РЕЗЮМЕТА НА НАУЧНИТЕ ТРУДОВЕ ИЗПОЛЗВАНИ ЗА ПРИДОБИВАНЕ НА АКАДЕМИЧНАТА ДЛЪЖНОСТ „ДОЦЕНТ"

на гл. ас. д-р Христо Стоянов Николов

представен за участие в конкурс за академичната длъжност „Доцент", обявен в Държавен вестник бр. 56 от 23.06.2020 г. от Института за космически изследвания и технологии - БАН в област на висше образование 4. Природни науки, математика и информатика, професионално направление 4.4. Науки за Земята; научна специалност „Дистанционни изследвания на Земята" за нуждите на секция „Системи за дистанционни изследвания".

B4.1

D. Petkov, Zdravev T., **H. Nikolov**, Interconnection architectures for transputer-based parallel image processing, Advances in Space Research, Volume 22, Issue 11, 1998, pp. 1619-1624

Индексирана в : Scopus

Линк към публикацията:

https://www.sciencedirect.com/science/article/pii/S0273117799001246?via%3Dihub

ABSTRACT

Image processing has been undergoing rapid development for more than thirty years. The tasks in this field are characterized by high computational complexity. Enabling image processing algorithms to run in real time requires large computational power. Modem display systems support more than 256 colors (8-bits) per pixel and typical images have a spatial resolution of 512x512 pixels or larger for each image. Supporting high resolution displays and imagery requires the use of visualization systems with high performance computational capabilities. The transputer is a contemporary state-of-the-art parallel computer environment that offers high computational performance at a relatively low price (i.e. high performance/price ratio) for building such systems. Our other goal is to prototype the use of transputers as a flexible image processing engine for remote sensing applications.

B4.2

D. Krezhova, T. Zdravev, S. Kovatchev, D. Mishev, **H. Nikolov**, Investigation on Vertical Profile of the Aerosol Scattering in the Atmosphere on Multichannel Data from Space Station "Mir", Advances in Space Research, Volume 22, Issue 11, 1998, pp.1533-1536, ISSN: 02731177, DOI: 10.1016/S0273-1177(99)00025-3

Индексирана в : Web of Science, Scopus

Линк към публикацията:

https://www.sciencedirect.com/science/article/pii/S0273117799000253

ABSTRACT

An approach is suggested and applied to determine the atmospheric optical depth parameters from spectral solar irradiance data provided by the multichannel trace spectrometric system "Spectrum 256". The system "Spectrum 256" has been designed by scientists from the Solar-Terrestrial Influences Laboratory at the Bulgarian Academy of Sciences and has been operated onboard the MIR space station since 1988. By scanning the atmosphere with the spectrometer pointed directly at the Sun as the MIR station passed from the terminator zone to the sunset zone, the distribution of the atmospheric optical depth components in a vertical column of the Earth's troposphere in the layer between 2 km and 14 km was determined. The molecular (Rayleigh) scattering was modeled and the aerosol scattering model parameters were evaluated. The selective absorption due to gaseous components and water vapor in the 475-810 nm spectral range was determined, taking into account the influence of the optical transmission characteristics of the hatches of the MIR station.

B4.3

H. Nikolov, Non-linear approach in multispectral data classification, Aerospace research in Bulgaria, vol.20, 2005, pp. 47-51

Индексирана в : Web of Science

Линк към публикацията: http://journal.space.bas.bg/arhiv/n%2020/Articles/8_Nikolov.pdf

ABSTRACT

During the past 20 years, statistical classification methods, such as the minimum distance and the maximum likelihood classifiers, have been widely used. However, these methods have their restrictions, related particularly to the distribution assumptions and limitations in the input data types. In the past decade, the non-linear approaches, theoretically a more sophisticated and robust methods of image classification has been introduced and employed in remote

sensing applications. Although these methods have been used in a wide range of scientific disciplines for a variety of applications since the early 1980s, their use in remote sensing area is relatively new, dating only from the early 1990s. Studies have shown that non-linear methods are more robust than conventional statistical methods in terms of producing classification results with higher accuracies and requiring fewer training samples. One of the most important of their characteristics is perhaps the non-parametric nature of the model, assuming no a priori knowledge, particularly of the frequency distribution of the data. Because of their adaptability and their ability to produce high-quality results, the use of non-linear methods has increased the in the remote sensing field research. Often comparison is made with model which applies maximum likelihood classification and this will be the approach stated hereafter.

B4.4

D. Petkov, Georgiev G., **Nikolov H.,** Thematically oriented multichannel spectrometer (TOMS), Aerospace research in Bulgaria, vol.20, 2005, pp. 51-54

ABSTRACT

The goal of the study is describe the key parameters and the process of working out a multichannel spectrometric system in the visible and near infrared bands of the electromagnetic spectrum. This system will be used for remote sensing investigations:

- recognition of main land covers (soils, natural and agricultural vegetation, water areas)
- state assessment and monitoring of the studied objects.
- Investigation of the relationships between the reflectance and spectral features of the studied objects; development and validation of spectral-biophysical models for estimation of land cover parameters.
- Soil state assessment – type, moisture content, surface texture.

B4.5

Borisova, D., Kancheva, R., **Nikolov, H.,** Spectral mixture analysis of land covers, Global developments in environmental earth observation from space, Millpress, 2006, pp. 509-516, (Proceedings of the 25th Annual Symposium of the European Association of Remote Sensing Laboratories (EARSeL), Porto, Portugal, June 6-11, 2005)

Индексирана в : Web of Science

Линк към публикацията: https://www.iospress.nl/book/global-developments-in-environmental-earth-observation-from-space/

ABSTRACT

The mixed pixels in remotely sensed data are one of the main problems in interpretation. Spectral mixture analysis is a possibility for solving it. Laboratory and field spectrometric measurements as a part of remote sensing are used for obtaining information about various biophysical features of the studied objects. As land cover is usually a mixture of materials with different spectral properties the reflectance additive theory is an efficient tool in data processing. This paper aims to describe the relationships between spectral reflectance of mixed pixels and fraction cover of rock, soil and vegetation therein and to evaluate the possibility of using spectral mixture decomposition in relation to their type and proportion determination. For these purpose laboratory multispectral measurements of granite, brown sandy loam soil and grass samples have been carried out in the visible and near infrared bands with a multi-channel radiometer. Different approaches such spectral mixture modeling, rock-soil baseline, spectral transformations (NDVI, NIR/R) have been applied to process and interpret data.

