ABSTRACT

The widely used channel predictor today is Wiener filter-based channel predictor, where the channel is assumed to be random and has time invariant correlation value. Based on the principle of quasi static, in the short observation time interval the channel tends to be deterministic and has time variant correlation value. This makes Wiener filter-based channel predictor can not yield minimum mean squared error. To solve this problem the filter should accomodate the deterministic properties and the correlation value fluctuation of the channel. This can be achieved by polinomially extrapolating the channel correlation value.

This study conducted performance evaluation of conventional Wiener filter and Wiener filter with polinomial extrapolation modification. The performance was evaluated by varying the carrier frequencies, receiver velocities, symbol rates and the filter orders. The performance evaluation is the error percentage of the prediction. However, the polinomial extrapolation performance for the noise was also observed.

The results of the simulations show that at high symbol rate, the polinomial extrapolation effectiveness does not tightly depend on the Doppler frequency and it is able to work more effectively in the low order filter. The noiseless channel prediction at the symbol rate of 120000 symbol/s to 1020000 symbol/s, receiver velocity of 60 m/s and carrier frequency of 2000 MHz, β (n+1) prediction using the first order of polinomial extraplation filter has a prediction error percentage reduction of 11.12% to the conventional Wiener filter; while β (n+2) prediction has a prediction error percentage reduction of 52.67%. At high symbol rate and in the influence of 10 dB of AWGN, $|\beta(n+2)|$ prediction using the first order of polinomial extraplation filter has an accuracy which could not be achieved by various orders of conventional Wiener filter. The results of $|\beta(n+2)|$ prediction simulation at various velocity, carrier frequency of 2000 MHz and symbol rate of 520000 symbol/s indicated that $|\beta(n+2)|$ prediction using first order of polinomial extraplation filter has prediction error percentage of 29.78%; while various orders of conventional Wiener filter has the minimum prediction error percentage of 43.05%.