K.Venkata Ramana *et al*, International Journal of Computer Science and Mobile Applications,
Vol.5 Issue. 11, November- 2017, pg. 76-82 **ISSN: 2321-8363**
Impact Factor: 5.515

Approach for PDP Estimation Technique for Load Matrix Concept

K.Venkata Ramana
Assoc.prof., Dept.of ECE
Sree Chaitanya Institute of Technological Sciences, KNR
vrkraotagiri@gmail.com, 9491699941

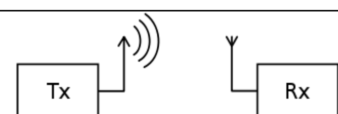
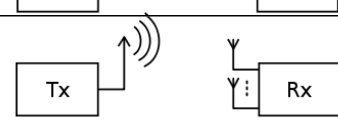
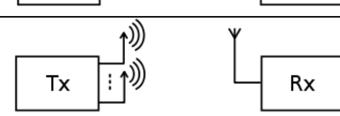
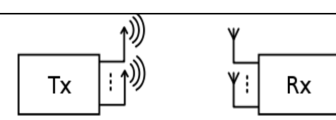
Narmala Raju
Assoc.prof., ECE Dept.
Jyothishmathi Institute of Technology and Science, KNR
narmalaraju@gmail.com, 9989558851

Abstract: ***In this paper we propose a new technique for the pilot assisted power delay estimation for the LMMSE channel estimator for the multiple input and multiple output OFDM system. The distortions due to the null subcarriers and the distortions due to the insufficient samples are also considered. The simulation results show that the proposed PDP estimator gives the good performance in estimating when compared to the weiner filter and kalman filtering.***