B4.6

Georgiev, G., Petkov, D., **Nikolov, H.,** Data acquisition field network for land state monitoring, Global developments in environmental earth observation from space, Millpress, 2006, pp. 347-351 (Proceedings of the 25th Annual Symposium of the European Association of Remote Sensing Laboratories (EARSeL), Porto, Portugal, June 6-11, 2005)

Индексирана в : Web of Science

Линк към публикацията: https://www.iospress.nl/book/global-developments-in-environmental-earth-observation-from-space/

ABSTRACT

The data collected by joint in-situ and remote sensing experiments contain additional information that could be further used during the classification process. Moreover, incorporating more data into existing GIS leads to better understanding, representing, managing, and

integrating many aspects of our earth as a system. The in-situ gathered data such as, establishing ground control points by GPS, measure the meteorological conditions, soil moisture, etc., provides additional information that is crucial in improving GIS effectiveness.

To improve and facilitate the process of collection and storage of this in-situ data a distributed mobile, wireless, field network was developed. The main components of the system are the autonomous, battery-powered micro controller devices wirelessly communicating with a central one. Two types of networks are allowed – simple, used in small areas (usually less than 10 km^2) and full, covering areas up to 50 km^2. The networks has flexible structure, offered by a variable number of commands that could be easily adapted to meet the requirements of dissimilar measuring devices thus increasing the number of target applications – from land use to disaster monitoring. A prototype system successfully performed well on test polygons in North Bulgaria.

B4.7

ABSTRACT

The aim of this research is to develop an effective approach being able to deal with the stochastic nature of remote sensing data. In order to achieve this objective it is necessary to structure the methodological knowledge in the area of data mining and reveal the most suitable methods for the prediction and decision support based on large amounts of multispectral data. The idea is to establish a framework by decomposing the task into functionality objectives and to allow the end-user to experiment with a set of classification methods and select the best methods for specific applications. As a first step, we compare our results from Bayesian classification based on nonparametric probability density estimates of the data to the results obtained from other classification methods. Tree scenarios are considered, making use of a small benchmark dataset, a larger dataset from Corine land cover project for Bulgaria and analyzing different features and feature selection methods. We show that the theoretically optimal Bayesian classification can also achieve optimal classification in practice and provides a realistic interpretation of the world where land cover classes intergrade gradually.

B4.8

Borisova, D., **Nikolov, H.,** Fusion of Landsat TM and ground spectrometry data in monitoring of non-operating mine, Proc. SPIE 7478, Remote Sensing for Environmental Monitoring, GIS Applications, and Geology IX, 74781V (7 October 2009).

ABSTRACT

Surface mining activities in Europe are estimated to cover an area of 5-10 000 km^2. In this paper we suggest that the availability of Landsat Thematic Mapper (TM) for Earth observation allows the collection of environmental and mine related data for use in the planning and undertaking of mine restoration work on cost-effective basis. The advantage is that these data are acquired digitally and can be easily processed and utilized in various information formats. Important step in the data processing is the verification of airborne data. For this purpose ground spectrometry measurements of samples taken from test sites have been performed. In the last decade several mining areas and corresponding dumps are subject to reclamation process in Bulgaria. We focused our research on one of the most important in the copper production for 20 year period for our country - Asarel-Medet deposit. This mining complex consists of an open mine, the dumps and a processing plant. After ceasing the exploitation of Medet deposit in 1994 a rehabilitation program for soil cover and hydrographic network was established and launched. A continuous task is the monitoring of these activities from the beginning for at least 15 years period, which is to end this year. To process the data, which characterize the progress of the land cover restoration, several techniques, both standard, such as basic and advanced statistics, image enhancement and data fusion, and novel methods for supervised classification were used. The results obtained show that used data and the implemented approach are useful in environmental monitoring and are economically attractive for the company responsible for the ecological state of the region.

B4.9

ABSTRACT

Mining plants are one of the factors having major negative impact on the area where they are situated. In the case of Mirkovo floatation plant, located in the outskirts of Stara Planina Mountain in the middle of Bulgaria, the pollution comes from two major sources – dust from milling shop and waste water from floatation shop. The investigations are carried out deal with determination of the impact on the soils and vegetation in the neighborhood areas using reflectance information from multispectral data and supporting hyperspectral in-situ measurements. During the research preliminary information about mineral content of the ore material coming from the mine and soil type is also considered.

Numerous studies have analyzed the variance of spectral reflectance of rocks, soils and vegetation in response to their cover using remote sensing. The goal of the study is to show land cover changes detected through vegetation indices as NDVI, RVI, SAVI and the soil line concept in remote sensing. On the next step change detection methods are used to support local authorities in preparation of short-term reclamation plans and as well to recommend farmers in planting suitable vegetation spices in assisting the rehabilitation of the top soils. In this research the data from Landsat TM/ETM+ combined with in-situ measured data are used. The obtained results show that the analyzed data and the implemented approach are useful in environmental monitoring and economically attractive for the company responsible for the ecological state of the region.

B4.10

ABSTRACT

One of the key input parameters in obtaining end products from SAR data is the DEM used during their processing. This holds true especially when persistent scatterers InSAR method should be applied for example to study slow moving landslides or subsidence. Since nowadays most of the raw SAR data are of space borne origin for their correct processing to high precision products for relatively small areas with centimeter accuracy a DEM taking into account the particularities of the local topography is needed. Most of the DEMs used by the SAR processing software such as SRTM or ASTER are obtained by the same type of instrument and present some disagreements with height information acquired by leveling measurements or other geodetic means. This was the motivation for initiating this research – to prove the need of creating and using local DEM in SAR data processing at small scale and to check what the magnitude of the discrepancy between final InSAR products is in both cases where SRTM/ASTER and local DEM has been used. In addition investigated were two scenarios for SAR data processing – one with small baseline between image pairs and one having large baseline image pairs – in order to find out in which case local DEM has bigger impact.

In course of this study two reference areas were considered – Bankya village near Sofia (SW region of Bulgaria) and Mirovo salt extraction site (NE region of Bulgaria). The reason those areas were selected lies in the high number of landslides registered and monitored by the competent authorities in the mentioned locations. The significance of the results obtained is witnessed by the fact that both sites we used have been included as reference sites for Bulgaria in the PanGeo EU funded project dealing with delivering information regarding ground instability geohazard as areas prone to subsidence of natural and manmade origin. In the said project largest part of the information has been extracted from Envisat SAR data, but now this information could be supplemented by adding such from Sentinel-1 derived by us.

During this research two local DEMs have been extracted from the tiles including the areas of investigation, one using SRTM data and one from ASTER, and after this procedure both were compared to the DEM gathered by leveling measurements. Finally conclusions are drawn and a direction for future research steps is provided.

