ABSTRACT

Modulation schemes classification is an ability to estimate the characteristics of any radio signals and determine the correct modulation scheme based on those characteristics. This final project will cover modulation schemes classification based on the reconstructed constellation at the receiver. This is possible by treating constellation diagram as the unique feature of each modulation. QPSK, 16 QAM, and 64 QAM will be used on this project.

Constellation diagram is reconstructed from N x 2 vector which are produced by the correlator detector as *in-phase* and *quadrature* component. Constellation which is corrupted and distorted by noise and fading will be reconstructed using fuzzy c-means algorithm. Min-max-median algorithm is used to initialize the reconstruction. Three different cluster validity method is used to classify the signal: *minimum hard tendency*, *mean hard tendency*, and *non-fuzziness index*. In order to counter the nature of multipath fading channel, blind adaptive equalizer is also implemented on this research. Simulation was carried out at AWGN channel and Rayleigh fading channel and also performed in several different SNR to examine the system's performance.

Using AWGN channel, the system correctly classify QPSK at all SNR. Additionally, 16 QAM is correctly classified down to 9 dB with 91% accuracy rate and 64 QAM is correctly classified down to 17 dB SNR with 97% accuracy rate. The system also performed correct classification with more than 90% accuracy rate for 16 QAM down to 14 dB SNR at Rayleigh fading channel.

Keywords: *modulation schemes classification, pattern recognition, constellation diagram, fuzzy c-means, min-max-median, clustering validity*