**ABSTRACT**

A least squares (LS) channel estimation scheme for multiple-input multiple-output (MIMO) orthogonal frequency division multiplexing (OFDM) systems based on pilot tones. We first compute the mean square error (MSE) of the LS channel estimate. We then derive optimal pilot sequences and optimal placement of the pilot tones with respect to this MSE. We propose Fast Harmony search Algorithm shown that the optimal pilot sequences are equipowered, equispaced, and phase shift orthogonal. To reduce the training overhead, an LS channel estimation scheme over multiple OFDM symbols is also discussed. Moreover, to enhance channel estimation, Fast Harmony search Algorithm is proposed, for which we derive the optimal forgetting or tracking factor. This factor is found to be a function of both the noise variance and the channel Doppler spread. Through simulations, it is shown that the optimal pilot sequences derived in this paper outperform both the orthogonal and random pilot sequences. It is also shown that a considerable gain in signal-to-noise ratio (SNR) can be obtained by using the RLS algorithm, especially in slowly time-varying channels.