Г7.1

Nikolov, H., Georgiev, G., Petkov, D., Zdravev, T., Object classification with neural networks, using multichannel spectral characteristics, Proceedings of the twenty-fifth international symposium on remote sensing and global environmental change: tools for sustainable development, vols I and II, 1993

[A-27]

OBJECT CLASSIFICATION WITH NEURAL NETWORKS, USING MULTI CHANNEL SPECTRAL CHARACTERISTICS

H. Nikolov, G. Georgiev, D. Petkov, and T. Zdravev
Bulgarian Academy of Science
Sofia, Bulgaria

SUMMARY

The paper considers a practical way towards classification of unmovable objects with neural networks, using their spectral characteristics in different spectral ranges. At the recent time we have the opportunity to obtain multi channel data of the objects from airborne based spectrometers. That allows us to choose from wide range of data, so further classification should be more adequate to the real scene. By now stochastic method used for classification of the objects needs so much time, but with neural networks more accurate and faster classification is produced. The time, which is essential for learning of neural network is less in comparison with the time that stochastic way of forming the basic classes is necessary.

This new approach should be done successfully on transputer based system, where the time for creating of the classes, which will be included to the database for neural network, decreases. Accept classification the proposed system provides also preliminary multi channel data processing such as noise reduction, filtering (convolution using block algorithms, mask with dimensions from 3x3 to 9x9), some geometrical transformations, creating of the histogram for any image in each spectral range and possible coding of IR and UV data with false colors too.

Г7.2

T. Yanev, S. Kovachev, D. Krezhova, T. Zdravev and H. Nikolov (STIL-BAS), D. Todorov and E. Karanov (IPPh-BAS), Estimation of the Physiological State of Maize Plants Grown Under Stress Conditions Using High Spatial Resolution Spectrometer - Conditions for Spectral Class Formation, , Bulg. Journal of Plant Physiology, XXII, 1, 1996.

ABSTRACT

The spectral reflectance, respectively the spectral reflectance coefficients (SRC) of vegetation provide an express and significant information for the impact of abiotic factors (water stress, heavy metals, herbicide pollution etc.) on important bio-agricultural parameters of vegetation in different phenophases. The high spatial resolution (HSR) of spectrometric systems in current use (in laboratory conditions they operate with HSR of the order of several square mm) reveals possibilities for examining individual leaves as well as the fine structure of the leaves. To obtain a reliable average SRC of the leaves making use of the SRC of a set of leaf areas (SRCLA) with dimensions defined by the HSR, the minimal number nl of SRCLA is to be determined so that the average SRCLA would be an estimate of SRC at a given confidence probability, i.e. it would belong to the spectral class defined by the whole leaf. In this study nl was determined for fresh and dry leaves (grown to phenophase 4–5th leaf) of maize, cv. Knezha, hybrid No 655. For this purpose known statistical methods and own examinations were utilized. SRC were obtained by means of the spectrometric system "Spectrum 256" developed by scientists of STIL – Bulgarian Academy of Sciences (BAS).

Г7.3

Tishchenko, Yu.G., Savorskiy, V.P., Smirnov, M.T., Nikolov, H., Kancheva, R., Petkov, D., Georgiev, G., Information system for multipurpose aerospace research: Structure and functional features, AIAA 57th International Astronautical Congress, IAC 2006; Valencia; Spain; October 2-6 2006, Volume 4, 2006, Pages 2146-2153

Индексирана в : Scopus

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-40549083409&origin=resultslist&sort=plf-f&src=s&sid=eb0119affb521adad5e1a815d1aa23a3&sot=autdocs&sdt=autdocs&sl=18&s=AU-ID%2824454439100%29&relpos=25&citeCnt=0&searchTerm

ABSTRACT

Scientific research aiming at the development of remote sensing (RS) technologies for various applications engages considerable material and intellectual resources. The effective management of these resources includes, first of all, support and updating of the services that provide all the necessary conditions for the profound analysis of the acquired experimental data. That is why the essential increase of the efficiency of the RS scientific projects is achieved by the creation and/or modernization of their existing information systems (IS). Such a support can be provided not only by IS developed within the framework of separate research projects, but also by systems created on the basis of specialized information and data centers. The development and maintenance of similar infrastructures are impossible without implementation of the latest achievements of modern information and communication technologies.

Along with a description of the informational system the paper presents a detailed operational scheme of its standard cluster. The following cluster subsystems are considered in details: 1) A system for data archiving and exchanging, 2) A system for data processing, 3) A system for metadata management, 4) A system for catalogue management, 5) A system for external users' support.

Г7.4

Tishchenko Yu., A. Shutko, V. Savorskiy, M. Smirnov, V. Krapivin, R. Kancheva, G. Georgiev, H. Nikolov, D. Petkov. Regional monitoring of the Black Sea basin for ecological disaster mitigation. Proceedings of 3rd International Conference "Resent advances in space technologies", Istanbul, Turkey, pp.684-686, 2007

Индексирана в : Scopus

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-46449093690&origin=resultslist&sort=plf-f&src=s&st1=Tishchenko+&st2=Yu.&nlo=1&nlr=20&nls=afprfnm-t&sid=97439b9056d4b1fe5a71511b3babb06a&sot=anl&sdt=aut&sl=37&s=AU-ID%28%22Tishchenko%2c+Yu+G.%22+6602851642%29&relpos=9&citeCnt=1&searchTerm=

ABSTRACT

The main directions of joint research activities, experimental works, fields of application and expected results from using a Geo-Information Monitoring System are presented in the paper. Such a system is planned to be created in the frames of a Russian-Bulgarian scientific cooperation. Investigations will be carried out under a project on the development and implementation of advanced technologies in the aerospace remote sensing of the Earth during 2006-2010.

Г7.5

Tishchenko Yu., A. Chukhlantsev, S. Marechek, E. Novichikhin, S. Golovachev, R. Kancheva, D. Borisova, H. Nikolov, G. Georgiev. Vegetation effects on passive microwave measurements. Proceedings of 3rd International Conference "Resent advances in space technologies", Istanbul, Turkey, pp.289-293, 2007

ABSTRACT

The developed laboratory waveguide transmission system for measuring the attenuation of microwaves by vegetation canopies is discussed. Some results obtained for the attenuation effects by fragments of trees in the frequency band 0.8 - 10.0 GHz are presented. The waveguide transmission system and the measuring procedure provide the acquiring of continuous attenuation spectra in a wide frequency band under controlled vegetation parameters. The propagation characteristics of the electromagnetic waves in the ultra-wide band waveguide transmission system are similar to the propagation characteristics in the free space. This makes possible to use the laboratory results in practice.

Г7.6

Nikolov H., R. Kancheva, D. Petkov, G. Georgiev, I. Kibardina, V.P. Savorskiy, Yu.G. Tishchenko, M.T. Smirnov, Distributed information system in support of aerospace research, "Remote Sensing for a Changing Europe" - Proceedings of 28th EARSeL Symposium and Workshops, Istanbul, Turkey, 2–5 June 2008, ed. D. Maktav, IOS Press, Amsterdam, pp.142-145, 2009

ABSTRACT

Modern remote sensing technologies for Land Use/Land Cover applications rely on the integration of a big variety of data from both airborne and ground-based instruments. The final product highly depends on the proper and successful exploitation of as much data as possible. This is the reason why a unified data integration and management system should be at the disposal of researchers from different science fields. One possible approach is to develop an information system (IS) based on an open source technology providing an easy data access. Also a standard way of seamless addition of new data should be considered. The approach adopted in this research study is based on a distributed database management system with simple web interface to the data and models. A single cluster contains the following components: a subsystem for data archiving and exchange; a subsystem for specific data preprocessing and calibration; a subsystem for metadata management and integration; a subsystem for the whole catalogue management; a subsystem in support of external users.