Keywords: MIMO, OFDM

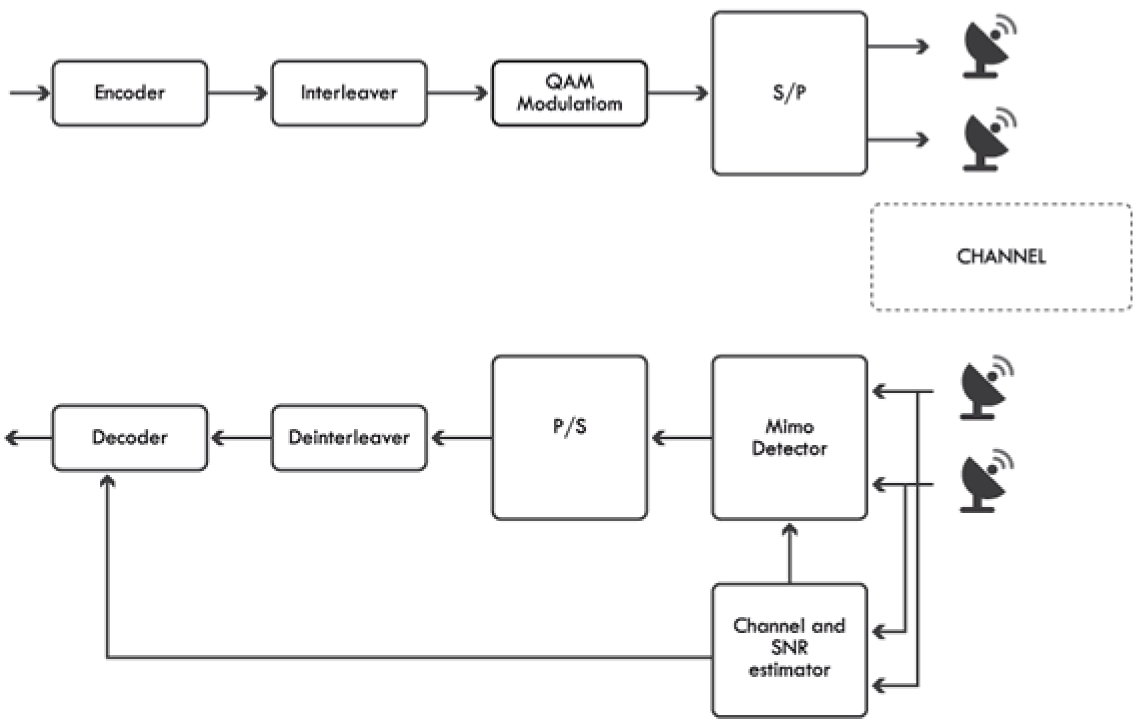
I. INTRODUCTION

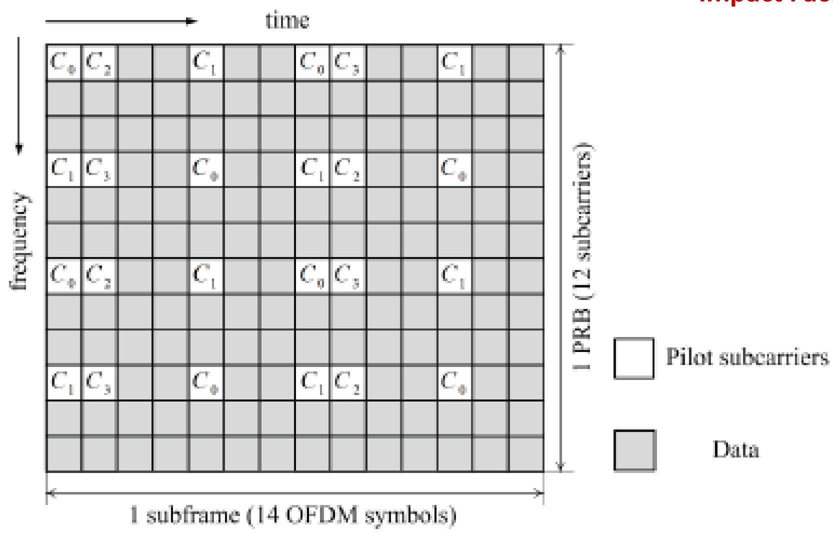
Digital communication using multiple-input-multiple-output (MIMO) has been regarded as one of the most significant technical breakthrough modern communications. In this, the overview of recent progress in the area of MIMO system is introduced. A key feature of MIMO system is the ability to turn multi-path propagation, traditionally a pitfall of wireless transmission, into a benefit for the user. There are a simple category of multi-antenna types:

Multi-antenna types		
SISO	Single-input-single-output means that the transmitter and receiver of the radio system have only one antenna.	
SIMO	Single-input-multiple-output means that the receiver has multiple antennas while the transmitter has one antenna.	
MISO	Multiple-input-single-output means that the transmitter has multiple antennas while the receiver has one antenna.	
MIMO	Multiple-input-multiple-output means that the both the transmitter and receiver have multiple antennas.	

MIMO exploits the space dimension to improve wireless systems capacity, range and reliability. It offers significant increases in data throughput and link range without additional bandwidth or increased transmit power. MIMO achieves this goal by spreading the same total transmit power over the antennas to achieve an array gain that improves the spectral efficiency (more bits per second per hertz of bandwidth) or to achieve a diversity gain that improves the link reliability (reduced fading).To improving the performance of LMMSE channel estimation employs another approach (i.e. uniform or exponential model) with the estimation of second channel Statistics they are mean delay and root-mean-Square (RMS) Delay spread. By using the pilots we can estimate the channel delay parameters with the low computational complexity. Therefore, the LMMSE channel estimator with the approximated PDP is suitable for sensible applications like a WiMAX system. However, the correlation mismatch and estimation error of delay parameters are caused by the degradation performance in approximated PDP estimation technique.

