ABSTRACT

Modulation recognition of the detected signal is one of important topics on intelligent receiver system used for military and commercial applications. Due to the limited knowledge of the transmitted signal parameter such as signal power, timing information, the carrier frequency and phase offset, modulation recognition can be a difficult task. The recognition process will be more complex (can be very complicated) when the received signal has passed through multipath fading channels, frequency - selective and time varying.

Recently, wireless industries show a great interest in orthogonal frequency division multiplexing (OFDM) due to its efficiency which does not require complex equalizer. (Therefore) This research explored the classifications of the OFDM signal modulation scheme namely QPSK, 16-QAM and 64-QAM. The OFDM signal was simulated to pass through a multipath channel (frequency slective fading) and AWGN (Additive White Gaussian Noise). The multipath channel model applied ITU large delay spread and Smith fading channel model. The classification system was developed using statistical feature extraction with a decision diagrams (tree diagram) as a classifier optimized by PSO algorithm.

The results showed that the dominant statistical features that were capable of distinguishing the three modulation schemes were the second order moment, tenth order moment and twentieth order moment with a logarithmic operation. The increasing number of OFDM symbols in the classification process that applied a voting system improved the accuracy of the classification of each modulation scheme. The optimum accuracy of the classification had been obtained when five OFDM symbols were applied in the classification scenario. The accuracy was 100% for QPSK classification, 99 % for 16-QAM classification and 96 % for 64-QAM classification on the minimum SNR accepted by the receiver of a system that applied a standard WiMax IEEE 802.16e.

Keywords: classification, modulation schemes, OFDM, statistical characteristics, euclidien distance, PSO.