The above-described IS was developed in the framework of a joint Russian-Bulgarian project for distributed system infrastructure for aerospace and in-situ data. The system consists of a set of archived data and is supported by hardware/software facilities allowing the exchange of catalogue and ancillary information in an on-line mode. The infrastructure allows to carry out general and detailed data search and to prepare orders for data delivery. The focus at this stage of the work was put on the refinement of the system specification, details of interchange protocols and archive formats, the development of software prototypes ensuring metadata exchange between the system's clusters and access to the information resources of the system. Along with a description of the IS the paper presents a detailed operational scheme of a single standard cluster.

Г8.1

Zdravev T., D. Petkov, H. Nikolov, G. Ganeva, Methods and Techniques for Estimation of Ecological Condition of Marine Water by Remotely Sensed Data, Proceedings of the International Conference with a Workshop on Regional Cooperation Project for Integrated Research an Monitoring of the Black Sea - Varna, 1994, pp. 5-6.

ABSTRACT

02 Methods and Techniques for Estimation of Ecological Condition of Marine Water by Remotely Sensed Data

Thomas Zdravev
Doyno Petkov
Hristo Nikolov
Galina Ganeva

Solar-Terrestrial Influences Laboratory - Bulgarian Academy of Sciences

ABSTRACT

In the presented paper methods for obtaining and processing remotely sensed data in the optical range of electromagnetic spectrum are discussed. The specific features, when use such kinds of data for estimation the condition and ecomonitoring of marine surface also are included. The model applied for description of the specific spectral interchanges between the water and electromagnetic flow to find presence and determine the concentration of soluted and dispersed particles, is combination of theoretical and empirical studies. The reliability of the proposed model of interchanges and adequatness of the results obtained are estimated. Technological and methodological requirements to the spectral measuring system and the monitoring conditions are defined too.

Г8.2

T.Zdravev, D.Krezhova, S.Kovachev, H.Nikolov, Lossless Compression Technique of Multichannel Spectral Data on Board the Manned Space Station "MIR", Comp.rend. Acad.Bulg.Sci., No 2, 1997

ABSTRACT

EXPLORATIONS COSMIQUES

LOSSLESS COMPRESSION TECHNIQUE OF MULTICHANNEL SPECTRAL DATA ON BOARD THE MANNED SPACE STATION "MIR"

T. Zdravev, D. Krezhova, St. Kovachev, H. Nikolov

Introduction. Nowadays the multichannel images of the Earth's surface and atmosphere obtained by onboard and satellite spectrometric systems form a large data flow that exceeds significantly the capacity for their treatment and makes difficult to extract the information necessary for the implemented techniques of remote sensing. This leads to restrictions in the use of the space devices and in many cases there is a need to archivize large sets of untreated data with the aim of future processing or storage of spectral reflectance (SR) data just in the most informative spectral ranges for a given class of objects.

The experience gained in using multichannel SR data for global ecological and agricultural monitoring has proved the necessity for enlargement of the studied surface areas without loss of information. Hence, data compression has to be done onboard the space vehicle in real time optimizing the resident software without changes in the spectrometric system.

Г8.3

Хр. Николов, И. Василева, Комбиниран подход за изследване на резултати от класификация на многоканални данни, Електроника и електротехника, том 33, 1999г.

РЕЗЮМЕ

Комбиниран подход за изследване на резултати от класификация на многоканални данни

Христо С. Николов, Ирина И. Василева

Предложено е използване на комбиниран подход, който прилага предимствата, предоставяни както от статистическите методи за разпознаване на образи, така и от методите, използващи невронни мрежи. Въпреки нарасналата изчислителна сложност при неговата реализация, този нов подход е приложен при класификация на многоканални спектрометрични данни, формирани при дистанционни изследвания на Земята. Получени са експериментални резултати, доказващи неговите предимства пред поединичното използване на съставящите го процедури.

Nikolov H., Vasileva I., Combined approach for assessment of results from multichannel data classification, Electronics and Electrotechnics, vol. 33, 1999

ABSTRACT

Combined Apptoach for Assesment of Results from Multichannel Data Classification. During the recent years in resolving pattern recognition problems together with the well developed statistical approaches a neural networks based methods are also applied. In this case we consider both techniques as counterparts in the process of classification since the mathematical basis used in them is not the same. This specific features must be taken into account if a comparative test between them will be carried out. In this paper we propose combined procedure for classification with increased complexity in the decision phase including the advantages of both methods. This new approach is applied on spectrometric data received from remote sensing of the Earth.

Г8.4

Nikolov Hr., D. Petkov. Neural Networks in Classification of Remotely Sensed Multichannel Images – Case Study, Proceedings of the International Conference "CompSysTech'2001" – Sofia, 2001, pp. I.1-1, I.1-4, ISBN 9549641252, 9789549641257

ABSTRACT

In this paper are presented recently obtained results concerning the classification of remotely sensed multichannel data using neural networks. A structure of the neural network is proposed and it is chosen a training method among the well known methods. Moreover, the procedure applied for preparation of the training data is described as well as the initial conditions under which the training was performed. The results obtained after final classification of an image are compared with results achieved using statistical methods.

Г8.5

Jeliazkova N., S. Ruseva, K.Boyanov, H. Nikolov, D. Petkov. Application of Nonparametric Bayesian Classifier to Remote Sensing Data, Information Technologies and Control N2, 2004 /ISSN 1312-2622/. pp. 8-12

ABSTRACT

A nonparametric Bayesian classification, based on a recently published very fast algorithm for multivariate density estimation is proposed. The classifier is applied to the problem of land cover type recognition of remote sensing data. A 7 channel satellite image of a region of North Bulgaria is used as input data. The procedure of object recording at a distance, forming the image by recording reflected light or radio waves, is known as remote sensing. The performance of the nonparametric Bayesian classifier is analyzed and compared to the performance of a backpropagation neural network over the same data. The proposed probabilistic approach gives very promising results. The assigned class membership of a pixel is a "soft classification". These results could be regarded as a realistic interpretation of the world, where land covers intergrade gradually, and boundaries between classes are sometimes blurred. In addition to pixel-by-pixel classification of an image, the method allows a classification of predefined image regions as a whole.

Г8.6

> Nikolov H., D. Borisova, M. Danov, Detection of open pit mines and dump areas based on land cover thermal mapping. Annual UMG "St. Ivan Rilski", Part I: Geology and Geophysics, vol. 48, pp.231-234, 2005.

