This dissertation investigates the problem of tracking a maneuvering target from passive acoustic sensors of uncertain position. A batch oriented maximum a posteriori (MAP) algorithm using an expanded state vector is used to accurately estimate both the sensor’s location and target trajectory from the data. Three sensor motion models are developed and compared under a variety of tracking scenarios. Additional tracking improvement is achieved through the use of transient signal processing. Two new wavelet-based time difference of arrival estimation methods are developed and compared to classical techniques. Testing on a variety of transient signals demonstrates that improved performance over the classical methods is achieved. The practicality and viability of the proposed techniques is confirmed through the modification and testing of a state of the art acoustic tracking system.

DoD KEY TECHNOLOGY AREA: Sensors, Target Tracking

KEYWORDS: Target Tracking, Non-Linear Estimation, Wavelet Analysis