

Image Fusion

Organiser

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Keywords

Processing of image series, variable image acquisition, multivariate image series, automated visual inspection

Scope

Information exchange and professional networking between researchers and developers

Abstract

Fusing information contained in images series plays an increasingly important role for quality inspection in industrial processes as well as in situation assessment for autonomous and assistance systems. The aim of image fusion in general is to use images as redundant or complementary sources to extract information which cannot be obtained by a single image or which offers higher accuracy or reliability for the inspection task. By using multiple images, the optical or theoretical restrictions that are often imposed during the image acquisition and processing can be avoided. Moreover, some innovative inspection principles require that images series are captured and processed in order to get the desired information.

The main concept of image fusion is to collect image information obtained by varying one or several imaging parameters, such as the position or spectral response of the camera, the use of polarization filters, the dynamic range or aperture settings. By means of suitable methods of multidimensional image processing or pattern recognition in the parameter space of the image series, the information of interest is extracted from the series. This information can further be used e.g. for quality assessment, traffic control, driver assistance or reconnaissance.

However, the challenges of image fusion are still numerous: for a certain class of inspection tasks, specific imaging configurations containing the desired information must be found. Furthermore, fusion techniques which are appropriate for the very type and quality of available data and which generate a result with the desired accuracy and reliability are needed. The designed fusion techniques should be easily interpretable in order to obtain traceable results. In addition, the algorithms must meet several requirements such as robustness against uncontrollable acquisition conditions or affordable calculation time in real-time systems.

Topic of interest

The objectives of this special session are to illuminate current innovative approaches in the rapidly developing field of image fusion and to give an impression of its large potential. The scope of the workshop covers the following areas:

- Physical measurement principles for image series
- Multivariate image series
- Bayesian image fusion
- Innovative methods and algorithms for the efficient and comprehensive evaluation of image series
- Applications for optical surface characterization and quality inspection of industrial products
- Applications for assistance systems for vehicles and production
- Image-based state monitoring for production and process engineering

Since image fusion will certainly gain more importance for many of these areas in the near future, the special session will help to identify common underlying challenges and to transfer research results to other application areas which have not been addressed yet.

This special session is intended for researchers and developers of visual inspection systems who are concerned with experimental and operational setups, methods and algorithms regarding image fusion.

Organiser's biography

Dr. Michael Heizmann (born 1971) received the M.S. degree in mechanical engineering in 1998 and the Ph.D. degree in automated visual inspection in 2004, both from the University of Karlsruhe, Germany. Since 2004, he is a Postdoctoral Research Assistant at the Fraunhofer Institute for Information and Data Processing IITB, Karlsruhe, where he heads the research group for Variable Image Acquisition and Processing. His research interests include image fusion, automated visual inspection, pattern recognition, and their applications in industrial quality inspection. He is author or co-author of about 30 national and international publications, head of the technical committee on Image Processing in Measurement and Automation Engineering of the VDI (Association of German Engineers), and has been organizer of several workshops and conferences on image processing and fusion, e.g.

- Special session "Fusion of multivariate sensor data" at the "IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems MFI 2006", Heidelberg, 03.-06.09.2006 (organization and session chair)
- Workshop "Image fusion" at the "37. Jahrestagung der Gesellschaft für Informatik e.V. (GI)", Bremen, 24.-28.09.2007 (organization and workshop chair)
- Conference "VDI/VDE-GMA-Fachtagung Bildverarbeitung in der Mess- und Automatisierungstechnik", Regensburg, 27.-28.11.2007 (organization and conference chair)

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