ABSTRACT

Ferrous and non-ferrous open pit mining and waste dumped are result of a human activity and are the largest pollutants for certain regions in Bulgaria. Since in the most of the open pits the mined substance is stone we suggest the remote investigations in such area to be carried out in the thermal range (8-12 um) of electromagnetic spectrum. The data used during our study consists of laboratory measurements and airborne data. After data processing and interpretation, areas into which reclamation activities have been made, could be easily determined. These results support the assessment of the human impact on the ecological status in contaminated by mining actions regions. Obtaining more reliable results is expected by the recently launched instruments with higher spatial resolution (less than 20 m).

Г8.7

> Hristo Nikolov, Nina Jeliazkova, Improving Withinclass Separation for Vegetatation Classification, EARSeL and Warsaw University, Proceedings of 4th EARSeL Workshop on Imaging Spectroscopy. New quality in environmental studies, pp. 753-757, Warsaw 2005

ABSTRACT

In the recent years some serious improvements in increasing spatial resolution of orbital remote-sensing systems has been made. In many articles the ETM+ instrument onboard Landsat is considered to have modest spatial resolution. Combining the high spatial and high spectral resolution (more than 30 spectral channels), new possibilities for obtaining precise information from remotely sensed data about the land cover types are presented. The single element of the data represents more adequately the specific type of land cover. In case of vegetation one application is precision agriculture, where the information obtained can be used to improve crop quality, monitor the irrigation and fertilization process, and enhance weed management. Another factor that could improve the state assessment is the textural information.

In this study we propose novel technique for classification of vegetation types combining spectral, spatial and textural data for better within class separation. The method applied is based on Bayesian decision rule with preliminary data processing for feature selection. The results shown that of crucial importance is the parameters selection procedure.

Г8.8

George Georgiev, Doyno Petkov, Hristo Nikolov, A Network for Data Acquisition and Synchronous Experiments Control in Remote Sensing, EARSeL and Warsaw University, Proceedings of 4th EARSeL Workshop on Imaging Spectroscopy. New quality in environmental studies, pp. 523-526, Warsaw 2005

ABSTRACT

Planning remote sensing experiments involves acquisition of airborne and in-situ data of the studied objects. The in-situ gathered data provides additional information that is helpful in establishing ground control points by GPS, measure the meteorological conditions, moisture. The last two parameters are of importance monitoring vegetation cover and soil conditions. The proposed telemetric system consists of distributed network stand-alone field instruments. The main components are the autonomous, battery-powered microcontroller operated devices. The network has flexible structure that can be changed easily in order to meet the requirements of different type applications such as commands and data exchange between field-based devices.

Г8.9

Shutko A., A. Haldin, V. Krapivin, E. Novichikhin, I. Sidorov, Yu. Tishchenko, R. Haarbrink, G. Georgiev, R. Kancheva, H. Nikolov, T. Coleman, F. Archer, P. Pampaloni, S. Paloscia, A. Krissilov, A. Carmona. Microwave radiometry in monitoring and emergency mapping of water seepage and dangerously high groundwaters. Journal of Telecommunications and Information Technology (JTIT), 1/2007, pp. 76-82, 2007

ABSTRACT

Detailed and geo-referenced maps identifying the locations of saturated and dry levees can be produced using microwave radiometric measurements from a light aircraft or helicopter, and integrated with GPS for positioning and orientation. The development of synergetic remote sensing technology for raised groundwater and seepage detection by the joint use of microwave and optical data along with GIS databases is an effective and most contemporary way of supporting risk assessment and facilitating disaster prevention and management. In this paper we present a remote sensing microwave technology for monitoring and detection of areas of water seepage through irrigation constructions, levees and dykes as well as for revealing areas with dangerously high groundwater level. The possibility for emergency response mapping,

integrated with GPS and GIS data, facilitates the risk assessment and management services. The passive microwave radiometry (PMR) is based on spectral measurements in the millimeter to decimeter range of wavelengths. Compared to other remote sensing techniques, such as color and infrared photography, thermal images and lidar, PMR is the only technology taking measurements under the earth's surface and therefore is very well suited for water seepage and underground water monitoring in a fast and reliable way.

Г8.10

Баркалова Т.С.,Кибардина И.Н., Кузиков С. И., Николов Х., Саворский В.П., ТищенкоЮ.Г., Предварительные результаты SAR интерферометрии для изучения процессов деформаций в горных районах Тянь-Шаня (Киргизия) и Кресна (Болгария), Proceedings of International Conference "Fundamental Space Research", Sunny Beach, Bulgaria, pp.19-21, 2008

РЕЗЮМЕ

В работе представлены результаты обработки данных ASAR ENVISAT по двум районам Киргизии: района озера Иссык-Куль и г. Бишкека. InSAR изображения получены с помощью пакета ROI_PAC (Repeat Orbit Interferometry Package), имеющегося в свободном доступе. Для компенсации высоты поверхности были использованы доступные данные цифровой карты SRTM(90). Для орбитальных данных ENVISAT использована орбита ODR. Выполнена обработка 4-х реализаций кадра ASAR района Иссык-Куль (Track 234, Frame 2745) и 4-х реализаций кадра района Бишкека (Track 420 , Frame 2763). В результате обработки получено по одной интерференционной картине каждого кадра для областей с высокой когерентностью сигнала (участки с достаточно пологой поверхностью). Остальные комбинации реализаций приводили к сбою пакета, что могло быть связано как с неоптимальным набором реализаций, так и с возможными сбоями алгоритмов ROI_PAC при некоторых условиях, что требует дальнейшего исследования.

Barkalova T.S., Kibardina I.N., Kuzikov S.I., Nikolov H., Savorsky V.P., Tishchenko Yu.G., Preliminary results of SAR interferometry for studying deformation processes in the mountainous regions of Tien Shan (Kyrgyzstan) and Kresna (Bulgaria), Proceedings of International Conference "Fundamental Space Research", Sunny Beach, Bulgaria, pp.19-21, 2008

ABSTRACT

The paper presents the results of processing ASAR ENVISAT data for two regions of Kyrgyzstan: the area of Lake Issyk-Kul and Bishkek. InSAR images were obtained using the

freely available Repeat Orbit Interferometry Package (ROI_PAC). To compensate for the surface height, the available data of the SRTM digital map (90) were used. The ODR orbit is used for the ENVISAT orbital data. Processing of 4 realizations of the ASAR frame of the Issyk-Kul region (Track 234, Frame 2745) and 4 realizations of the frame of the Bishkek region (Track 420, Frame 2763). As a result of processing, one interference pattern was obtained for each frame for areas with high signal coherence (areas with a fairly flat surface). The rest of the combinations of implementations led to a package failure, which could be due to both a non-optimal set of implementations and possible failures of the ROI_PAC algorithms under certain conditions, which requires further investigation.

