ONS Problem Set 6

Wednesday, January 18, 2017

Problem 1: Pulse Shaping

a) Explain the meaning and benefits of pulse shaping. How can it be implemented?
b) Refer to a raised-cosine (RC) pulse shape. How is the spectral shape defined – give the mathematical form. What is described by the roll-off factor β?
c) Prove that RC pulses are free from inter-symbol interference (ISI). For simplicity, consider RC pulses with 0 roll-off, i.e., $\beta = 0$. What is the peak-to-average power ratio (PAPR) and how can it be derived?
d) What is a root-raised cosine (RRC) filter? In contrast to RC, RRC signals suffer from ISI. Why is it still an interesting pulse shape for communication purposes?

Problem 2: Chromatic Dispersion Compensation – Algorithm Complexity

Compare the computational complexity in terms of the number of multiplications per output sample for a chromatic dispersion (CD) compensation algorithms implemented in the time and frequency domain, respectively. Therefore, proceed in the following way:

- How would such an algorithm be implemented in the time domain? How many multiplications are involved here?
- How would you implement such an algorithm in the frequency domain?

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