ELECTRICAL ENGINEER

CLASSIFICATION OF DIGITAL MODULATION TYPES IN MULTIPATH ENVIRONMENTS

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As the expansion of digital communication applications still continues, the need for automated classification of digital modulation types increases. This study attempts to give a partial solution to this problem by proposing a classification scheme which identifies nine of the most popular digital modulation types; namely 2-FSK, 4-FSK, 8-FSK, 2-PSK, 4-PSK, 8-PSK, 16-QAM, 64-QAM and 256-QAM. Higher-order statistics parameters are selected as class features, and a hierarchical neural network-based classifier set-up proposed for the identification of all modulation types considered except those within the M-QAM family. Specific M-QAM types identification is obtained via equalization-based schemes. This study considers the effects due to real-world multipath propagation channels and additive white Gaussian noise. Results show a consistent overall classification performance of at least 68% for severe multipath propagation models and for SNR levels as low as 11dB.

DoD KEY TECHNOLOGY AREAS: Electronics, Electronic Warfare

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QUALITY OF SERVICE ANALYSIS IN MOBILE AD-HOC NETWORKS

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This thesis proposes schemes to provide Quality of Service (QoS) in mobile ad-hoc networks (MANETs). To achieve QoS, independently of the routing protocol, each mobile node participating in the network must implement traffic conditioning, traffic marking and buffer management (Random Early Drop with in-out dropping) or queue scheduling (Priority Queuing) schemes. In MANETs, since the mobile nodes can have simultaneous multiple roles (*ingress, interior* and *destination*), it was found that traffic conditioning and marking must be implemented in all mobile nodes acting as source (*ingress*) nodes. Buffer management and queue scheduling schemes must be performed by all mobile nodes.

By utilizing the Network Simulator (NS2) tool, this thesis focused on the empirical performance evaluation of the QoS schemes for different types of traffic (FTP/TCP, CBR/UDP and VBR/UDP), geographical areas of different sizes and various mobility levels. Key metrics, such as throughput, end-to-end delay and packet loss rates, were used to measure the relative improvements of QoS-enabled traffic sessions. The results indicate that in the presence of congestion, service differentiation can be achieved under different scenarios and for different types of traffic, whenever a physical connection between two nodes is realizable.

DoD KEY TECHNOLOGY AREA: Command, Control, and Communications

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