Photonirvachak to JISRS

A journey of 50 years

INDIAN SOCIETY OF REMOTE SENSING

February, 2023

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INDIAN SOCIETY OF REMOTE SENSING

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February, 2023

Dr. Shailesh Nayak

Message

Journal of ISRS – Towards Stewardship of Spatial Sciences

The Journal of the society had a modest start in 1973. It is of great credit to the editorial leadership of the journal to sustain it for a long time. Over the years, it had reformed, performed, and transformed into a very professional journal in the field of remote sensing. The journal is being published every month and attracts high quality papers from many countries in Asia and Africa apart from India.

The major change in the Journal publication came during 2006-07. Under the leadership of Prof. Deekshatulu, it was decided to engage a professional publisher to improve the quality of the Journal. Springer was chosen as a publisher after negotiations and the journal started getting published jointly. The editorial control remained with the Society while the managing manuscripts, printing and distribution of journal remained with the Springer. Such professional service has helped the Journal to widen the horizon and became known internationally in the subsequent years. Under the leadership of Dr George Joseph, the editorial functions were restructured to publish it monthly. These reforms in managing journal have not only brought academic benefits but also professional and economic benefits. The Journal has not only become self-sufficient but also been able to support many activities of ISRS.

The Journal has achieved a reasonable presence in the international arena, but still, we must work hard to reach among the top journals. The strategy is to attract review articles and publish special issues on the topics of importance, so that it gets better visibility among the community. I appeal to all members to publish their results of scientific research in the JISRS and also contribute review articles. My greetings to all contributors, reviewers and members of editorial board and members of the society on its Golden Jubilee. I am sure with your continued support, the Journal of ISRS will scale greater heights.

Dr. Shailesh Nayak
Director, NIAS
Editor-in-Chief, JISRS

Prof. Vinay Kumar Dadhwal

Message

I am very happy to join the members of Indian Society of Remote Sensing and the community of authors and readers of the Journal of Indian Society of Remote Sensing in celebrating Golden Jubilee of the society as well as the journal on February 24, 2023 at Indian Institute of Remote Sensing (IIRS), Dehradun.

Although started as a modest effort to disseminate the early research in the area of remote sensing, with the name 'Photonirvachak', the journal has kept pace with advancements in remote sensing technology and applications and is now among the leading journals in this research domain from this part of the world.

I have the privilege of being editor of this journal since 2010, when Prof R.P. Singh of IIT Kanpur, after bringing transformative improvements, handed over the reins to me. Under the guidance of Chief Editors, first Dr. George Joseph and currently Dr. Shailesh Nayak, support from Executive Council of ISRS and the members of the editorial board, the journal has taken a number of progressive steps by partnering with Springer India for publication, enlarging the editorial board, enhancing the frequency to monthly publication and on the web access to members as well as entire body of published articles being accessible on web. These changes have made the journal a truly an international journal, editorial oversight with an appropriately high rejection rate has kept the standard of journal high and its impact factor among the top tier of scientific journals being published from India.

In the interim period, India has risen in the ranks in terms of scientific output, the journal publishing is moving towards open publications with article processing fees by authors or their institutions. The competition among journals has also increased as new journals have started catering to this discipline. However, I am sure the journal and its advisory committees will continue to take progressive and far reaching decisions that would further enhance the standing of the journal. I am sure that journal will continue to act as an important vehicle for researchers to share new science, methodologies and applications of remote sensing and geospatial sciences to the global readership.

Once again my greetings, congratulations and best wishes for continued growth of the Journal.

Prof. Vinay Kumar Dadhwal
Indira Gandhi Chair Professor, NIAS
Editor, JISRS

Dr. S. P. Aggarwal

Message

The Journal of Indian Society of Remote Sensing (JISRS) had a modest beginning in 1973, which was initially known as Photonirvachak and published biannually. Today, it is a leading publication in the field of remote sensing and has been a driving force in advancing the understanding of the use of remote sensing technology and its applications. As the Indian space program gained momentum, the JISRS also grew and played a key role in publishing advance research. With the remote sensing technology becoming increasingly sophisticated and widely used, the JISRS also kept on promoting new and innovative ideas to become one of the leading journals in the field. Over the past 50 years, the JISRS has published numerous research papers covering almost all areas of Remote Senisng technology and applications. The journal's commitment to quality and practical applications has made it a valuable resource for professionals, academicians, students, and policymakers.

