UNDERWATER TARGET CLASSIFIER USING A MODIFIED TRANSFORM BASED FEATURE SET

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ABSTRACT

Underwater target classification has been a domain of considerable importance due to its immense applications in sonar engineering. Various classification schemes have been evolved over the time, taking into account, the aspects that can maximize the system performance. The judicious selection of source specific features in a classifier system determines its efficiency and performance in a broad perspective. Discrete sine transform (DST) possesses the essential traits suitable for the extraction of target specific features from underwater signals. The DST based features can be modified by the application of second degree Hermite polynomial functions. The Hermite polynomial modified DST feature set can be efficiently incorporated onto a suitably formulated Hidden Markov Model(HMM) which provide a robust architecture that can be utilized in the classification of underwater noise sources. The modeling and performance analysis of a 20-state HMM based classifier for underwater targets in Gaussian ambient noise and in nonlinear channel conditions have been presented in this paper. The Hidden Markov Models utilizing these modified DST based feature sets are found to perform efficiently in underwater target classification scenario. The system performance has been simulated for a variety of underwater signals and the results have also been summarized in this paper.

KEYWORDS: Discrete Sine Transform, Hermite Polynomials, K- Means Algorithm, Hidden Markov Models, State Transition Probabilities