Remote Detection using Fused Data

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August 31, 1994

Awarded 1995

[1]This work was supported by the Opto-Electronics Division, Surveillance Research Laboratory of the Defence Science Technology Organisation, Australia, the Department of Electrical and Electronic Engineering, the University of Adelaide, Australia, and the Cooperative Research Centre for Sensor Signal and Information Processing, the Levels, Pooraka, South Australia, 5095.

Abstract

The problem is detecting and tracking objects at large ranges, when no target features are visible, with imaging type sensors. A system is developed which estimates the optical flow of the scene in a parallel architecture similar to that of an artificial neural network. From the estimated motion of the scene, hypotheses are determined about the object type. These hypotheses are determined in a manner which leads to a bounded probability range driven by the data and which incorporates doubt and allows fusion of information from other sensors along similar lines to Dempster-Shafer reasoning. An uncertain probabilistic approach to decision making is employed so that sparse decision spaces and noisy data don't cause biased decisions due to generalisation. Incorporation of information from a different sensor type enables false objects caused by correlated noise sources such as multipath reflections to be removed.

The approach is designed to operate in a parallel architecture in high noise, high resolution situations where conventional approaches scale very poorly, consequently it is not envisaged that the approach presented in this thesis will compete with more conventional approaches which are applicable in different problem domains. The approach is proved and is simulated using both real and artificial information. The real test data comes from an IR array and a passive sonar sensor.

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