TCOM 370 Homework 99-3

Please turn in the following 6 problems on 2/23/98 for grading

Problem 1 3.1 (b) in Halsall

Problem 2 Consider the following scheme for line encoding. Binary data a_m, each a "0" or "1", (m=1, 2, 3, ...) are presented to an encoder which then generates a new binary stream b_m, m=0, 1, 2, ... according to

$$b_m = (a_m + b_{m-1}) \quad \text{(mod 2)}$$

with b_0 defined to be "0". [In mod-2 addition, 0+0=0, 0+1=1+0=1, 1+1=0]

Pulse amplitudes c_m, m=1, 2, 3,... are then generated as $c_m = b_m - b_{m-1}$ (Here the arithmetic is the usual arithmetic for real numbers). Received pulse amplitudes are decoded to form binary digits d_m according to the rule

d_m = "0" if received pulse amplitude is close to 0; otherwise d_m= "1"

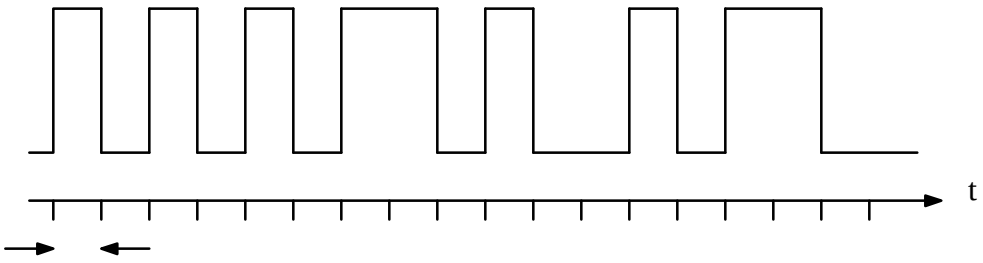
(a) For transmission of pulses without distortion, what is the relationship of the d_m sequence to the original a_m sequence?

(b) What type of line encoding scheme is this?

(c) How would you modify the equation(s) above to get pseudoternary line encoding?

Problem 3

(a) Suppose the waveform below comes from a Manchester encoded binary data stream for which the rate is 1/T bps. Determine the beginning and end of bit periods (i.e., extract timing information), and give the binary data sequence.



(b) Now assume that the waveform represents differential Manchester coding, and find the two possible bit streams.

Problem 4 In a serial synchronous transmission scheme, transmit and receive clocks are operating at a nominal 10 MHz rate and the transmit bit rate is nominally 10 Mbps. They *each* have a maximum drift (depart from the nominal timing) of 0.5 ms per minute. Suppose synchronization takes place only at the beginning of each frame. Assume that a data bit is received correctly as long as its waveform is sampled in the middle half of its duration. How long can the frame contents be to ensure correct recovery?

Problem 5 Coded Mark Inversion (CMI) is a two-level line encoding scheme. Here successive "1"s are coded with alternating (opposite polarity) amplitude levels, the levels being held for the full duration (T) of the bit. "0"s are always coded as a level transition from high to low in the middle of the bit interval.

(a) Draw an example waveform corresponding to the particular bit sequence: 001100101101

(b) What is the longest duration of a constant amplitude level in the CMI waveform? What is the shortest duration?

(c) Discuss its expected performance from the point of view of bandwidth, dc value, timing recovery, and polarity inversion. Compare it to Manchester coding.

Problem 6: Problem 2 from 1998 Exam 2

Note:

(a) Problems 1–8 in Ch.3, Halsall, on synchronization, require descriptive answers. You should be able to do these kinds of problems

(b) See also other problems asked in previous exams (Problem 4 in 1997 Final Exam, Problem 1 in 1998 Exam 2)