

Reconfigurable Modulation Scheme for Communication System

Mohamed Syed Ali

AMET Business School, AMET University, Chennai, India

Article Info

Article history:

Received Nov 30, 2017

Revised Feb 4, 2018

Accepted Feb 17, 2018

Keywords:

BPSK

Modulation/Demodulation

QPSK

ABSTRACT

In any communication system transmitter and receiver are used to transmit the signal via wired or wireless channel. In the transmitter, modulation is one of the processes to transmit the signal efficiently. Likewise, receiver contains demodulation to recover the original signal from the transmitter. In general, the communication system uses one modulation/demodulation process at a time. It cannot use different modulation/demodulation within a single system. To overcome this problem reconfiguration technique is implemented. It is the method using different modulation scheme at the same time. It will increase the efficiency of the communication system. QPSK and BPSK modulation technique is used to transmit and receive the signal.

Copyright © 2018 Institute of Advanced Engineering and Science.
All rights reserved.

Corresponding Author:

Mohamed Syed Ali,
AMET Business School, AMET University,
Chennai, India.

1. INTRODUCTION

Orthogonal Frequency Division Multiplexing (OFDM) based wireless data transmission system is the multi-carrier system in which single higher rate data stream can be divided into multiple lower rate data streams. Modulation and De-Modulation technique play a significant role in OFDM based data transmission system. Based on Modulation technique only, the frequency transformation method and encoding and decoding methods are enabled [1]-[3]. These both are executed based on SNR values generated from modulation techniques. But in the current research work, an adaptive modulation and adaptive demodulation method also proposed by using two different types of efficient modulation and demodulation techniques.

2. BACKGROUND

Hardware reconfigurable node with novel scheduling enabled the utilization of environmental energy with harvesting awareness. The task allocation can be scheduled according to the availability of energy. In this approach, energy can be saved because only the most frequently used tasks are executed using the hardware [4]. The novel scheduling strategy was used to identify the most valuable application for the reconfigurable hardware. The reconfigurable hardware based heterogeneous system is an effective method of increasing the processing ability of systems at lower energy costs. However, this scheme provides computing complexity.

The obtained results show that a significant improvement regarding bit error rate (BER) and throughput can be achieved by demonstrating the superiority of the adaptive modulation schemes when compared to fixed transmission systems. Fuzzy C strange points clustering algorithm was proposed for clustering modulation implementation [5]. The obtained sampling frequency is 5.4MHz. The proposed adaptive modulation scheme of this work can able to meet the BER target at 25dB when compared to more than 28dB for 4-QAM fixed modulation scheme [6-7]. The proposed algorithm utilizes the average value of

the instantaneous SNR of the subcarriers in the sub-band as the switching parameter. The results of this work show an improved throughput performance with significant BER performance.

Dynamically reconfigurable routing protocol was designed for under water sensor network. The sensor nodes must be able to re-route their packets even if the configuration of the network changes [8]. It is a multi-hop datagram routing scheme which will offer reliable underwater wireless transmission by dynamically re-routing data, when there is a change in the network configuration [9]. This protocol provides the optimal path for successful communication of data without any interruption and allows reliable communication within limited resources. The failure of nodes may leave some areas uncovered and degrade the fidelity of the collected data. Losing network connectivity has a very negative effect on the applications.

3. THE PROBLEM

Each modulation law requires an specific modulator circuit. This is a problem if it is necessary to have a transmitter capable of operating with various modulation laws without drastic modifications. A similar problem exists for the receiver. This dissertation proposes a solution to these problems with the concepts of universal modulation and universal demodulation.

4. THE PROPOSED SOLUTION

Quadrature Phase Shift Keying (QPSK) modulation is a type of digital modulation coming under Phase Shift Keying (PSK) modulation. In Binary Phase Shift Keying (BPSK) modulation, the phase of the information signal can be changed every step based on a single bit digital signal. But, in a case of QPSK modulation, two bits (called as debits) are to be considered to change the phase of an information signal. QPSK modulation is bandwidth efficient because each signal point represented as two bits. Hence, reconstruction of original signal using QPSK demodulation is also provided more accuracy than BPSK modulation. The block diagram of QPSK modulation is illustrated in Figure 1.

