Lab Handout # 4
CPP based based Simulation of M-QAM modulation over wired/wireless system

Design LAB II(Software)
Instructor: D. RAWAL, N. SHARMA
Dept. of ECE, The LNMIIT, Jaipur

Time : 3:00 Hour Maximum Marks : 10

Instructions and information for students

- This Lab Handout consists of 2 pages. Please check that you have a complete copy.
- Simulate in matlab or any other Software.

Objective:

1) Simulate M-QAM modulator and Demodulator.

Itroduction:

1) $C++$ **based Qam modulator Demodulator.**

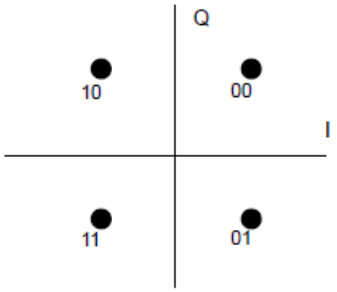

Figure - QPSK constellation

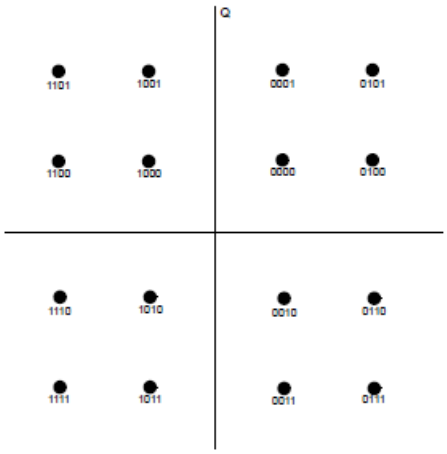

Table - QPSK bits to symbol mapping

B(1)	B(2)	I	Q
0	0	1	1
0	1	1	−1
1	0	−1	1
1	1	−1	−1

B(1)	B(2)	B(3)	B(4)	I	Q
0	1	0	1	3	3
0	1	0	0	3	1
0	1	1	0	3	−1
0	1	1	1	3	−3
0	0	0	1	1	3
0	0	0	0	1	1
0	0	1	0	1	−1
0	0	1	1	1	−3
1	0	0	1	−1	3
1	0	0	0	−1	1
1	0	1	0	−1	−1
1	0	1	1	−1	−3
1	1	0	1	−3	3
1	1	0	0	−3	1
1	1	1	0	−3	−1
1	1	1	1	−3	−3

Fig. 1. Modulator

a) **Simulating M-Qam modulator using C++:**

i) Generate a random binary sequence of 10-1000 values using rand function. Lets call it 'X' sequence.

ii) Map it to various QAM modulator given in the figure. For ex. for 16 QAM use combination of 1 and 3 to genrate constellation points.
iii) Use $DevC++$ to generate $C++$ code for the above modulator.
iv) Method-1: Generate code using using complex array structure.
v) Method-2: Generate code using pointers to array and functions.(useful to associate in simulink S-function.)

2) **Observations and Results**.
a) Generate BPSK modulator, demodulator using Method-1. [2]
b) Generate QPSK demodulator using Method-2. [4]
c) Generate $C++$ code for wired QPSK modulator.(Monday batch)
Generate $C++$ code for wireless QPSK modulator. use zero noise case(Tuesday batch)
Generate $C++$ code for wired 16-QAM modulator. use zero noise case(Wednesday batch)
Generate $C++$ code for wireless 16-QAM modulator. use zero noise case(Thursday batch) [4]

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