

# ERCIM



# NEWS

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Special theme:

# Image Understanding

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SECCRIT: Secure Cloud Computing  
for High Assurance Services

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Introduction to the Special Theme

# Image Understanding

by Michal Haindl and Josef Kittler

*Vision is the most important sense on which the majority of organisms depend for life. Scene reflectance properties in various spectral bands provide invaluable information about an object's characteristics, including its shape, material, temperature, illumination and dynamism. This information, however, is very difficult to capture with an electronic device. A real visual scene to be captured is subject to variable illumination as well as variable observation conditions. Furthermore, single objects of interest can be partially occluded or shaded, may be positioned at various distances from the capturing device, data can be noisy and / or incomplete; thus successful interpretation of imaging sensor data requires sophisticated and complex analytical methods and computing power.*

The wide availability of visual data and continuous advances in computer vision and pattern recognition techniques have stimulated a growing interest in novel applications, which successfully simulate human visual perception. This special issue presents a sample from the gamut of current research activities in this area, reflecting the wide spectrum of imaging and visualization (range observation) modalities and their combinations. These include the conventional static grayscale (Salerno et al) and colour images (Cardillo et al, Riesen et al, Li et al, Amato et al, Suk et al), satellite panchromatic and radar images (Craciun et al, van Lieshout), stereo images (Kadiofsky et al), magnetic resonance images (Roerdink, Murino et al), through dynamic video (Bak et al, Gaidon et al), and multi modal measurements such as spectral video and audio (van der Kreeft et al), range-thermal images (Guerrero), video-multi-beam LIDAR (Benedek et al), spectral-range video (Oikonomidis et al, Fotopoulos et al, Piérard et al, Rogez et al), and the frustrated total internal reflection images (Risse et al).

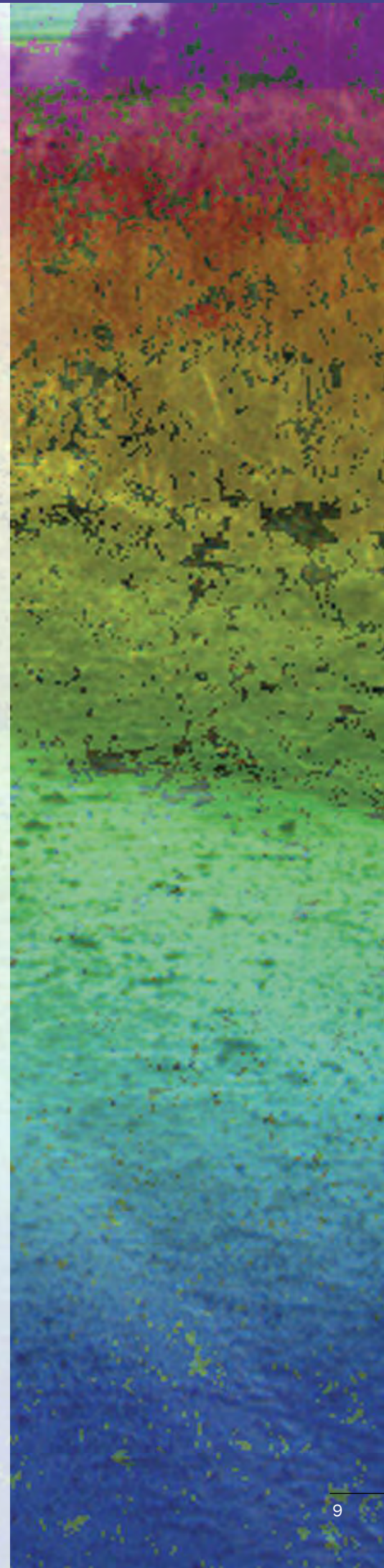
This issue unveils an impressive number of successful applications of visual scene understanding. Remote sensing applications are targeted in papers by Craciun et al (boat detection) and van Lieshout (field detection), document analysis is addressed in Riesen et al (handwritten word recognition in ancient manuscripts) and in Salerno et al (interferences removal). Biological studies feature in Risse et al (small translucent organisms detection and real time visualization of their internal structures) and Suk et al (leaf recognition based on visual contour features). Driver assistance systems are the topic of the contribution by Kadiofsky et al, while video shot detection is discussed in Kreeft et al and Li et al. Mixed reality is pursued by Benedek et al, and security by Bak et al (person identification) and Gaidon et al (human activities recognition). The fashionable topic of content-based image retrieval is discussed in Cardillo et al and Amato et al. Hand tracking is addressed in Oikonomidis et al. The most popular applications in the issue are medical applications. This group includes the papers of Guerrero (mental or physical disabilities detection), Roerdink (brain diagnosis), Murino et al (neurodegenerative diseases), Fotopoulos et al and Piérard et al (multiple sclerosis), and Rogez et al (assisted living).

The articles herein reflect recent trends in tackling diverse problems in visual information analysis in realistic, less restrictive conditions. They indicate that moving from fixed laboratory acquisition setups to much more challenging, dynamically changing exterior conditions, where all critical parameters, such as illumination, distance, viewpoint, shape and surface properties can vary simultaneously, requires either sophisticated invariant representation or adaptive machine learning approaches. The work here also suggests that adopting contextual cognitive reasoning and multidimensional data models offers an effective way to deal with the challenges of ever-increasing scene complexity.

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