Multi-Modal Evidence Filtering in Wireless Sensor Networks

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Abstract

A novel framework named ***Dempster-Shafer Information Filtering*** for information processing in Distributed Sensor Networks (DSNs) is presented. Moreover, distributed algorithms to implement spatio-temporal filtering applications in grid sensor networks are presented within the context of the framework. The framework facilitates processing multi-modality sensor data with a high noise level. Moreover, we compare intuitively appealing results against Dempster-Shafer fusion to grant further credence to the proposed framework.

The concept of the proposed framework is based on the belief notions in Dempster-Shafer (DS) evidence theory. It enables one to directly process temporally and spatially distributed multi-modality sensor data to extract meaning buried in the noise clutter. Certain facts on filter parameter's selection impose several challenges in the design of the Information Filter. This is analysed using a fire propagation scenario when high noise is present in the sensed data. Information bandwidth and the sluggishness of the filter are traded-off to minimise the effect of the noise in the output evidence signal.

From the application point of view, we address a Wireless Sensor Network (WSN) deployed in a multi-stoery building which can be effectively used to convey information to relevant parties (firefighters in their rescue operations) during an emergency situation. Therefore, a fire propagation scenario is simulated to illustrate the applications and justify the proposed framework.

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I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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