Since 2008, when the JISRS signed MoU with Springer for its publication, there is a continual improvement in the visibility, dissemination, citation and its impact factor. Currently the journal is published monthly and having impact factor of 1.894. This increase in impact is a testament to the high quality and relevance of the research published in the JISRS, and reflects the journal's increasing prominence among the remote sensing community across the globe. In view of rapid pace of technological innovation and advances, the Journal is well-positioned by publishing cutting-edge research and fostering dialogue among experts from different disciplines.

I take this opportunity to congratulate and thank all the present and past Editor-in-chiefs, Editors, Executive editors, Managing Editors, Associate Managing editor, Reviewers, Authors, and all others who have directly or indirectly contributed to bring the JISRS to this prominent place. I am sure that JISRS shall continue to play a key role in advancing the field of remote sensing in India and beyond. I wish a grand success of the Golden Jubilee celebrations of the ISRS and JISRS.

Dr. S. P. Aggarwal
Director, NESAC
Executive Editor, JISRS

Dr. Asis Bhattacharya

Message

It is my great pleasure expressing in this message my experience associated with JISRS (Journal of Indian Society of Remote Sensing), for inclusion in this special compendium as published in commemoration of the golden jubilee celebration of JISRS, which was earlier known as 'Photonirvachak'. I have always had an emotional attachment and feeling towards the then 'Photonirvachak' as I was its Chief Editor.

When a batch of geologists including me, deputed by the Geological Survey of India (GSI) to the then 'IPI' (Indian Photo-interpretation Institute), the former name of the present IIRS (Indian Institute of Remote Sensing) in1973 for undergoing a one-year training programme in aerial photo-interpretation in geology, we were lucky then to witness the conceptualisation of publishing the journal of 'Photonirvachak' in the same year. Next year, that is in 1974, 'Photonirvachak' was first published, where Prof B. N. Raina, then Head, of the Geosciences Division, IPI, was its first Chief Editor.

Later, when I joined IPI in July 1977 as Professor (Research) Geology after having a brief stint in GSI, I then found the Late Professor D. P. Rao of the Geosciences Division, IPI, was then the second Chief Editor of 'Photonirvachak'. During that time, finding me a young dynamic person, the Late Professor H. S. Iyer, then Head, of the Soil Division, IPI, and then Secretary of the Indian Society of Photo-interpretation (ISPI), which is presently known as ISRS, that is, Indian Society of Remote Sensing, used to associate me with the Society for various editorial work of the Journal. As I was always interested in such editorial jobs, I happily used to perform those jobs. At the request of Professor H. S. Iyer, I then became also the Life Member of the Society. Finally, in the year 1979, I was elected as the third Chief Editor of the Journal of 'Photonirvachak', and I continued up until 1983. I sincerely performed my editorial work. During that time, editorial jobs were very difficult as everything was manual. There was no digital concept at that time. Even thinking about present-day computer-assisted work was also a dream at that time. During that time, reproduction and copying of any technical papers were also a big task because of the absence of any copier or Xerox machine. Only one Xerox machine was available in the entire IPI and its use was also restricted. It could only be used after getting permission from a higher authority. Hence, we had to mainly do cyclostyling for getting many copies of the desired documents.

After getting the papers from the authors for publication, I had to check the papers manually for editing. If any corrections are needed, I had to carry out those corrections by retyping the entire manuscript in a manual typewriter machine as available in those days, because sending back the papers to the authors for corrections and getting them back to us was a time-taking process as there was no email concept and everything was by normal post. Even, the speed post concept did not exist. I had to do everything by myself as Chief Editor to hasten the entire process. There was just for name sake an ornamental Editorial Board. Thus, the maximum pressure of editing jobs was lying to the Chief Editor only. The formal concept of the editorial Board came much later after my tenure. Referring the papers outside IPI was also a big task due to time constraints as Referees were not always sending back their comments regarding the papers at our ends in time for further processing, as everything was always by normal post, which was time taking. That was the reason, we mostly carried out the reviewing of the papers in-house ISRO, that is within IPI, NRSA (National Remote Sensing Agency, the former name of present NRSC, that is, National Remote Sensing Centre) and SAC (Space Application Centre, Ahmedabad). Often, we also used to send the papers for reviewing outside ISRO, such as CAZRI (Central Arid Zone Research Institute, Jodhpur), NBSSLUP (National Bureau of Soil Survey and Land Use Planning, Nagpur), AISLUS (All India Soil and Land Use Survey, New Delhi), GSI, to name a few. Sometimes, papers were also sent for review to some Academic Institutions like IITs, Roorkee University, Calcutta University, and Andhra University, to mention a few.