Г8.11

Borisova D., H. Nikolov, B. Banushev, I. Iliev. Recognition of main rock types using a sub-pixel method. Proceedings of International Conference "Fundamental Space Research", Sunny Beach, Bulgaria, pp.54-57, 2008

ABSTRACT

The multichannel spectral reflectance data, registered satellite borne sensors (such as Landsat-TM, ETM+, SPOT etc.), often result in a spectrally mixed class consisting of several so-called "pure" spectral classes, included in the area covered by single pixel. This problem is often considered as a mixed pixel problem. It has always been a difficult to decompose multi-spectral data and classify those to derive the accurate proportions of the land cover classes. Inclusion of ground-measured data, such as laboratory and in-situ, is especially useful with respect to increase the accuracy of the subsequent supervised classification.

This study proposes the use of a spectral linear unmixing (SLU) or spectral mixture analysis (SMA) based on sub-pixel method for minerals, rocks, and bare soils recognition. In most cases mixing is considered linear, and the resulting pixel reflectance is thought as a linear summation of the individual material reflectance multiplied by the surface fraction they constitute. Besides the abovementioned problem of mixed pixel the limited spectral separability among similar minerals, rock, and soil types is another problem that causes inaccuracy in their identification. Various methods of SLU/SMA have been developed to improve the classification of mixed pixels and to detect and identify sub-pixel components and their proportions. For this reason, additional laboratory and in-situ multichannel spectrometric measurements and approaches as well as rock line and ratio indices are applied. In the course of this study large number of laboratory experiments made by SPS-1 spectrometric system has been performed along with in-situ measurements using spectrometer TOMS. The rock line quoted above is based on the soil line concept adopted in remote sensing technology. Several

ratio indices are chosen considering rock types in the study as follow basalt, limestone, and marble samples.

The main advantage of the presented technique is that mixed pixels are used during the training phase of the following supervised classification. Compared to these other multichannel data processing techniques, the present one is found to be simple, cheap, and objective.

Г8.12

ABSTRACT

The need for standard networking different devices (especially sensors) operating onboard space platforms was realized not long ago. The SpaceWire standard is facilitating the construction of high-performance onboard data acquisition systems, helping to reduce the overall system integration costs, promoting the compatibility between data handling equipment and subsystems, and providing possibilities to re-use data handling equipment across several different missions.

Implementation of the SpaceWire standard into new data acquisition ensures such equipment is compatible with all other interconnected instruments at both the component and sub-system levels. Processing units (i.e. processors, microcontrollers) and mass-memory units using SpaceWire interfaces developed for one mission can be readily used on another mission. This way: the development phase cost less and takes less time since only the new part of the system should be constructed from the scratch. Moreover implementing standard protocols the reliability is increased which is crucial for space missions with budget several M€.

Г8.13

Борисова Д., Хр. Николов, Банушев Б.,. Полеви и лабораторни измервания на магмени, седиментни и метаморфни скали за попълване на база данни при дистанционни изследвания, Годишник на МГУ „Св. Иван Рилски", ISSN 1312-1820, vol. 52, , pp.137-140, 2009.

РЕЗЮМЕ. Наземните измервания в комплекса на дистанционните изследвания се много важни в съставянето и попълването на бази данни. За целта са проведени лабораторни и полеви спектрометрични измервания на образци от магмени, седиментни и метаморфни скали от България. Използван е тематично ориентиран спектрометър, работещ в диапазона 400-900 nm. Спектрометърът е конструиран в ИСЗВ-БАН. Получените данни ще бъдат включени в база данни за допълнителна информация при дистанционни изследвания на земната повърхност.

ABSTRACT.

Ground-truth data in remote sensing investigation complement are very important. For this purpose laboratory and field spectroscopy measurements of samples of the igneous, sedimentary and metamorphic rocks are performed. The thematically oriented spectrometer working in 400-900 nm range is used. The spectrometer was designed and constructed in STIL-BAS. The obtained data will be included in data base for Earth observation complement.

Г8.14

Borisova D., H. Nikolov. Improvements of the segmentation of multispectral images by means of LSMA. Conference with International Participation "Space, Ecology, Safety" (SES'2010), Sofia, Bulgaria, 2-4 November 2010.

ABSTRACT

The classification procedure relying on data spectral properties is often preceded by segmentation which in turn might be greatly improved by a preliminary sub-pixel analysis and mixed-pixel decomposition. A generally accepted meaning of the word 'segmentation' in the image processing community is the decomposition of the image under study into its different and homogeneous regions of interest (RoI). In this study, we have been focused on the assumption that, by applying the linear spectral mixture analysis (LSMA) on the border line of an image, one could achieve better segmentation than relying on spectral or geometrical properties only. In the LSMA, the mixed pixels, especially those in the border areas of the

image are expressed as linear combinations of the respective spectra of the basic land cover types presented in the image. By implementing the LSMA on the data, the segments' smoothness was improved.

Г8.15

Borisova D., H. Nikolov, B. Banushev, D. Petkov. Techniques for segmentation of open pit and stone mines. Annual of UMG "St. Ivan Rilski", ISSN 1312-1820, vol. 53, Sofia, Publishing House "St. Ivan Rilski", pp.139-142, 2010.

ABSTRACT

РЕЗЮМЕ. В тази работа е приложен метод за анализиране на спектрални данни при сегментирането на открити рудници и кариери. Идеята е да се използват множеството възможности, предлагани от многоспектрални изображения със средна резолюция като TM на борда на Landsat 5. Чрез методът, който прилагаме, се търсят стабилни статистически зависимости между полевите многоспектрални данни и данните от изображенията, получени от сензори на борда на летящи апарати. След коректно разпознаване на съответните пиксели последващото сегментиране на изследваната наземна форма може да се определи като надеждно. Полевите измервания са извършени на кариера за трошен камък близо до с. Смолско. За района са обработени съответните изображения от спътника Landsat 5 от различни дати. Проведени са геоложки наблюдения, петрографски изследвания, фотодокументация и in-situ спектрометрични измервания.

ABSTRACT.
In this paper a statistical method has been applied in the segmentation of human made land covers as open pit and stone mines. The idea is to exploit to larger extent the possibilities offered by multispectral imagers having mid spatial resolution such as TM onboard Landsat 5. The method has been applied in the framework of our research is to find consistent statistical dependencies between multispectral data gathered in-situ and the corresponding ones in images offered by airborne-based sensors. After correct identification of the pixels the subsequent segmentation forming the shape of the artificial feature is determined much more reliable. This especially holds true for objects with relatively narrow structure for example two-lane roads for which the spatial resolution of one pixel is larger that the object itself. We have been combined ground spectrometry of stone-pit near Smolsko village, Landsat images of region of interest (RoI), and in-situ condition surveys for assessment of stone pit area. Geological observations, petrographical investigations, photo documentation and in-situ spectrometric measurements have been performed.