II. MIMO - OFDM SYSTEM MODEL

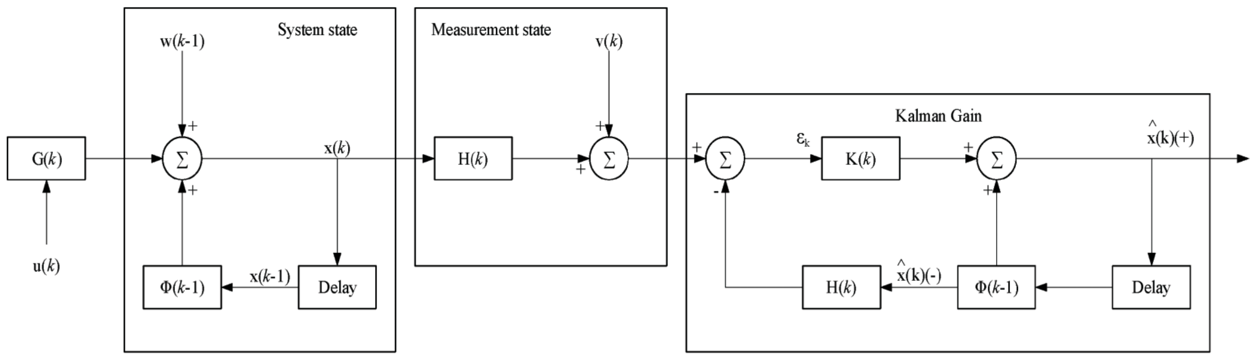




In Orthogonal Frequency Division Multiplexing (OFDM) system, information can be transmitted and received by utilizing multi-carrier modulation technique to increase system capacity. When a signal is transmitted through a channel, it suffers frequency drift and timing jitter when the channel is not ideal. It needs at the receiver to estimate or determine the frequency drift and timing jitter to the extent that it can correctly decode the transmitted signal. Furthermore it makes the situation more complicate if the channel has time varying characteristics. Many channel estimation techniques, such as Least Square Estimation , Minimum Mean-square Error Estimation , Regression Least Square Calculation and Kalman filtering have been proposed and implemented in many applications and each estimation technique has its own merit to be applied in certain special application. In OFDM system, it is evidenced from many research results that it is a feasible process to estimate the channel characteristics by transmitting pilot signals through the channel and analyze their received signals at the receiver end. In this paper we will combine the algorithms of Minimum Mean-square Error and Kalman filtering to estimate the channel characteristics by simulating the environment when pilot signals are transmitted through a noise affected and signal strength faded OFDM system. We use MMSE algorithm as the first step in the channel estimation process for a fast or slow fading wireless communication environment, and by utilizing this algorithm to investigate the effect of intersymbol interferences on the transmitted signal when the channel does not have ideal characteristics. With this MMSE operation the estimated channel response can be generated, we then use this estimated channel response as the initial condition for a Kalman filtering algorithm so that the channel characteristics can be estimated iteratively through this Kalman filtering when pilot signals are continuously transmitted through the channel.

K.Venkata Ramana *et al*, International Journal of Computer Science and Mobile Applications,
Vol.5 Issue. 11, November- 2017, pg. 76-82 ISSN: 2321-8363
Impact Factor: 5.515

III. KALMAN FILTERING FOR CHANNEL ESTIMATION IN MIMO OFDM



The system state equation in the Kalman filtering is defined as a linear stochastic difference equation:

$$x(k) = \Phi(k) * x(k-1) + G(k) * u(k) + w(k)$$

where *x* (*k*) is the system state vector at time *k*, *u* (*k*) is the system control vector at time *k*, *G* (*k*) is the input control matrix, is the state transition matrix, and *w* (*k*) is the plant noise vector and *w*(*k*) is assumed to be white Gaussian noise with covariance matrix *Q* (*k*) and it is assumed to be uncorrelated with system state.
The measurement state equation in Kalman filtering can be defined as:

$$z(k) = H(k) * x(k) + v(k)$$

where *z* (*k*) is the measurement vector at time *k*, *H*(*k*) is the parameter in the measurement system, it is a matrix when it is a multi-parameter measurement system, and *v* (*k*) is measurement noise vector and *v* (*k*) is assumed to be white Gaussian distribution with covariance matrix *R* (*k*) and to be uncorrelated with system state.

IV. EXTENDED KALMAN FILTERING

Let us consider a MIMO OFDM system with N_T antennas the relation between the transmit and received signal can be expressed as

$$X[n,k] = P[n,k]H[n,k] + n[n,k]$$

Where P[n,k] denotes the Pilot symbols then

$$H[n,k] = \widehat{P^{-1}[n},k]X[n,k]$$

Thus the channel state information can be achieved by applying the inverse Fast Fourier transform to the transfer function and we can conclude that

$$h_l[n] = \widehat{h_l[n]} + Z_l[n]$$

Where Z is a zero mean complex Gaussian vector distribution

V. PROPOSED MEHTOD FOR CHANEEL ESTIMATION

For improving the performance of LMMSE channel estimation employs an approximated (i.e., uniform or exponential model) with the estimation of second-order channel statistics, which are mean delay and root-mean-square (RMS) delay spread. The channel delay parameters are estimated using pilots with low computational complexity. Therefore, the LMMSE channel estimator with the approximated PDP is appropriate for practical applications such as a WiMAX system. However, the performance degradation is caused by both the correlation mismatch and the estimation error of delay parameters. To reduce the mismatch in the frequency domain, we propose a PDP estimation technique for the LMMSE channel estimator of MIMO-OFDM systems. For practical applications, the proposed technique uses only the pilot symbols of all transmit antenna ports to estimate the PDP with low computational complexity. In addition, the proposed technique effectively mitigates the distortion effects, incurred by null subcarriers and an insufficient number of estimated channel impulse response (CIR) samples. Simulation results show that the performance of LMMSE channel estimation with the proposed PDP estimate approaches that of Wiener filtering.

