

Sensor Registration in Multi-Static Sonar Fusion Detection

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Abstract : In order to prevent target splitting and ensure the accuracy of fusion, system error registration is an important step in multi-static sonar fusion detection system. To eliminate the inherent system errors including distance error and angle error of each sonar in detection, this paper uses offline estimation method for error registration. Suppose several sonars from different platforms work together to detect a target. The target position detected by each sonar is based on each sonar's own reference coordinate system. Based on the two-dimensional stereo projection method, this paper uses real-time quality control (RTQC) method and least squares (LS) method to estimate sensor biases. The RTQC method takes the average value of each sonar's data as the observation value and the LS method makes the least square processing of each sonar's data to get the observation value. In the underwater acoustic environment, matlab simulation is carried out and the simulation results show that both algorithms can estimate the distance and angle error of sonar system. The performance of the two algorithms is also compared through the root mean square error and the influence of measurement noise on registration accuracy is explored by simulation. The system error convergence of RTQC method is rapid, but the distribution of targets has a serious impact on its performance. LS method can not be affected by target distribution, but the increase of random noise will slow down the convergence rate. LS method is an improvement of RTQC method, which is widely used in two-dimensional registration. The improved method can be used for underwater multi-target detection registration.

Keywords : data fusion, multi-static sonar detection, offline estimation, sensor registration problem

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