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Convergence of Computer Graphics and Machine Vision (From the Editor of the Special Issue)

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The first special issue of the journal *Programming and Computer Software* on computer graphics appeared in 1992. It contained several papers that were presented at the International GraphiCon'92 conference. The first issue turned out quite successful: owing to it, many Russian researchers got access to the materials of this conference. Many Russian dissertations and papers contained references to these papers. The second special issue was published in 1999 and was dedicated to the GraphiCon'99 conference.

The papers selected for the current special issue were presented at the 13th International Conference on computer graphics and computer vision, which was held in Moscow in September 2003. Among the 45 papers presented at this conference, one-third were submitted by foreign researchers. The conference demonstrated the convergence of several lines of scientific research, such as computer graphics, image processing, computer vision, and multimedia technologies. Unfortunately, it is impossible to present in one issue of the journal all of the subjects discussed at the conference, so we have had to confine ourselves to only five papers. Note that these papers are not identical to those presented at the conference but rather are revised and extended versions of the latter.

In the paper "Bidirectional Ray Tracing for the Integration of the Illumination by the Quasi-Monte Carlo Method" by A.G. Voloboi, V.A. Galaktionov, K.A. Dmitriev, and E.A. Kopylov, the problem of physically accurate synthesis of photorealistic images is considered. An approach to constructing an algorithm of the bidirectional ray tracing, which reduces overheads of the quasi-Monte Carlo integration associated with the high constructive dimensionality and discontinuity of the integrand in the rendering equations, is suggested.

A physically accurate image, as a rule, cannot correctly be represented on the existing display devices. In the paper "An Effective Tone Mapping Operator for High Dynamic Range Images" by B.Kh. Barladian, A.G. Voloboi, V.A. Galaktionov, and E.A. Kopylov, a method for compressing a large range of pixel luminances into a smaller range, which can be displayed on a monitor screen, is suggested. The suggested tone mapping operator ensures good quality of images and almost does not require manual parameter tuning.

The problem of the reconstruction of three-dimensional scenes is considered in the paper "A Priori and A Posteriori Estimation of Errors of Recovery of 3D Scenes by Factorization Algorithms" by N.V. Sveshnikova and D.V. Yurin. Algorithms based on the matrix factorization are studied, and a modification of an algorithm with the adaptive selection of the approximation is suggested.

Distortions and various defects of digital images require further development of the image processing methods. In the paper "A Diffusion Filtering Method for Image Processing" by G.V. Borisenko, A.M. Denisov, and A.S. Krylov, a new diffusion method for image filtering, which is based on incorporating an integral of image intensity over a point neighborhood into the diffusion coefficient, is suggested.

The convergence of the computer graphics and computer vision is especially pronounced in problems related to the creation of virtual environments, organization of videoconferences, and production of movies and computer games. In the paper "Creating and Animating Personalized Head Models from Digital Photographs and Video" by V.G. Zhislina, D.V. Ivanov, V.F. Kuriakin, V.S. Lempitskii, E.M. Martinova, K.V. Rodyushkin, T.V. Firsova, A.A. Khropov, and A.V. Shokurov, all stages of the model construction, including the image marking and camera registering, the geometrical model adaptation and texture formation, as well as the modeling of additional elements, such as eyes and hair, are discussed.

The 14th conference GraphiCon'2004 will be held in Moscow in September 2004. The interested reader can find details about this conference at www.graphicon.ru. We hope that it will open new opportunities for the cooperation with the journal *Programming and Computer Software.*

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