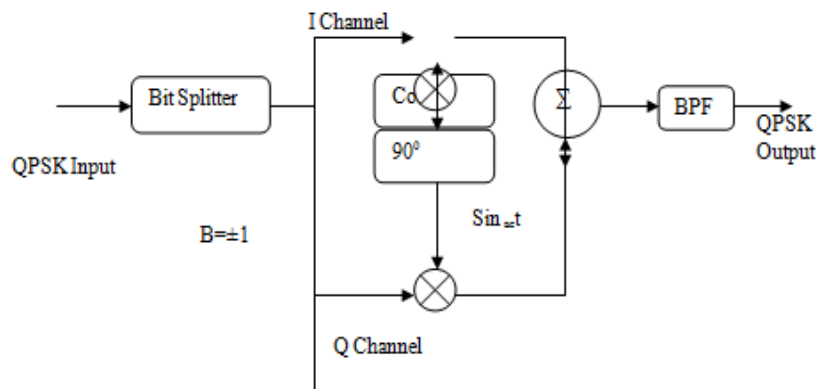


Figure 1. QPSK Modulation

An adaptive system selects QPSK modulation and demodulation technique to reduce the hardware utilization and power consumption. In another hand, if the width of input data is four means, an adaptive system selects BPSK modulation and demodulation technique to improve the speed of the modulation operation. Based on dividing more sampling the rate of the processors has been enhanced significantly. Adaptive modulation techniques are designed to improve the spectral efficiency of radio communications. To improve the transmission rate while guaranteeing a prescribed error performance, under the constraint of fixed transmit-power. The architecture of proposed adaptive modulation and demodulation technique is shown in Figure 2.

