

## FUSION 2017 TUTORIAL PROPOSAL

**TITLE:** Implementations of random-finite-set-based multi-target filters

**PRESENTER:** Ba-Ngu Vo

**INTENDED AUDIENCE:** Anyone who is interested in multi-target tracking.

**DESCRIPTION:** In this tutorial, we show how the random finite set multi-target filters are implemented, and illustrate via Matlab how they work. Matlab code for these filters will be provided to all participants. The random finite set framework for multi-sensor multi-target tracking has attracted considerable interest in recent years. It provides a unified perspective of multi-target tracking in a very intuitive manner by drawing direct parallels with the simpler problem of single-target tracking. This framework has led to the development of well-known multi-target filters such as the Probability Hypothesis Density (PHD), Cardinalized PHD (CPHD), Multi-Bernoulli filters and a recent advance, the Generalized Labeled Multi-Bernoulli filter. In particular, the tutorial will present the implementations of the

(1) PHD filter

(2) CPHD filter

(3) Generalized Labeled Multi-Bernoulli filter—a Bayes optimal multi-target tracker capable of tracking thousands of targets on a laptop.

It is envisaged that participants will come away with sufficient know-how to implement and apply these algorithms in their work.

**PREREQUISITES:** Working knowledge of random variable, probability density function, Gaussian distribution, and concepts such as state space models.

### About the presenter:

Ba-Ngu Vo received his B.Sc. degree in Pure Mathematics and B.E. degree in Electrical Engineering with first class honors in 1994, and PhD in 1997. He had held various research positions before joining the department of Electrical and Electronic Engineering at the University of Melbourne in 2000. In 2010, he joined the School of Electrical Electronic and Computer Engineering at the University of Western Australia as Winthrop Professor and Chair of Signal Processing. Currently he is Professor and Chair of Signals and Systems in the Department of Electrical and Computer Engineering at Curtin University. Prof. Vo is a recipient of the Australian Research Council's inaugural Future Fellowship. He was a recipient of the 2010 Australian Museum DSTO Eureka Prize for "Outstanding Science in Support of Defence or National Security". His research interests are Signal Processing, Systems Theory and Stochastic Geometry with emphasis on target tracking, robotics, computer vision and space situational awareness.