

Research highlights

RESEARCH HIGHLIGHTS

The results made by the research groups of the Centre of Excellence are significant to the field and have a number of potential applications. Especially, the research groups of the Centre of Excellence have made significant contributions to the following subfields of inverse problems (see links for more information):

- [Electrical impedance tomography, or imaging the interior of living tissue or process pipelines using electric measurements on the boundary of the target,](#)
- [Cloaking and electromagnetic wormholes,](#)
- [General purpose incoherent scatter radar measurements,](#)
- [Detection of space debris,](#)
- [Three-dimensional medical X-ray tomography, where the inner structure of a patient is imaged from a set of X-ray images,](#)
- [Recovering the shapes and spin states of asteroids from light curve data,](#)
- [Adaptive Markov Chain Monte Carlo methods,](#)
- [Statistical inverse problems.](#)

Spinoff-companies

Numcore

[Numcore](#) offers measurement systems for process imaging and control. For the first time you can really see inside your process. Using innovative three-dimensional imaging technology, you can monitor the process on-line, enabling efficient and energy saving control of your process. Numcore products can be used in different fields of process industry, such as pulp & paper, mining, bioenergy, biofuel and food production. With Numcore products you get facts to support your operational experience to run your operation as effectively as possible, because you know what happens inside of the pipes and tanks.

The CoreApus, CoreHydra and CoreTucane measurement systems all comprise an electronic unit including current injection and voltage measurement units, a sensor part including measurement electrodes, and a computer for data analysis and process control. The systems can be extended to a maximum of 64 measurement channels and currents can be injected through several pairs of electrodes, enabling high accuracy in the 3D images. With one glimpse the operator can see the state of the process and then adjust the process parameters when necessary.

Numcore was established in December 2007 to commercialize the results of scientific research projects of the Inverse Problems group in the University of Kuopio, Finland. Numcore innovatively merges the experience and knowledge from the academic and the engineering worlds. The founders are leading experts in various fields of industry, academic research and financing. Numcore is owned by private shareholders.



CoreApus sensors.

Kuava Ltd

Kuava Ltd is a company specialised in computational technology. Kuava enhances customers' competitiveness by providing tools for developing processes and products to be more accurate, environmentally friendly and more efficient. The basis of these tools is in physical or statistical modelling and optimization. The employees of Kuava are professionals in the fields of physics, data analysis and computing. We model accurately phenomena related to processes or products, and implement simulators based on these models to meet customers' needs. In addition, plug-ins offered by Kuava can improve customers' own modelling and analysing tools. Process control and optimization expertise of Kuava enables model-based optimisation of physical and measuring data based models.