The quality and standard of the papers were good, considering the technology available during that backdrop. However, the papers were mainly based on aerial photo-interpretation, because the concept of remote sensing was unfrequented. Papers were mainly in the fields of Land Use, apart from a few in geology, forestry and soil. Much after the launch of ERTS (Earth Resources Technology Satellite, the earlier name of Land sat) by the USA in July 1972, few papers on remote sensing were used to come, that too mainly from NRSC and a few from SAC. Papers related to digital image processing of satellite data were rare; mainly those papers were coming then from NRSA. The figures, diagrams and maps were mainly drawn by Draftsmen, as Computer Aided Drawing (CAD) did not exist during those days. Hence, any corrections needed in the diagrams were also a tedious job because of redrawing the entire diagram again manually.

The scope of printing the journal was also very manual in those days as a digital concept did not exist. Only two or three printers were available locally in the entire Dehra Dun in those days. Further, the quality of printing and printing papers was very modest. A big task for the Chief Editor was then proofreading and correcting the sample papers as provided by the printer. Though professional proofreaders were also available during that time, they were not from the respective scientific fields. Hence, the possibility of mistakes remained. Sometimes, I had to carry out proof corrections several times for the same paper before giving a final shape. After passing through all these stages, it was also a big challenge to publish the journal on time. During my time, the 'Photonirvachak' journal was mainly printed by the 'Commercial Printer' of Dehra Dun. Later, after my tenure, so far as I remember, another Printer named 'Vikalp Printer' took the charge of the printing of 'Photonirvachak'.

In those days, though the concept of the 'Impact factor' of the journal was not that common, 'Photonirvachak' was then the only premier journal in the country in the field of RS. Internationally, the ITC journal of The Netherlands was also then quite established.

However, 'Photonirvachak' was also then comparable with the ITC journal, considering the technical content. Of course, I should admit that the printing quality of the ITC journal during that time was better than that 'Photonirvachak'. We also published some special issues of 'Photonirvachak', particularly theme-based, like one in forestry and seminar papers of the first National Seminar on RS as was held in IPI under the chairmanship of Col. Prof. Prabhakar Misra. I also tried to introduce a change in the cover design of the journal. For the first time, a satellite image of the Himalayan terrain in colour was printed as a journal cover, as Dehra Dun is situated in the Himalayan terrain.

Today, 'Photonirvachak' as known as 'JISRS' (Journal of Indian Society of Remote Sensing) has attained a much higher level of height having an 'Impact factor' of 1.864 and is internationally famous in the field of 'Remote Sensing and GIS', with the untiring effort by the present team of 'Editorial Board'.

I wish, for the further success of the 'JISRS' in its future endeavours.

Dr. Asis Bhattacharya
Former Chief Editor

Dr. Baldev Sahai

Message

It was a great privilege to be at the helm of the Journal of the Indian Society of Remote Sensing (JISRS) during 1990-95 as it was beginning of many innovations in publication of papers in this field.

The era marked a transition of the Journal from conventional mapping related publications to that of modern disciplines like digital image processing, data processing and modeling of data gathered by satellite-borne modern electronic sensors. This is aptly reflected in the changes in the name itself – from Photonirvachak - Journal of Indian Society of Photo Interpretation in 1973, to Journal of Indian Society of Photo Interpretation and Remote Sensing in 1979 and finally to Journal of the Indian Society of Remote Sensing in 1986.

Launch of the state-of-the-art remote sensing satellites like IRS-1A in March 1988, followed by other such satellites by the Indian Space Research Organisation (ISRO), gave impetus to research in this field in India and consequently number of publications increased.

ISRO's initiative on remote sensing projects with user departments under the Nation Natural Resources Management System (NNRMS) and teaching of remote sensing as a discipline in educational institutions further broadened the base of research in remote sensing applications and technique in the country.