Г8.16

РЕЗЮМЕ. Минната дейност в Европа се разпростира от големи площи с огромни открити рудници до съвсем малки кариери. В настоящата работа са анализирани спектрални данни от апаратурата на борда на спътника Landsat TM с цел определяне на площта на открити рудници и препоръки за планиране и осъществяване на рекултивационни работи. Предимството на този вид данни е, че са в цифров вид, лесни са за обработка и анализ в различни информационни формати. За верификация на резултатите са проведени наземни спектрометрични измервания на образци от изследваните райони. Използвани са дву- и три-компонентни линейни модели за оценка на минералното съдържание в открите мини като са използвани сателитни данни за същия район. Колективът планира да приложи регресионен и клъстерен анализ за разграничаване на класовете земно покритие. Също така в моделите ще се включат повече минерали, скали и почви.

ABSTRACT.

Surface mining activities in Europe are estimated to cover a large area and range from large open-cast coal and base metal mines, to much smaller aggregate, industrial minerals, and building materials quarries. In this paper we suggest that the availability of Landsat TM for Earth observation allows the collection of environmental and mine-related data for use in the planning and undertaking of mine restoration work on costeffective basis. The advantage is that these data are acquired digitally and can be easily processed and utilized in various information formats. For verification of the results spectrometric measurements of samples from test sites are performed. Two- and three-component linear models for estimation of the mineral composition of an open pit are created using satellite data over the same area. Further regression and cluster analysis for distinguishing class covers as dump and open mine is intended. As a future work we consider the development of these models including more minerals, rocks and soils.

Г8.17

ABSTRACT

Remote sensing is an established technique in environmental studies. Soil monitoring in risk areas such as open pit mines, landslides, etc. is associated with rock appearance detection.

The actual usefulness of the remote sensing information depends on its accuracy and reliability. The objective of this paper is to study soils, embedding rocks and their mixtures in relation to color features. It is shown that the colorimetrical analysis provides means for soil and rock evaluation. In the paper we report some results of the colorimetrical analysis of reflectance multispectral data obtained in laboratory, in-situ and airborne measurements. Experimental data was used to model reflectance and color characteristics of soils and relevant soil-rock mixtures. This is of a particular interest in remote sensing as far as the proportion determination of mixtures' components is concerned being an important issue in data interpretation. The results provide further confirmation of the potential of remote sensing technique LSMA (linear spectral mixtures analysis) for soil monitoring in risk areas.

Г8.18

РЕЗЮМЕ

Антропогенното въздействие на минната индустрия върху околната среда се наблюдава по целия свят. През последните десетилетия няколко миннодобивни района и съответните депа за отпадъци в България се наблюдават за протичащите процеси на рекултивация в тях. В тази работа се спряхме на изследване и последващо наблюдение на екологичния статус на един от най-важните райони за производство на мед за страната ни - Медет. Целите на настоящата работа са: (1) да се анализират многоспектрални спътникови данни за периода 1972 - 2011 г., за да се оцени замърсяването на околната среда от минна дейност в района на открития рудник Медет във времето, (2) да се докаже, че с помощта на дистанционните изследвания и наблюдения може да се направи комплексна оценка на въздействието върху околната среда. След преустановяване на експлоатацията на рудник Медет през 1994 г. е създадена и започва програма за рекултивация на почвената покривка и хидрографската мрежа. От 1995 г., за най-малко 15-годишен период, постоянна задача е проследяването на тези дейности. Считаме, че разкриването на потенциала на многоспектралните спътникови изображения, анализирани във времето, ще предостави ценна информация за въздействието на многогодишната минна дейност върху околната среда. Една от първите стъпкг е използването на методи за установяване на

постепенната промяна за оценка на краткосрочните рекултивационни дейности чрез изследване на състоянието на растителната покривка в районите около рудника. За да изпълним тази задача бяха използвани данни от Landsat TM/ETM+, съчетани с данните от проведените на място измервания. За обработка на данните бяха приложени няколко метода, както стандартните статистически обработки, подобряване на изображението и синтез на данните, така и нови методи за контролирана класификация. Получените резултати показват, че използваните данни и приложеният подход са полезни в наблюдението на околната среда и икономически изгодни за компанията, отговорна за екологичното състояние на региона.

ABSTRACT

The anthropogenic impact of the mining industry on the environment is seen all over the world. In the last decades several mining areas and corresponding waste disposal sites in Bulgaria are being monitored for ongoing reclamation processes. In this research we were focused on one environmental status of one of the most important copper producing fields for our country - Medet deposit. The objectives of the study were: (1) to analyze multispectral satellite images for 1980 - 2000 in order to assess the environmental pollution from the mining activity in the Medet open pit mine in temporal perspective; (2) to prove that by means of remote sensing an integrated environmental impact assessment can be made. After ceasing its exploitation in 1994 a rehabilitation program for soil cover and hydrographic network was established and launched. A continuous task is the monitoring of these activities from the beginning for at least 15 years period. We consider that revealing the potential of satellite multispectral and multitemporal imagery will provide valuable information on the impact of this long-term mining activity on the environment. One of the first steps change detection methods were used to assess the short-term reclamation activities by examination of vegetation cover status in the areas surrounding the mine. To complete this tasks data from Landsat TM/ETM+ instruments combined with in-situ measured data was used. For data processing several techniques, both standard, such as basic and advanced statistics, image enhancement and data fusion, and novel methods for supervised classification were used. The results obtained show that used data and the implemented approach are useful in environmental monitoring and economically attractive for the company responsible for the ecological state of the region.

Г8.19

Nikolov H., D. Borisova, Application of multitemporal remote sensing data in large water basins area estimation, Ninth Scientific Conference with International Participation "Space, Ecology, Safety" (SES'2013), Sofia, Bulgaria, 20-22 November 2013

ABSTRACT

Natural and artificial water basins are main source for water used by agriculture, industry and households. Traditionally the level, respectively the area, of these water bodies is monitored locally by gauging stations. In this paper the effort we put is in finding reliable procedure to obtain the mean water level from remotely sensed optical data. Topolnitsa dam was selected as test site for our study due two reasons – first, it has been used in previous research activities, and second it has serious impact on environmental state of the area where it is located. In the framework of this research we developed a method for solving the task mentioned using freely available data (multispectral and in-situ) and processing software.

