Industrial Process Tomography

2004 Meas. Sci. Technol. 15

(http://iopscience.iop.org/0957-0233/15/7/E01)

EDITORIAL

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Guest Editor

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Industrial process tomography remains a multidisciplinary field with considerable interest for many varied participants. Indeed this adds greatly to its appeal. It is a pleasure and a privilege to once again act as guest editor for a special feature issue of *Measurement Science and Technology* on industrial process tomography, the last being in December 2002. Those involved in the subject appreciate the efforts of *Measurement Science and Technology* in producing another issue and I thank the journal on their behalf.

It can be seen that there are considerable differences in the composition of material covered in this issue compared with previous publications. The dominance of electrical impedance and electrical capacitance techniques is reduced and there is increased emphasis on general utility of tomographic methods. This is encompassed in the papers of Hoyle and Jia (visualization) and Dierick *et al* (Octopus).

Electrical capacitance tomography has been a core modality for industrial applications. This issue includes new work in two very interesting aspects of image reconstruction: pattern matching (Takei and Saito) and simulated annealing (Ortiz-Aleman *et al*). It is important to take advantage of knowledge of the process such as the presence of only two components, and then to have robust reconstruction methods provided by pattern matching and by simulated annealing.

Although crude reconstruction methods such as approximation by linear back projection were utilized for initial work on electrical impedance tomography, the techniques published here are much more advanced. The paper by Kim *et al* includes modelling of a two-component system permitting an adaption-related approach; the paper by Tossavainen *et al* models free surface boundaries to enable the estimation of shapes of objects within the target. There are clear improvements on the previous crude and blurred reconstructions where boundaries were merely inferred rather than estimated as in these new developments.

Interest in magnetic induction tomography has evolved recently and I am pleased to note the inclusion of new work in that modality by Casanova *et al*. Note that this work also makes full use of prior information to improve reconstruction results.

A modality that is relatively new to industrial applications is featured by Holstein *et al*, namely acoustic tomography. The novelty is provided by using measurements of the speed of sound in gas (air) to identify temperature distributions. Two well chosen applications illustrate the technique.

Hard-field tomography, that is the modalities of x-ray and gamma-ray tomography, has always been of interest for some industrial applications. Often this has been for the high resolution of reconstructions available with these techniques, but there application has been restricted due to concerns about use of ionizing radiation. Cattle *et al* include an application to a process where the material to be imaged is a gamma emitter, i.e. only passive sources are used. The novelty here is that both source and attenuation information is used concurrently to obtain reconstructions.

I thank the authors for a fascinating collection of papers that reflect current interest in the subject of industrial process tomography.