Adaptive Clutter Density in Multi-Hypothesis Tracking

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Abstract: In underwater surveillance active sonar is an important technological asset. Compared to passive sonar it features higher detection ranges and enables the detection of silent objects. As a drawback the interaction of sound waves with the seabed and the water surface causes false alarms, named clutter. False alarms usually appear randomly and variable in time and space. To distinguish false alarms from true contacts the Multi-Hypothesis Tracking approach can be used. This approach incorporates the density of sonar contacts to extract possible target tracks. Thus, the assumed clutter density influences, amongst others, the performance of this tracking approach.
This paper presents a method for determining the clutter density adaptively. It considers positions of all sonar contacts within one measurement and thereby approximates the actual clutter density precisely. The influence on the tracking results using adaptive clutter density in a multi-hypothesis tracker is shown by applying the algorithm to two multistatic sonar datasets and comparing it to results obtained by tracking using constant clutter density. Tracking performance is quantified by existing tracking performance metrics.