Г8.20

Hristo Nikolov, Application of machine learning method in classification of rock types in open pit mines, 8th Congress of Balkan Geophysical Society in Chania, Crete, Greece, 4-8 October 2015

ABSTRACT

Support vector (SV) method for classification originates from supervised machine learning methods. Although theoretically developed in the 70-ties of the 20-th century it was significantly improved in theory and practically implemented in the late 90-ties. Originally intended and elaborated as two class separation procedure it was latter transformed in robust multiclass classification technique. In this research the SV based technique for classification has been used for discrimination of rock types found in and around the open pit mines of Asarel-Medet mining complex located in the Srednogorie copper-porphyry mining region. The data used for the experiments are from the multispectral instruments TM/ETM+ onboard Landsat satellites from the same season of two different years. For ground trutning polygons having nomenclature under CORINE EU project were taken and adapted to the needs of this research. The results after classifying the area under study confirmed that the method selected is robust and offers good alternative to other approaches used for this task. In conclusions it is mentioned that for improvement of the outputs better spatial resolution is essential, but also more and narrower spectral bands would offer an advantage.

Г8.21

Hristo Nikolov, Borisova D., Tracing landscape changes near open pit mines, Third SCGIS conference "Geoinformation technologies for natural and cultural heritage conservation", 2016, ISSN 1314-7749, p 54-63

ABSTRACT

Open pit mining areas in Europe are responsible for 8333 km2 according to Corine2006 data. In this paper we focus our research on the change of landscape in the one of the most exploited mining regions of Bulgaria – Panagyurishte ore region. We investigate the impact of the mining industry in this specific region since it is exploited starting in the early 60-ties of the last century. In our previous research we traced the changes of the environment at small scale investigating specific open pit mine and one of the conclusions was that an extensive study encompassing the whole region is needed. In this case we are focused on the developments taking place in larger area and the impact this specific type of activities has on the land cover/land use. We expect that the results from this study can be used for better planning at regional level. Main source of data used throughout this research are multichannel data from TM/ETM+/OLI instruments and this choice was based on the two essential for this study requirements – repeatability of the data and derived products and the open access to them. For verification of the results additional data from other sources were also used – in-situ measurements made by the team at specific points of interest, digital orthophotos, DEMs, etc.

Г8.22

Hristo Nikolov, Atanasova, M., Landslides monitoring near Kranevo by means of InSAR, Third SCGIS conference "Geoinformation technologies for natural and cultural heritage conservation", 2016, ISSN 1314-7749

ABSTRACT

The InSAR method provides fast and accurate means for detecting even Earth's small movements of magnitude several centimeters which is particularly suitable for landslides monitoring. The information obtained by this technique is based on interferograms resulting from phase data processing contained in two images from different dates over the same region. One advantage of this method is that it can combine data from different SAR instruments using same wavelength thus providing larger time coverage for one and the same area. Based on this time series data conclusions can be made regarding the speed of movement of the land for several time epochs. Compared to field checks and measurements

the InSAR interferograms, obtained from satellite-based instruments, cover larger areas thus offering cost effective manner for monitoring this natural phenomena.

The motivation behind this research was twofold – first to provide high quality information with regard to continuous monitoring of the site under study and second to make use of freely accessible data from Sentinel-1 SAR mission by ESA whose main data acquisition mode is the interferometric one. Other goal that was achieved throughout this study was that, as our expectations were, we could detect small horizontal movements regardless the short time period between the two images used for interferograms creation (in this case the first image was dated Nov 2015 and the second one was dated Jan2016). The results obtained provide solid grounds to make reliable forecast with regard to further progress of the landslides processes in the studied area although the data used are from relatively short time period (less than one year). For the zone investigated the detected movements are of magnitude of 1.5 to 2cm. Those data will be overlaid with a map for the susceptibility landslides map for the same region and with map of land cover/land use.

Г8.23

РЕЗЮМЕ

В настоящата статия са представени резултати получени при обработката на SAR изображения, която бе насочена към откриване на деформации на земната кора. Цел на изследването бе да се предложи точен и надежден метод за регистриране на вертикални и хоризонтални движения на земната кора, позволяващ регулярен мониторинг през кратки интервали от време (около 3 месеца) и допълващ информацията получавана от геодезически, сеизмични и друг тип наблюдения. Конкретната задача бе, прилагайки предложеният метод, да се установи степента на антропогенно въздействие в района на Мировското каменосолно находище. Приложеният метод, използващ DInSAR, показа търсените качества, които бяха потвърдени от резултатите след неговото прилагане върху три набора SAR данни получени в рамките на последната година. Допълнителна мотивация за провеждане на изследването бе и фактът, че в този район деформационните процеси са предмет на изследване през последните 20 години и бе възможно да се направи сравнение с данни от продължителен период.

ABSTRACT

In this article presented are results obtained after processing several SAR images focused on detecting deformations of the Earth's crust. The problem we solved is to elaborate and verify an accurate and reliable method for registration of vertical and horizontal movements of the Earth's surface by means of regular monitoring at short intervals (about every three months) using satellite and complementary data acquired by surveying, seismic and geophysical observations. The specific task to be solved was to apply the proposed method in order to determine the extent of anthropogenic impact in the area of Mirovo salt deposit. The method applied based on DInSAR fulfilled the requirements which is affirmed by the results from three sets of SAR data collected in the last ten months. Additional motivation for conducting this study was the fact that in the area investigated the deformation processes are subject of research for more than 20 years and it was possible to make a proper comparison of the results with data from large period of time.

Г8.24

РЕЗЮМЕ

Спътниците, които обикалят около Земята, осигуряват огромен обем данни, предоставящи на изследователите и бизнеса нови възможности за изследвания и развитие. Една от стъпките при получаване на информация от оптични данни във видимия /VIS/ и близкия инфрачервен /NIR/ обхвати е да се превърнат спектралните класове в информационни класове. За постигането на тази задача се използват различни подходи, като например класификация с/без наблюдение, обектно-ориентиран анализ на изображения, евристични методи и т.н. За оптимален избор на спектралните канали с цел намаляване на излишъка в наличната информация при данните от дистанционни изследвания, които ще се използват в споменатите процеси, от съществено значение са типичните спектрални характеристики за отделните класове, които са обект на изследване. Това е причината да предложим да се създаде специфична и да се обогатят налични спектрални библиотеки, където такива представителни набори от данни могат да бъдат намерени за повечето обекти, които се разпознават на земната повърхност. В това изследване се опитваме да докажем необходимостта от добавяне на повече спектрални данни (включително и метаданни) към съществуващите спектрални библиотеки с отворен достъп.

ABSTRACT

The satellites orbiting the Earth deliver enormous volume of data providing researchers and businesses with new opportunities. One of the steps in producing information from optical data in the visible /VIS/ and near infrared /NIR/ ranges is to convert spectral classes into informational classes. Several approaches such as supervised/unsupervised classifications, object-based (or object-oriented) image analysis, heuristic methods, etc. are implemented in order to complete this task. For optimal selection of the spectral bands for removing the data redundancy present in remotely sensed data that shall be used in the mentioned processes essential element is to have typical spectral signatures for the classes of interest. This is the reason to create and enrich spectral libraries where such representative data sets can be found for most of the objects present in the land cover. In this study we try to proof the need in adding more spectral data to the existing spectral libraries with open access along with metadata as well.