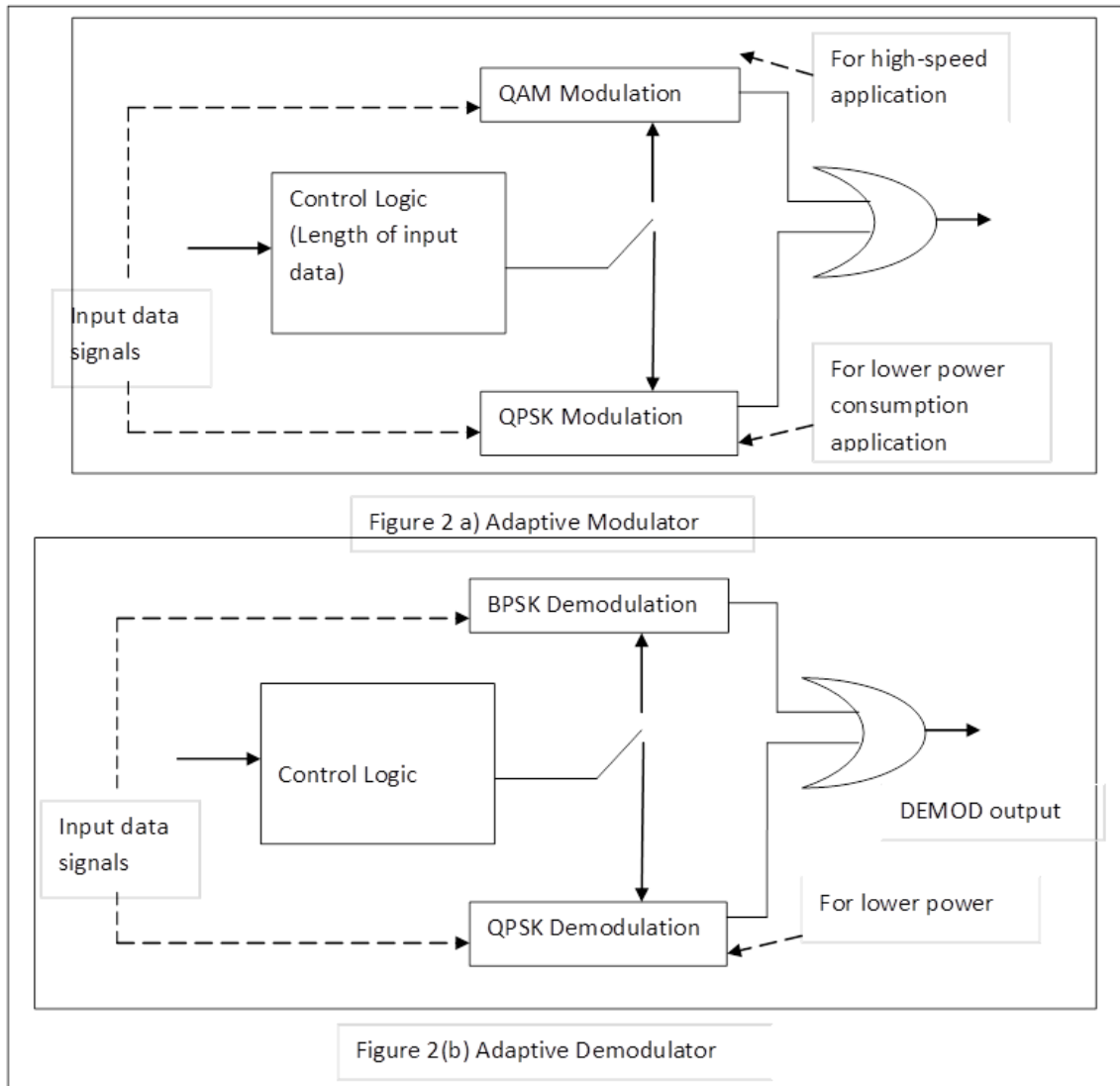


Figure 2. Reconfiguration Based Modulation scheme

5. RESULTS AND DISCUSSION

To evaluate the proposed adaptive modulation and demodulation model, ModelSim 6.3C is used in the current research work. The simulation result of proposed adaptive modulation (QPSK) technique for establishing high-speed operation is shown in Figure 3.

Similarly, the simulation result of proposed adaptive modulation (BPSK) method for determining less area utilization and lower power consumption is shown in Figure 4.