As chief of a professional editorial team, we responded to increasing flow of research papers by improving the processing of papers for publication. At the same time we maintained the quality of Journal by increasing the rejection ratio through a refereeing system by engaging wider expertise available in the country.

As per decision of the Executive Council of the Society, Chief Editor also acted as the Chief Editor of Proceedings of annual national symposia. This helped in selecting promising papers in a symposium and encouraging the authors to finalise and submit them to the Journal.

The quarterly frequency of issues was thus maintained in response to enhanced flow of papers.

The base of the Journal which was largely Indian researchers was expanded to cover foreign authors as well, which gave better credibility to JISRS.

Overall, it was a very rewarding engagement. I thank the entire editorial team and the office bearers for their cooperation and support.

It is indeed heartening to note that frequency of publication became monthly with effect from the year 2018 [volume 46], achieved worldwide recognition and achieved a high impact factor.

I wish the Journal greater and greater success.

Dr. Baldev Sahai
Former Chief Editor

Prof. Ramesh P Singh

Message

JISRS Needs to Connect Asian Remote Sensing Scientists to Monitor and Study the Impacts of Climate Change

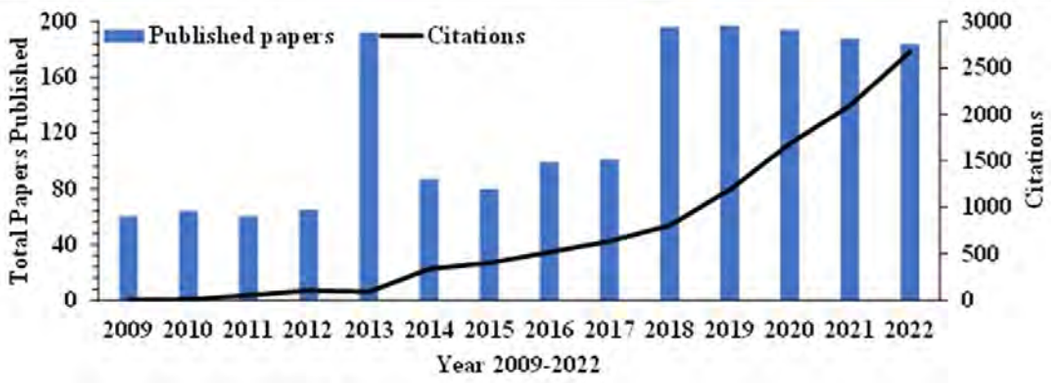
The Journal of the Indian Society of Remote Sensing (JISRS) started with the name 'Photonirvachak' in 1973 and now it has completed fifty years of publication. I was associated with the Journal as a Chief Editor for the period 2001-2007. When I took the role of the Chief Editor, the outgoing Editor expressed his concerns that a person like me without any experience will not be successful since the responsibility as the Editor is huge. I was humble not to say anything, but I took his words as a challenge. After taking the responsibility, I started handling manuscripts, reviewing processes, finalizing the publication of each accepted manuscript, arranging the order content for each issue of the Journal, proofreading the paper, and also incorporating the corrections received from the authors, at my own with some support from my lab assistant. One of my biggest desires is to publish the Journal timely when the Journal was lagging behind almost a year and also to improve the quality of the Journal. My efforts continued to bring each issue timely without any compromise to the quality of the papers. I made efforts in 2004 to include the Journal in Thomson ISI Products but I was asked to continue efforts to improve the quality and timely publication, finally, the good news was received, and the Journal was included in the Thomson ISI Products beginning with volume 34(1) 2006. This was a great achievement of the Remote Sensing Society. Our Journal received international status, I brought out an Editorial "**PHOTONIRVACHAK: From National to New International Status",** in March 2007 as an outgoing Chief Editor. The inclusion of JISRS in Thomson ISI Products was appreciated by the ISRS members and authors of JISRS started to see their names in the Web of Science ISI Alerting Service. The reputation of the Journal and the author's recognition are associated with the Impact Factor reported by the Thomson ISI every year. The Journal has a current Impact Factor of 1.894, the Journal is timely published and the papers are included in the Web of Science and the Journal attracts papers from international authors.

In 1973, beginning, the Journal started with 1-2 issues, sometimes 3 issues until the year 1987, in the year 1988 the Journal started publishing four issues, in 2016 bimonthly publication of the Journal started, and now monthly publication since 2018. The Journal is

published by Springer. The following figure shows the number of papers (blue color bar) published in the Journal from 2009 until 2022 and the black line shows the number of citations.

