Wireless Communication

aokblast
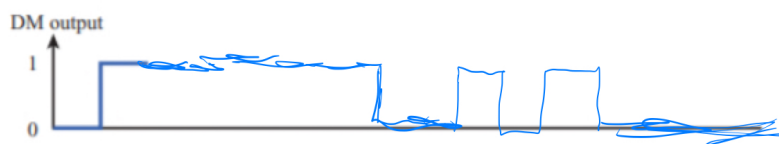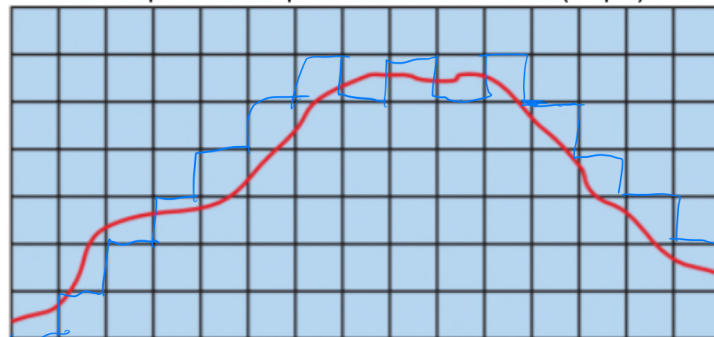
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Contents

1 Problem 1

AM, PM, FM are modulation technology that engage in changing analog data to analog signal.

- AM: Change the amplitute of wave to represent different signal frequency(data)

- PM: Change the phase of wave to represent different signal frequency(data)

- FM: Change the frequency of wave(In same amplitite) to represent different frequency(data)

We cannot distinguish between PM and FM if we don't have the function.

2 Problem 2

3 Problem 3

Angle Modulation

$$s(t) = A_c \cos(2\pi f_c t + \theta(t))$$

In this problem:

$$\theta(t) = 5\sin\left(2\pi(10^3)t\right)$$

$$\theta'(t) = 5 * 2\pi * 10^3 * \cos\left(2\pi(10^3)t\right)$$

In PM:

$$\max(|\theta(t)|) = \max(|5sin(x)|) = 5$$

In FM:

$$\max(|\theta'(t)|) = \max(|5 * 2\pi * 10^3 * sin(x)|) \text{ rad } / \text{ s} = 5\text{kHz}$$

4   Problem 4

- Slow FHSS Frequency of changing channel is lower than frequency that one element transfer. An data element is transfer in one channel

- Fast FHSS Frequency of changing channel is higher than frequency that one element transfer. An data element is transfer in multiple channel by seperating different bit.

5   Problem 5

Gold sequence is the sequence that is constructed by XOR of two m-sequence
Result:
s1: 110101111000100 s2: 101011110001001 res: 011110001001101

m_1	x_1	o_1	m_2	x_2	o_2	res	o_1 xor o_2
0	1011	0	1	0101	1	1	0
1	0101	1	1	1010	1	0	1
2	1010	1	0	1101	1	1	1
3	1101	1	1	1110	1	0	1
4	1110	1	0	1111	0	1	1
5	1111	0	1	0111	0	1	0
6	0111	0	1	0011	0	1	0
7	0011	0	1	0001	1	1	0
8	0001	1	1	0000	0	0	1
9	0000	0	0	0100	0	0	0
10	0100	0	0	0010	1	0	0
11	0010	1	0	1001	1	1	1
12	1001	1	1	1100	0	0	1
13	1100	0	0	0110	1	0	0
14	0110	1	0	1011	0	1	1

6 Problem 6

- Advantage:

1. Can contain multiple use at one time
2. Cannot be hacked if the hacker don't know the code of user(add security)

- Disadvantage:

1. Need synchronization
2. Vulnerable to interference from other radio signal