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Entwicklung und Vergleich geeigneter Algorithmen zur Verbesserung der Detektions- und Klassifikationsleistung eines Taucherdetektionssonars.

ABSTRACT - Masterthesis

Underwater combat divers and small submarine vehicles pose a risk for ships and harbours. The small target strength and the low echo level of these objects require special tasks for the detection. These can be reached with active high frequency sonar sensors and specially optimized signal processing steps. However, the false alarm rate of the available sensors for fully automated operation is still too high. In this thesis the false alarm rate of a diver detection sonar (DOS) is reduced by using a machine learning algorithm for classifying detected echoes. For applying a classification algorithm, in a first step features have to be worked out to distinguish between targets and non targets. The used features are explicitly described and analysed e.g. by determining their receiver-operating-characteristic (ROC) curves. Moreover, it is necessary to select the best feature space for classification. Therefore, the correlation of the features was examined and the principal component analysis (PCA) and the sequential forward selection (SFS) were implemented.

For reducing the false alarm rate, different classification algorithms (Expert system, K-Nearest-Neighbour, Support-Vector-Machine, Gaussian-Mixture-Model, Adaptive Boosting) were evaluated. Furthermore, their performance was analysed and compared by applying the trained classifiers on different real sonar datasets.