

Russian and Japanese Aerospace Literature

During 1996 the *AIAA Journal* will carry selected abstracts on leading research topics from Russian aerospace literature and, as space permits, from similar Japanese literature. The topics will be chosen and the abstracts reviewed for pertinency by *AIAA Journal* editors. This month features Remote Sensing from Russia and Fatigue Tests from Japan.

Support for assembling and publishing the selected abstracts has been provided by the Innovative Science and Technology Directorate of the Strategic Defense Initiative Organization (SDIO), with the sponsorship and technical management of the abstract service by the Office of Naval Research (ONR) under ONR Grant N00014-93-I-1074.

Abstracts in this listing have been taken from the monthly abstract journal *International Aerospace Abstracts* (IAA), published by the American Institute of Aeronautics and Astronautics (AIAA). Additional materials can be obtained through searching the Aerospace Database—available online via DIALOG or NASA RECON.

Paper copies and microfiche of the original documents cited are available from Aeroplus Dispatch, 1722 Gilbreth Road, Burlingame, CA 94010; (800) 662-2376. Use the "A" number to identify material you want. Please be advised that most of the original documents are in the original language. Direct questions concerning this abstract section of the *AIAA Journal* to Norma Brennan at AIAA Headquarters.

Russian Aerospace Literature This month: *Remote Sensing*

A95-43304 Application of order statistic filtering to multichannel radar image processing. V. V. LUKIN, A. A. KUREKIN, V. P. MELNIK, and A. A. ZELENSKY (Kharkov Aviation Inst., Ukraine), *Nonlinear Image Processing VI; Proceedings of the Conference*, San Jose, CA, 1995 (A95-43301 12-63), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2424), 1995, pp. 302-312. 14 Refs. Documents available from Aeroplus Dispatch.

The problems of secondary processing digital algorithm design and selection for multichannel remote sensing radar image filtering and first stage segmentation/recognition are discussed. On the basis of radar image specific features analysis it is shown that the application of order statistic algorithms is expedient for the different stages of data processing. Some novel techniques and approaches to image filtering and interpretation are proposed. (Author)

A95-40492 Fast data weighting algorithms of non-focused SAR-image forming. I. P. ANUKHIN, V. V. LUKIN, and A. A. ZELENSKIY (Kharkov Aviation Inst., Ukraine), *Algorithms for Synthetic Aperture Radar Imagery II; Proceedings of the Meeting*, Orlando, FL, 1995 (A95-40458 11-32), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2487), 1995, pp. 404-411. 6 Refs. Documents available from Aeroplus Dispatch.

Fast data weighting algorithms applicable to synthetic aperture radar (SAR) image forming are proposed. The problem of image enhancement for non-focused signal processing is discussed. The approach to weighting function hardware implementation and/or its digital realization is presented. SAR ambiguity function (response) characteristics are investigated and optimized. Other techniques of SAR image quality improvement are analyzed. (Author)

N95-28257 Science and technology. Central Eurasia. Joint Publications Research Service, Arlington, VA, May 1995, p. 61. Documents available from Aeroplus Dispatch.

Translated articles cover the following topics: increasing the speed associated with accurate computation of satellite orbits with large eccentricities; comparison of optimal and locally optimal geocentric boosts of a solar-sail-equipped spacecraft; use of a laser altimeter in satellite remote sensing of the Earth's surface; method of determining optical state of the atmosphere and surface Albedo from multiangle convergent observations; effect of number of gradations of brightness levels on textural features of radar images; displaying sea state with Synthetic-Aperture Radars (Comparative analysis of data obtained by Almaz-1 and ERS-1 Satellites); problems with Russian Elektro Weather Satellite described; and threats to Russian space program.

A95-39459 Technique of combined processing for data of an imaging spectrometer and of a multispectral camera. B. ZHUKOV (Russian Academy of Sciences, Space Research Inst., Moscow, Russia) and D. OERTEL (DLR, Inst. fuer Optoelektronik, Oberpfaffenhofen, Germany), *Imaging Spectrometry; Proceedings of the Conference*, Orlando, FL, 1995 (A95-39417 10-35), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2480), 1995, pp. 453-465. 8 Refs. Documents available from Aeroplus Dispatch.