During 2009-2022, a total of 1687 papers were published in JISRS, these papers have received a total citation of 10837. The number of papers published has increased significantly since 2018 due to the increase of the Impact Factor (0.867 in 2018). The citations help to improve the Impact Factor of the Journal which is clearly reflected in the figure. The Journal attracts high-quality papers from international authors which is reflected from citations of the papers published in the Journal (Figure 1).

Although the Journal is being published since 1973, citations of earlier published papers are not available, however, a common problem of the Indian authors not citing the work of Indian colleagues, such attitude hampers the impact factor of the Journals, this is one



of the reasons for the Indian Journals.

Following are a list of papers published in JISRS which has received more than 50 citations. The topmost paper by Pradhan et al. (2010) received the top citations 231 as of Dec 2022, followed by 131 citations by Akram et al. (2009) and 103 citations by Patro et al. (2009). All these citations have helped to enhance the Impact Factor of the Journal. I would like to congratulate these authors for their contributions.

1. Pradhan, 2010, Landslide Susceptibility mapping of a catchment area using frequency ratio, Fuzzy logic and multivariate logistic regression approaches, v. 38, no. 2, no of citations 231.
2. Akram et al., 2009, Prioritization of Sub-watersheds based on Morphometric and Land Use Analysis using Remote Sensing and GIS Techniques, v. 37, no.2, no. of citations 131
3. Patro et al. 2009, Flood Inundation Modeling using MIKE FLOOD and Remote Sensing Data, v. 37, no. 1, no. of citations 103.

Following papers with 50 and less than 100 citations

4. Alsharif et al., 2014, Urban Sprawl Analysis of Tripoli Metropolitan City (Libya) Using Remote Sensing Data and Multivariate Logistic Regression Model, v. 42, no. 1.
5. Sharifzadeh et al., 2019, Ship Classification in SAR Images Using a New Hybrid CNN-MLP Classifier, v. 47, no. 4.
6. Kumar et al. 2020, Identification of Groundwater Potential Zones of a Tropical River

Basin (Kerala, India) Using Remote Sensing and GIS Techniques, v. 48, no. 3.

7. Singh et al., 2009, Water Harvesting Structure Positioning by Using Geo-Visualization Concept and Prioritization of Mini-Watersheds Through Morphometric Analysis in the Lower Tapi Basin, v. 37, no. 1.
8. Bihamta et al., 2015, Using the SLEUTH Urban Growth Model to Simulate Future Urban Expansion of the Isfahan Metropolitan Area, Iran, v. 43, no. 2.
9. Rahman et al., 2012, Assessment of Land use/land cover Change in the North-West District of Delhi Using Remote Sensing and GIS Techniques, v. 40, no. 4.
10. Kumar et al., 2020, Identification of Groundwater Potential Zones Using RS, GIS, and AHP Techniques: A Case Study in a Part of Deccan Volcanic Province (DVP), Maharashtra, India, v. 48, no. 3.
11. Singh et al., 2009, Selection of Suitable Sites for Water Harvesting Structures in Soankhad Watershed, Punjab using Remote Sensing and Geographical Information System (RS&GIS) Approach- A Case Study, v. 37, no. 1.
12. Nagarajan and Singh, 2009, Sujit Assessment of Groundwater Potential Zones using GIS Technique, v. 37, 1.
13. Goldarag et al., 2016, Fire Risk Assessment Using Neural Network and Logistic Regression, v. 44, no. 6.
14. Binh et al., 2018, Spatial Prediction of Rainfall-Induced Landslides Using Aggregating One-Dependence Estimators Classifier, v. 46, 9.
15. Bouzekri et al., 2015, A New Spectral Index for Extraction of Built-Up Area Using Landsat-8 Data, v. 43, no. 4

My message to the readers of the JISRS is to freely cite papers published in the Journal when they contribute to this Journal or any international Journals so that their work gets recognized and also the Journals Impact Factor is enhanced.

