

EDITORIAL TO THE SPECIAL ISSUE ON IMAGE CONTENT UNDERSTANDING

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Image Content Understanding aims at analyzing and comprehending the content of an image, including the identification and interpretation of objects, scenes, relationships, and other aspects within the image. The purpose of the special issue is to collate a selection of representative articles that were primarily presented at the Conference on China Multimedia 2023 (China MM 2023) on 2–4 August 2023 in Kunming, China. The special issue was also made open to public submissions for a wide inclusion.

The scope of the special issue is broad and represents multi-disciplinary nature of image content understanding. It covers topics from low-level image processing technologies (e.g., image dehazing, mathematical morphology, and image enhancement) to high-level semantic understanding (e.g., image super-resolution, facial expressions spotting, and image generation). In recent years, medical image has become a popular area for deep learning research and application. This special issue also includes articles on image risk assessment.

With the rapid development of imaging technologies and electronics, the environment in which images are captured has become diverse. As a result, fundamental enhancement techniques based on image pixels and spatial spaces have increasingly

become the research focus. In [1], Huang et al. present a haze-veil model to increase the correlation between model parameters by constructing an atmospheric veil term to address color distortion and incomplete dehazing for image haze removal. Huang et al. [2] propose a slimming-assisted deep residual network architecture, which utilizes model compression technology to balance the performance and efficiency of the network without using the special accelerator. Zhang et al. [3] propose an adaptive mathematical morphology (SAMM) using fuzzy set theory to define serial operators. SAMM operators inherit key mathematical properties from traditional morphological operators while exhibiting both adaptivity and robustness. Li et al. [4] introduce a weighted fractional-order variational model for lowlight image enhancement, which can precisely decompose the illumination and reflectance maps.

Meanwhile, image super-resolution stands as a crucial domain within image content comprehension. Its objective is to enhance the resolution of an image while preserving its content and intricate details. It can be used for various applications such as improving image quality, enhancing visual details, and increasing the accuracy of computer vision algorithms. In [5], Yu et al. present an effective self-supervised cooperative learning framework via a conditional diffusion contraction method for blind face super-resolution. Yang et al. [6] propose a shift-channel attention mechanism to build an effective network, where the shift-channel attention produces an attentional map with a larger field of view. In addition, a local shift-channel attention feature extraction is utilized to reduce the network depth and retain more original features for the subsequent up-sampling compensation operation. Wang et al. [7] introduce a lightweight convolutional neural network which leverages the connection between low-resolution and high-resolution images to enhance performance without increasing the number of parameters.

Moreover, understating and inferring the semantic concepts and elements of images also have been researched hotspots in artificial intelligence. In [8], Shi et al. propose a risk assessment model that unites a model, a sample and an external knowledge base. First, the uncertainty of the training data is created by randomly masking the noise. Secondly, simulating sensory uncertainty by introducing a dynamically expanding convolutional kernel allows the model to perceive different features to make personalized decisions. Thirdly, a positional relationship base is constructed to assess the credibility of the decisions. Zhang et al. [9] employ an end-to-end network to extract efficient spatial and multi-scale temporal features. The proposed method significantly outperforms existing state-of-the-art methods and supplies a new solution for facial expressions spotting. Ye et al. [10] utilize a radical constraint-based generative adversarial network for handwritten Chinese character automatic generation. Sun and Zheng [11] propose a pyramid grouping convolution module for stereo matching, which combines local context information with multi-scale features generated from CNN backbone, aiming to obtain a more discriminative feature representation.

We hope that the perspectives presented in this special issue would be of great interest to the readers. We also expect the readers to contribute to this exciting and fast growing research area.

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