The spaceborne imaging spectrometers to be flown in the near future (MOS/PRIRODA, MODIS-N/EOS-AM1, MERIS/POEM-ENVISAT1) will have the spatial resolution of a few hundred m to 1 km. The usefulness of their data for land-oriented applications is limited due to the problem of "mixed pixels." A technique is proposed for "unmixing" the data of an imaging spectrometer by combined processing of its data with the data of a high-resolution multispectral camera. This makes it possible to retrieve the spatial distribution of classes with the resolution of the multispectral camera and their spectral signatures—with the detail of spectral measurements of the imaging spectrometer. The technique has been tested, using the data of the airborne imaging spectrometer GER-II, obtained over an agricultural area. Various resolutions of the imaging spectrometer were simulated from tens of meters to about 1 km. The accuracy of the retrieved spectra proved to be a few to 10% in most of the cases, even when the mean area of "homogeneous units" was significantly smaller than the pixel area of the imaging spectrometer. The proposed approach makes it possible to use a combination of a high-resolution multispectral camera and of a medium-resolution imaging spectrometer instead of a high-resolution imaging spectrometer and to combine the high resolution information of the camera with the detailed spectral information of the imaging spectrometer during data processing. (Author)

A95-37482 Ionospheric structures of anthropogeneous origin by radio-tomographic diagnostic. V. N. ORAEVSKY, V. E. KUNITSYN, Y. Y. RUZHIN, O. G. RAZINKOV, and I. I. SHAGIMURATOV (IZMIRAN, Troitsk, Russia), *Advances in Space Research* (ISSN 0273-1177), Vol. 15, No. 11, 1995, pp. 145-148. 7 Refs. Documents available from Aeroplus Dispatch.

Anomalous plasma effects in the ionosphere associated with high-power urban activity are analyzed. It is shown that there have been facts of magnetic conjunction violation in the terminator area for Moscow and Kiev in comparison to Siberian cities. The vertical cross sections of electron density in the ionosphere along the Moscow-Arkhangelsk trace obtained by the radio tomographic methods are presented. The plasma trough and the local inhomogeneities "cloud/hole" were found. The possibility of the creation of such structure from anthropogenic factors is discussed. (Author)

A95-37481 FTIR-spectroscopy from space—The MIRIAM mission (Mir Space Station Infrared Atmospheric Measurement). R. FURRER (Berlin, Free Univ., Germany), V. V. ANTONOV (NPO Energiya, Moscow, Russia), and Y. M. TIMOFEEYEV (St. Petersburg State Univ., Russia), *Advances in Space Research* (ISSN 0273-1177), Vol. 15, No. 11, 1995, pp. 135-144. 18 Refs. Documents available from Aeroplus Dispatch.

To evaluate the physical and chemical processes in our atmosphere with special emphasis on anthropogenic impacts a long-term IR experiment is planned on the space station MIR by the joint German-Russian group MIRIAM (MIR Infrared Atmospheric Measurements). With a newly developed fast scanning Fourier Transform-IR Spectrometer (DOPI) sun-absorption measurements will be done during orbital sunsets. The mission pursues the goals of some recent space experiments and also complements the scientific perspectives of the Upper Atmosphere Research Satellite and the ATMOS program (Space Shuttle). The experiment will analyze the time/space distribution of more than 30 atmospheric trace gases for more than 3 years. In combination with some other instruments of the PRIRODA and SPECTR modules DOPI will be launched in 1995. The retrieved long-term data are expected to improve our present understanding about the composition, chemistry, and

dynamics of our atmosphere. The paper outlines some of the mission objectives and reports on a few experimental and theoretical aspects. (Author)

N95-24768 Science and technology. Central Eurasia. Otechestvennaya Geologiya: Studies in Aerospace and Remote Sensing. Joint Publications Research Service, Washington, DC, Jan. 1995, p. 61. Documents available from Aeroplus Dispatch.

Translated articles cover the following topics: Otechestvennaya Geologiya studies in aerospace imaging and remote sensing; development of aerospace methods at the Laboratory of Aerial Methods of the All-Russian Scientific Research Institute of Satellite Aerogeological Methods; the place of remote methods in Russian geological research; infrared aerospace imaging: achievements and outlook; development of remote methods of studying petroleum and gas bearing territories at the Laboratory of Aerial Methods of the All-Russian Scientific Research Institute of Satellite Aerogeological Methods; remote-data study and prediction of material-structural inhomogeneities: petroleum and gas traps; remote sensing in forecasting and locating mineral ores in research by workers at VNIKAM (the All-Russian Scientific Research Institute of Satellite Aerogeological Methods); using aerial and satellite imaging materials in geological research (status and outlook); and specifics of integrating GIS and remote sensing technologies in the study of natural resources. (Author)

N95-24539 Science and technology. Central Eurasia. Joint Publications Research Service, Arlington, VA, Feb. 1995, p. 41. Documents available from Aeroplus Dispatch.

