

# IEEE Signal Processing WA Chapter Seminar

**Time: Wednesday (March 17, 2015) 3:30pm**

**Venue: Building 314 rm 134, Curtin University, Bentley Campus**

This is a free event, open to both IEEE and non-IEEE members.

## **Title:**

The Labelled Multi-Bernoulli filter and its Applications in Autonomous Vehicles

## **Abstract:**

The aim of multi-object tracking is the estimation of the number of objects and their individual states using a sequence of measurements. While state of the art algorithms use object individual single-object trackers, the multi-object Bayes filter models the multi-object state as well as the measurement process using random finite sets which naturally represent the uncertainty in the number of objects as well as in the state of the objects. During the last decade, several tractable approximations of the multi-object Bayes filter (Probability Hypothesis Density (PHD) filter, Cardinalized PHD (CPHD) filter, and multi-Bernoulli (MB) filter) have been proposed based on the statistical moments or the parameterization of the multi object probability density. However, these approximations are prone to unstable cardinality estimates, the influence of missed detections on well-separated objects ("spooky effect"), or a biased cardinality estimate.

In this presentation, the labelled multi-Bernoulli (LMB) filter is presented. The LMB filter approximates the multi-object posterior density using labelled multi-Bernoulli random finite sets and applies the exact update equations of the Generalized Labelled Multi-Bernoulli filter which results in an accurate and real-time capable tracking algorithm. Using the class of labelled random finite sets, the LMB filter further estimates target tracks and does not require heuristic post-processing algorithms like e.g. the PHD or CPHD filter. In this talk, several applications of the LMB filter in the context of intelligent vehicles will be presented. Beside the realization of the multi-object tracking module for our autonomous Mercedes E-Class, I will also introduce current developments like e.g. LMB-SLAM (Simultaneous Localization and Mapping).

## **Biography:**

Stephan Reuter received a Diploma degree (equivalent to M.Sc. degree) in electrical engineering from Ulm University, Germany, in 2008. Afterwards, he joined the Institute of Measurement, Control and Microtechnology in the school of Engineering and Computer Science at Ulm University as a research assistant. In 2014, he received the Dr.-Ing. degree (equivalent to Ph.D.) from Ulm University for his thesis entitled "Multi-Object Tracking Using Random Finite Sets". His main research topics are sensor data fusion, multi-object tracking, environment perception for intelligent vehicles, and sensor data processing.