

# DOCTOR OF PHILOSOPHY

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## PASSIVE TARGET TRACKING WITH UNCERTAIN SENSOR POSITIONS USING WAVELET-BASED TRANSIENT SIGNAL PROCESSING

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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