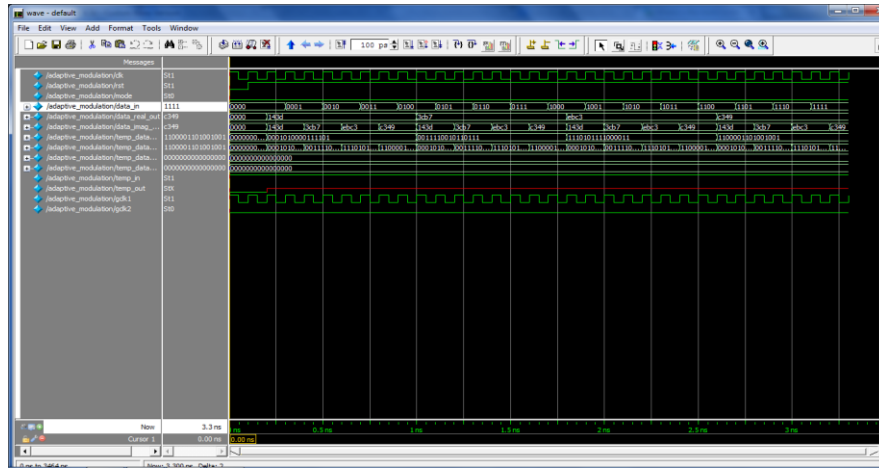


Figure 3. Simulation result of adaptive modulation (QPSK) technique

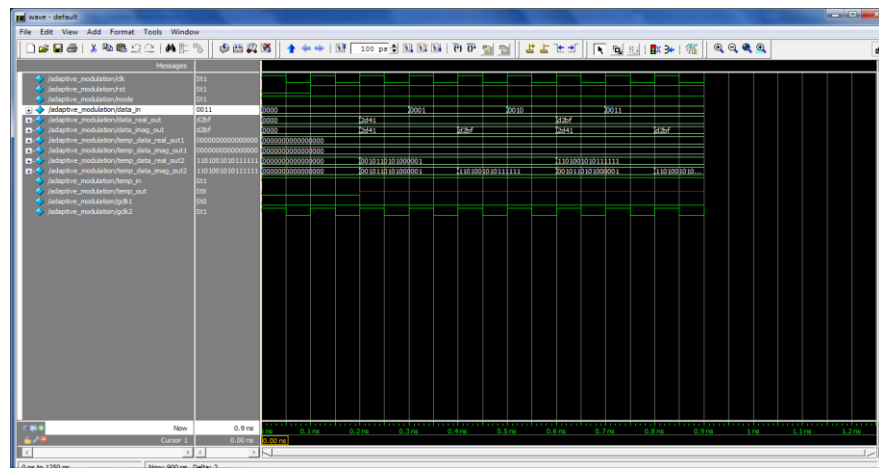


Figure 4. Simulation result of adaptive modulation (BPSK) technique

Table 1. Comparison result of BPSK and QPSK demodulation technique

Type	Slices	LUT	Delay(ns)	Power(mW)	Application
BPSK Demodulation	20	37	6.241	254	High-Speed Application
QPSK Demodulation	10	25	6.134	199	Low Power and Low area Application

6. CONCLUSION

An adaptive modulation and adaptive demodulation model are designed by using two efficient modulation and demodulation techniques such as Binary Phase Shift Keying Modulation (BPSK) and Quadrature Phase Shift Keying Modulation (QPSK) modulation. Verilog Hardware Description Language (Verilog HDL) is used to design an adaptive modulation and adaptive demodulation model. 50% of LUT counts is reduced. 32% of slices counts should be reduced. The security measures are given by adding cryptographic algorithm to the proposed mechanism.

REFERENCES

- [1] Waleed, A. *Adaptive Minimum Bit Error Rate Beam-forming Assisted QPSK for Pre-FFT OFDM Communication Systems* International Journal of Networking and Communication, 2014; 1, 101-107.
- [2] Sivakumar Reddy, B, Lakshmi, B *Adaptive Modulation and Coding with Channel State Information in OFDM for WiMax* International Journal of Image, Graphics and Signal Processing, Issue. 2015; 1 61-69, 2015.

- [3] Rupali, D Kalyani, G Nikhil, P, Khule, R B. *Implementation of Adaptive Viterbi Decoder for Wireless Communication* International Journal of Science and Research (IJSR), 2013 2, 3 24-28,
- [4] Johnson, T, Singh, S K Divisive *Hierarchical Bisecting Min–Max Clustering Algorithm*. In Proceedings of the International Conference on Data Engineering and Communication Technology 2017; 579-592.
- [5] Johnson, T, Singh, S K, 2016, February, *Fuzzy C strange points clustering algorithm*, In Information Communication and Embedded Systems (ICICES), International Conference on 2016; 5.
- [6] Shilpha G. *Low power 128 point split radix fft for lte application*.*International Journal of MC square Scientific Research (IJMSR)*.2014;6(1):66-74.
- [7] Salh A, Audah L, Shah NS, Hamzah SA. *Maximizing Energy Efficiency for Consumption Circuit Power in Downlink Massive MIMO Wireless Networks*. *International Journal of Electrical and Computer Engineering (IJECE)*. 2017;7(6).
- [8] Esmail BA, Majid HA, Abidin ZZ, Dahlan SH, Rahim MK. *Reconfigurable Metamaterial Structure at Millimeter Wave Frequency Range*. *International Journal of Electrical and Computer Engineering (IJECE)*. 2017;7(6).
- [9] Suman S, Sharma KG, Ghosh PK. *250 MHz Multiphase Delay Locked Loop for Low Power Applications*. *International Journal of Electrical and Computer Engineering (IJECE)*. 2017;7(6).