TRAX is an Initial Training Networks (ITN) research project sponsored by the EU under the Marie Curie actions in the 7th Framework Program. TRAX concentrates on Tracking in Complex Sensor Systems, focussing on complexities due to large volumes of data, complex object dynamics and measurement models, as well as large scale systems. The project starts October 1st 2013, will run 4 years and is led by Thales NL.

The project partners are a well-known and well-respected mixture of academia, research institutes, small and large business companies, including Lancaster University and Rinicom from the United Kingdom, Linköping University and Ericsson from Sweden, Fraunhofer FKIE from Germany, and University of Twente, Xsens and Thales from The Netherlands.

TRAX is hiring 12 Early Stage Researchers (ESR) acting as PhD students, and 3 Experienced Researchers (ER) in the role of PostDoc.

An extensive training program is part of the project involving an impressive array of courses, secondments within and outside the consortium and yearly Summer Schools for stimulating the exchange of results.

This flyer provides brief descriptions of the various individual research projects within TRAX.

**Thales Nederland (NL) research vacancies (2ESR + 1ER)**

“Smart tracking for wide area surveillance”

Development of effective methods for information extraction out of huge amounts of data gathered by modern wide area surveillance sensor systems. Efficient algorithmic solutions, e.g. based on Particle Markov Chain Monte Carlo, particle flow and sparseness, will be investigated for enabling this extraction.

“Modelling and estimating complex radar objects”

Tracking and classification of complex radar objects through the use of sophisticated models will require extra state variables and parameters. The challenge is the development of such sophisticated object and observation models as well as associated methods for dealing efficiently with the increase in this particular form of model complexity.

“Efficient tracking of closely-spaced and interacting objects”

Development of efficient methods for tracking and labelling of objects that are (extremely) closely spaced and/or interacting. Methods like Particle Markov Chain Monte Carlo, Random Finite Set formulations, group tracking and object labelling and their combinations will be explored to derive those methods.

Info: Hans Driessen (hans.driessen@nl.thesalesgroup.com)

**Ericsson (SE) research vacancies (1ESR + 1ER)**

“Temporal representation of terminals and radio environment”

New algorithms for determining trend and flow properties of combined device trajectory data from a large number of devices to assess radio link performance variability over time. The research task is to propose and demonstrate new trend and flow estimation mechanisms for radio link performance including both short term and long term statistics extending the Bayesian fusion perspective to encompass also the time dimension.

“Spatial representation of terminals and radio environment”

New algorithms for combining information from multiple device trajectories with uncertainties in both positioning and associated radio measurements using and extending Bayesian smoothing ideas. The research task is to propose and demonstrate new information combination approaches based on a Bayesian fusion perspective.

Info: Fredrik Gunnarsson (fredrik.gunnarsson@ericsson.com)

**Rinicom Ltd. (UK) research vacancies (2ESR)**

“Algorithms for practical night vision surveillance systems with large data”

The development, analysis and optimisation of new video analytics algorithms for low resolution video streams generated during the night time surveillance with large data. The research task is to propose and demonstrate the feasibility of the proposed new algorithms. The accuracy and quality of the developed algorithms will be determined both by simulations and practical trials.

“Metadata Interoperability for fusion platform”

To develop, analyse and optimise metadata interoperability for the developed fusion platform. The research task is to propose and demonstrate the feasibility of the proposed metadata interoperability algorithms both by simulations and practical trials.

Info: Garik Markarian (garik@rinicom.com)

**Twente University (NL) research vacancy (1ER)**

“Efficient state and parameter estimation in very large systems”

The goal in this project is to develop techniques/methods for efficient estimation of state and parameters in complex systems. The system structures will be studied and exploited to develop efficient techniques and better algorithms for state and parameter estimation in high-dimensional systems. Amongst others, proposal densities that will help with high-dimensional situation will be studied and characterized for specific system structures. The idea of ensemble particle filter will also be explored to handle large systems.

Info: Pranab Mandal (p.k.mandal@utwente.nl)
**Lancaster University (UK) research vacancies (2ESR)**

“Knowledge extraction from data”
The objectives for this project are simultaneous estimation and inference from heterogeneous sources. New algorithms for information extraction from complex, heterogeneous data will be developed using Bayesian approaches and extending ideas based on sparsity and compressed sensing.

“Tracking multi-target large scale systems”
This project focuses on tracking a large number of targets. The objectives are to develop nonparametric Bayesian methods and combine them with sequential Bayesian methods and resolve the problems that generic sequential Monte Carlo methods face in high dimensions. New methods will be developed that are able to deal with the high state dimensions, e.g., compressed sensing, and combined with Bayesian approaches. Transformation from the high dimensional state space to a lower dimensional state can cope with the high dimensionality. These approaches will be applied to e.g., vehicular transportation systems, tracking of large groups and crowds, security and surveillance systems.

*Info:* Lyudmila Mihaylova (mila.mihaylova@lancaster.ac.uk)

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**Fraunhofer FKIE (GE) research vacancies (2ESR)**

“Simultaneous segmentation and tracking in 3D point cloud data”
Processing of large amounts of sensor data (3D laser range sensing) for obstacle avoidance and motion control. Development of joint classification and tracking approaches; efficient segmentation and aggregation of sensor data into the relevant objects of traffic situations.

“Multi-sensor maritime traffic monitoring and surveillance”
The goal is to achieve a mid-to-long term traffic prediction and to generate a probability density map of vessel existence for maritime traffic surveillance. New methods will combine macroscopic/mesoscopic traffic flow models, e.g., continuum models from fluid dynamics, with Bayesian estimation theory and context information (knowledge bases).

*Info:* Martin Ulmke (martin.ulmke@fgan.fraunhofer.de)

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**Xsens Technologies B.V. (NL) research vacancy (1ER)**

“Inertial body tracking”
The goal is to develop robust optimization based estimation methods for large scale systems with an application to inertial human body tracking and parameter estimation, exploiting recent developments in numerical optimization and SLAM. The challenge is to ensure that inevitable modelling errors and contradicting sensors only affect the state vector locally, thus ensuring a manageable solution. The performance of the new algorithms will be validated on experimental data.

*Info:* Jeroen Hol (jeroen.hol@xsens.com)

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**Linköping University (SE) research vacancies (2ESR)**

“Identification of complex nonlinear systems”
The development of new algorithms for automatic calibration of unknown parameters in complex state space models, such as biomechanical systems for modelling body motion by exploiting recent developments in machine learning and convex optimization.

“Interpolation and model estimation aspects of large scale spatial data”
The development of new algorithms and models for spatial interpolation or radio measurements indoors. Bayesian approaches will be adopted to fuse measurement data uncertainty with measurement position uncertainty.

*Info:* Fredrik Gustafsson (fredrik@isy.liu.se)

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For general information about TRAX, please consult hans.driessen@nl.thalesgroup.com. For general information about ITN2013 projects including allowance terms and conditions, please consult the EU website http://ec.europa.eu/research/mariecurieactions/about-mca/actions/itn/index_en.htm.