VI. SIMULATION RESULTS

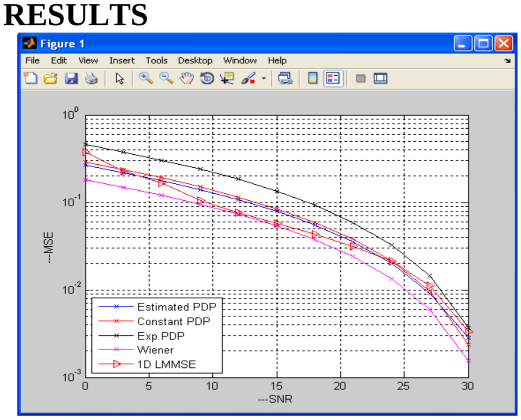


Fig: Performance of LMMSE technique using the estimated PDP over ETU channel.

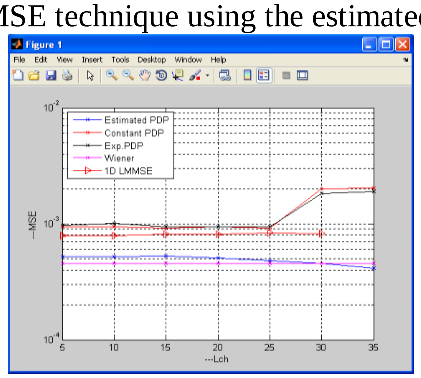


Fig: Performance of LMMSE technique using the estimated PDP over 6-ray exponential channel with variable channel maximum delays (Pilot SNR= 30dB)

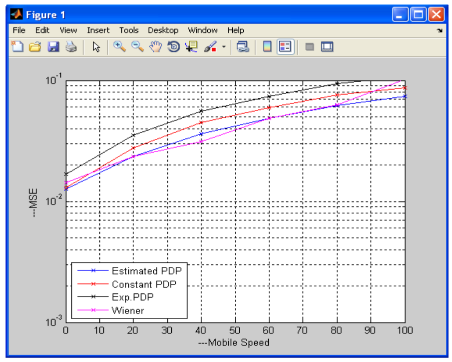


Fig: Performance of LMMSE technique using the estimated PDP over ETU channel with different mobile equipment speeds (Pilot SNR= 30 dB and Doppler frequency = 9.26 – 203.7 *Hz*).

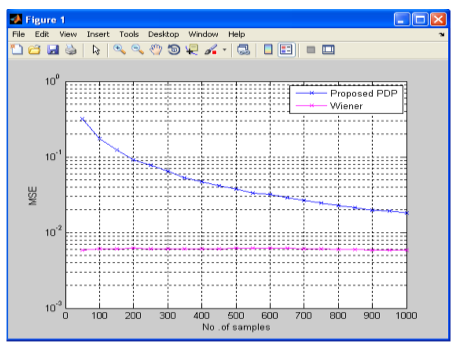


Fig: Simulation and analysis results of LMMSE channel estimation over ETU channel with various number of samples for the PDP estimation (Pilot SNR= 20 *dB*).

VII. CONCLUSION

We proposed an improved power delay profile estimation in multiple input multiple output orthogonal frequency division multiplexing (MIMO-OFDM) systems under linear minimum mean square error (LMMSE) channel**.** The CIR estimates at every path of the MIMO channels were used to obtain the PDP. For correct PDP estimation, we consider the spectral leakage effect from virtual subcarriers, and also the residual noise caused by the in sufficient number of estimated CIR samples. The proposed technique effectively reduces the both spectral leakage and residual noise. Simulation results show that the performance of LMMSE channel estimation using different PDP estimation techniques .the outputs of proposed PDP estimate approaches that of extended Kalman filtering.

REFERENCES

[1] TS 36.211, "Physical channels and modulation," in 3GPP TSG RAN1 Rev. 10.1.0, January 2011
[2] TS 36.101, "User equipment (UE) radio transmission and reception," in 3GPP TSG RAN1, Rev. 10.1.0, Jan. 2011.
[3] K. C. Hung and D. W. Lin, "Pilot-based LMMSE channel estimation for OFDM systems with power-delay profile approximation," IEEE Trans. Vet Technol., vol. 59, pp. 150-159, Jan. 2010
[4] T. W. Yune, C. H. Choi, G. H. I'm, J. B. Lim, E. S. Kim, Y. C. Cheong, and K. H. Kim, "SC-FDMA with iterative multiuser detection: improvements on power/spectral efficiency," IEEE Communication Mag., vol. 48, no. 3, pp. 164-171, Mar. 2010.
[5] M. G. Song, D. Kim, and G.H. I'm, "Recursive channel estimation method for OFDM-based cooperative systems," IEEE Commun. Lett. vol. 14, no. 11, pp. 1029-1031, Nov. 2010.