Translated articles cover the following topics: new principle of detecting moving objects; Russian Federal space program for the period to year 2000: prospects for developing communication; systems for communication via low-orbit artificial earth satellites; and new communication and broadcasting satellites for economic purposes. (Author)

A95-34118 The verisimilitude of the independent pixel approximation used in cloud remote sensing. A. MARSHAK, A. DAVIS, W. WISCOMBE (NASA, Goddard Space Flight Center, Greenbelt, MD), and G. TITOV (Russian Academy of Sciences, Tomsk, Russia), *Remote Sensing of Environment*, (ISSN 0034-4257), Vol. 52, No. 1, 1995, pp. 47-78. 25 Refs. Documents available from Aeroplus Dispatch.

We assess the validity of the independent pixel approximation (IPA) using Monte Carlo simulations of realistic scale-invariant clouds modeled with two-dimensional horizontal variations in optical depth. The IPA uses a plane-parallel approximation for each pixel, and is used in virtually all cloud remote sensing algorithms. We confirm the validity of the IPA at the largest scales and demonstrate its shortcomings on the smallest scales. It overestimates the variability of the radiation field when the optical depth field is known, and it underestimates the variability of the optical depth field when the radiation field is known. Both effects are due to smoothing by horizontal fluxes. (Author)

A95-28016 One method of imaging polarimetry for remote sensing purposes—The technique accuracy investigations. O. LYCHAK (Ukrainian Academy of Sciences, Physico-Mechanical Inst., Lviv, Ukraine), *Polarization Analysis and Measurement II; Proceedings of the Conference*, San Diego, CA, 1994 (A95-27995 06-35), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2265), 1994, pp. 390-400. 14 Refs. Documents available from Aeroplus Dispatch.

This paper is dedicated to investigation of accuracy characteristics of Earth surface mapping, using polarimetric technique. The author had proposed and realized a special technique for application of natural polarized scattered sun light; linear and circular polarization components of reflected light are used. The images were obtained by four-channel photograph surveying system which included camera MSK-4 with isopanchromatic type film, four glass spectral filters and four polarizing elements, placed before objectives. Such images were obtained for anisotropy properties study of underlying surface which is modeled as little anisotropy absorption medium. The accuracy analysis of proposed technique is done by means of computer modeling on the base of real images. Statistical characteristics of output data deviation as function of survey parameters deviation are given. The regression equation of obtained data is built. (Author)

A95-27038 Remote diagnostics of electron and atom density in plasma thruster. G. POPOV, V. KIM, and A. SOKOLOV (Moscow Aviation Inst., Russia), *Spacecraft Propulsion; Proceedings of the International Conference*, Toulouse, France, 1994 (A95-27001 06-20), Toulouse, France, Centre National d'Etudes Spatiales, 1994, p. 4. 2 Refs. Documents available from Aeroplus Dispatch.

A spectral diagnostics procedure for obtaining information about the magnitude and variations of the concentration of neutral and electronic components in plasma thrusters has been developed. This approach makes it possible to avoid disturbances introduced in the plasma in the case of measurements by other procedures. Under certain conditions, the procedure extends the capabilities of the acquisition of data on an operating thruster. (Author)

A95-26949 The 'Priroda' Project on Earth remote sensing from space. Y. G. TISHCHENKO (Russian Academy of Sciences, Inst. of Radio Engineering and Electronics, Moscow, Russia), *Russian Space Bulletin* (ISSN 1060-1848), Vol. 2, No. 1, 1995, pp. 21-23. Documents available from Aeroplus Dispatch.

The suite of instruments carried by the Priroda spacecraft module for remote Earth sensing in the microwave and optical bandpasses is designed to conduct experiments associated with cloud cover characteristics, sea-surface temperatures, large-scale atmospheric circulation, and ocean-atmosphere interaction. The Priroda Project is international, and participation is open to all interested scientific research organizations.

