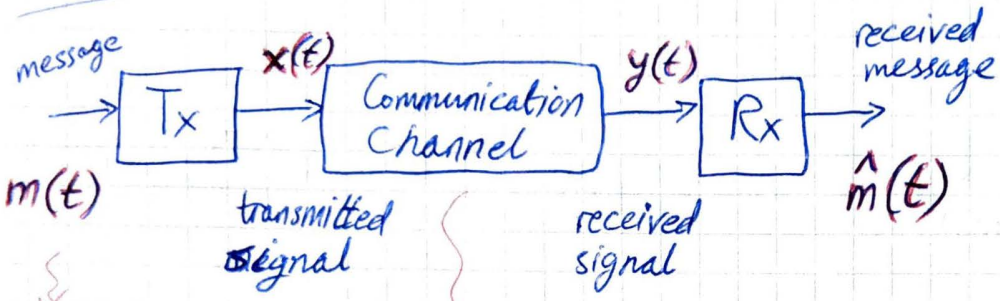
↓

SAMSUNG

Lec 1

ex Probability in Communication Systems :

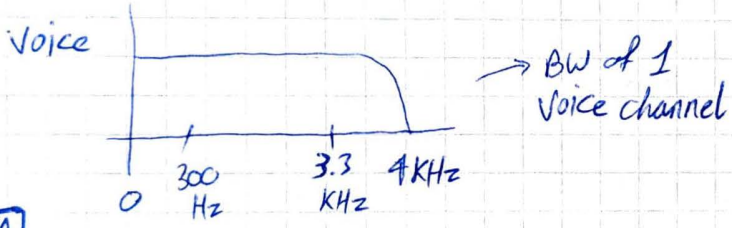


$$M e^{j\theta} = A + jB$$

$$e^{j\theta} = \cos\theta + j \sin\theta$$

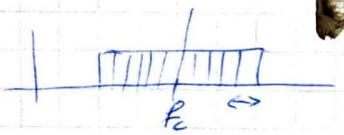
ex voice/text data video

Before, it used to differ depending on type of message. Now, it is kinda similar for them all.



A

Tx ⇝ does ① Modulation, that is like freq. multiplexing



② Amplification

③ Digitization → Noise immunity
- smaller computation area
- easier for software applications

④ Coding ← Can add redundancy for noise immunity (odd-even parity for example)

⑤ Interleaving

Vs Analog Comm. & Electronics

∴ $x(t) \neq m(t)$

B Channel → ① Air ② Fiber ③ Copper

Never perfect ⇨ Has to distort $x(t)$

ex DSL = "Digital Subscriber Lines"
- data is transmitted through Cu lines (designated for voice)
- Cu lines are originally for 4k data, but in DSL, 2MHz data could be sent.

(c)

Rx ⇝ needs to undo what the channel & the Tx did to the transmitted signal.

Our system's goal: $\hat{m}(t) = m(t)$ with minimum cost

1) ⇒ Channel adds NOISE, & Here is where PROBABILITY comes (random)

ex 

AWGN ⇒ additive white gaussian noise

2) ⇒ The message is also RANDOM ← PROBABILITY

↳ if message is not random, the message is useless.

"Randomness does not mean chaos & anarchy, Having something that is random doesn't mean it can't be expected & measured (known)"

Noise
① Analog circuits → supply, components, flicker, thermal
② Digital circuits → Quantization noise

So, we actually want to design my system such that:

$$P[\hat{m}(t) = m(t)] \gg$$

$$P_{e_{error}} = P[\hat{m}(t) \neq m(t)] \ll$$