A95-26402 Remote sensing of moving sources with complex spatial-time structure. N. A. SIDOROVSKAYA, I. S. FIKS, and V. I. TURCHIN (Russian Academy of Sciences, Inst. of Applied Physics, Nizhni Novgorod, Russia), *Automatic Object Recognition IV; Proceedings of the Meeting*, Orlando, FL, 1994 (A95-26387 06-63), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2234), 1994, pp. 169-177. 7 Refs. Documents available from Aeroplus Dispatch.

The theoretical concept and algorithms of experimental signal processing permitting the determination of complex acoustical source characteristics from near-field data are discussed. The algorithms are based on two different approaches: on integral transformations using an HF approximation and on methods of parametric estimation theory. The theoretical part of the near-field methods includes the design of algorithms of measured data transformation, an investigation of the angular sectors of the determination of the direction pattern and resolution of image reconstruction, and an analysis of requirements for a receiving system. The numerical simulation of the direction pattern reconstruction and experimental results of the reconstruction of the ship acoustical images in the frequency-spatial domain from linear array data are included. (Author)

A95-24883 Optoelectronic sensing of image movement in focal plane of Earth's surveillance optical system. B. E. BONSHTEDT, D. N. ESKOV (State Optical Inst., St. Petersburg, Russia), and A. J. SMIRNOV (Portuguese Institution for Scientific Research and Technology, Covilha, Portugal), *Acquisition, Tracking, and Pointing VIII; Proceedings of the Meeting*, Orlando, FL, 1994 (A95-24872 05-63), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2221), 1994, pp. 128-133. 2 Refs. Documents available from Aeroplus Dispatch.

The quality of an image movement sensor may be evaluated according to two parameters: precision (measurement error) and nominal speed (frequency bandwidth), both depending on the image moving and technical characteristics of the sensor. Measurement error being given, those characteristics may be optimized to provide the widest frequency band. In this paper such an optimization problem is considered for the optoelectronic sensor, which is a constituent part of an image stabilization system for a spaceborne high-resolution Earth surveillance telescope. Some results of computer modeling of the sensor are presented. (Author)

A95-24756 Combining sensor information from automated visual inspection for quickest detection of disorders. N. A. NECHVAL (Riga, Aviation Univ., Latvia), *Sensor Fusion VII; Proceedings of the Meeting*, Boston, MA, 1994 (A95-24734 05-63), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2355), 1994, pp. 248-259. 12 Refs. Documents available from Aeroplus Dispatch.

This paper is concerned with automated visual inspection of manufactured products which is carried out by means of pixel-by-pixel comparison of the sensed image of the product to be inspected with some reference pattern (or image). In this framework, the disorder detection problem (or the change-point problem) is of basic importance; it consists in detecting possible abrupt changes in parameters of the initial distribution of observations of a process occurring at unknown time points. In the paper, the problem is considered from the point of view of both the parametric and nonparametric approaches. The purpose of this paper is to give a presentation of several sequential jump detection algorithms which combine sensor information from automated visual inspection and also have applications in such areas as remote sensing, target recognition, environmental monitoring, etc. Examples are given to illustrate these algorithms. (Author)

A95-23676 Reliable estimations of microwave spatial spectra as a priori information in oceanic environment studies. V. SAVORSKIY (Russian Academy of Sciences, Inst. of Radioengineering and Electronics, Moscow, Russia), *ISPRS Commission III Symposium on Spatial Information from Digital Photogrammetry and Computer Vision*, Munich, Germany, 1994, Proceedings (A95-23619 05-35), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings, Vol. 2357; International Archives of Photogrammetry and Remote Sensing, Vol. 30, Pt. 3/2), 1994, pp. 718-723. 13 Refs. Documents available from Aeroplus Dispatch.

Statistical methods for studying the spatial structure of microwave emission that can be observed over oceanic surface by satellite remote sensing methods are developed. The microwave emission spatial structure appears to be a hierarchy of global, synoptic, and mesoscale inhomogeneities. Accounting for time-space features of these inhomogeneities makes it possible to separate their contributions in spatial structure. As a consequence, it provides a possibility to develop the reliable statistical methods for evaluating parameters of spatial spectra attributed to synoptic and mesoscale disturbances of microwave spatial structure. Results of experimental data analysis permit one to propose and validate simple model descriptions of synoptic and mesoscale microwave spatial spectra that can be easily included in remote sensing applications as a priori information. In addition, this analysis confirms the validity of chosen statistical methods of spectral estimations. (Author)