The Journal publishes papers work related to remote sensing principles, remote sensing missions, and remote sensing applications to natural hazards, earth systems, earth's resources, monitoring, and mapping of resources. The papers appearing in the Journal, bring out new ideas and new concepts, the Journal would like to promote remote sensing studies in Asian countries, which can help remote sensing scientists to connect in Asia and further with Global scientists. The impacts and state of climate change are apparent from the snow/glacier studies from the higher Himalayan region and from the ocean surrounding Asian continents. The language of remote sensing from the publications of JISRS will bring remote sensing scientists closer to exchanging their ideas helping to minimize the impacts of climate change and the loss from the associated natural hazards.

Finally, I thank the members of the present and past Executive Committees, and members at large of the ISRS for their contributions over the last fifty years. I enjoyed the support of authors, reviewers, and the then Presidents (S.K. Bhan, George Joseph, R. R. Navalgund, and K. Radhakrishnan) of the ISRS for playing an active role as the Chief Editor (2001-2007), a big thank you to everyone. Let us use remote sensing data together with ground data to study various Earth System problems and to prepare new generations to cope with the impacts of climate change in Asia and globally. My sincere thanks to the current President Dr. Prakash Chauhan for inviting me to write personal impressions.

Prof. Ramesh P Singh
Former Chief Editor

Prof. B.L. Deekshatulu

Message

I am happy to learn that the 'Indian Society of Remote Sensing' (ISRS) which was established in the year 1969, as the 'Indian Society of Photo-Interpretation' has grown in stature, since then and is recognized as a National member of the International Society of Photogrammetry of Remote Sensing (ISPRS). It is a moment of pride ISRS publishes Journal of the Indian Society of Remote Sensing (JISRS), earlier known as "Photonirvachak" in 1973, is celebrating its 50 years of existence. The society and the journal have come a long way. I understand it is now an online journal brought out by Springer Nature, a reputed publisher and its Impact Factor (IF) has improved to 1.894. The distinguished scientists who have led the Editorial Board and referees have made immense contributions in improving the scientific content and overall quality of the publications. I remember many landmark articles on aerial & satellite remote sensing, geographical information system, its applications in management of natural resources and environmental studies and so on. Besides it organizes many seminars and symposia to foster growth and awareness among the scientists and practitioners of remote sensing & GIS.

It looks as though only the other day I joined ISRS. I am rejoiced to know to commemorate the occasion in a befitting way the society is organising the golden jubilee celebrations on 24th February, 2023 at IIRS, Dehradun.

On this occasion, I congratulate the executive council of ISRS and also the members of the editorial board of JISRS for the remarkable achievement. I wish many more memorable events in times to come.

Prof. B.L. Deekshatulu
Former Chief Editor

Dr. George Joseph

Message

I am happy to note that the Indian Society of Remote Sensing (ISRS) is celebrating the golden jubilee of ISRS and the Journal of the Indian Society of Remote Sensing (JISRS).

The ISRS started as the "Indian Society of Photo-interpretation" by a small team of professional from the Indian Photo-interpretation Institute (IPI) as it was known then. In the past few decades the ISRS has grown as a premier professionals body with its chapters spread throughout the country. The society through its various regional and national programs provides an opportunity for the professionals in the field to share their experience to further the application of remote sensing and GIS for the national benefit.

To provide a platform for remote sensing professionals to share their research work, the society started its journal initially known as Photonirvachak. Currently, the journal known as Journal of the Indian Society of Remote Sensing (JISRS) is the only journal in the country exclusively dealing with remote sensing technology and its applications. The journal has contributions from national and international scientists. It is gratifying to note that over the years the impact factor of the journal has been steadily increasing to 1.894 in 2021.

I am confident that society and the journal will contribute further to the scientific development, advancement, and dissemination of remote sensing and allied fields.

My best wishes for the golden jubilee celebrations.

Dr. George Joseph
Former Editor-in-Chief, JISRS

Dr. Prakash Chauhan

Message

It is indeed a matter of great pride and happiness that the Indian Society of Remote Sensing (ISRS) one of the oldest professional societies in the field of Geospatial Technology is celebrating its Golden Jubilee at its Headquarters at Dehradun. Apart from many professional activities, ISRS also brings out a monthly journal namely Journal of the Indian Society of Remote Sensing (JISRS), which used to be known earlier as "Photonirvachak" on a regular basis along with Springer as publisher. My associate with the journal started almost three decades back, when I was the student at University of Roorkee in the years of 1988-1990 and used to glance this remote sensing journal in the historical library of the university. At that time I never realised that destiny will play in a way that I will take up remote sensing as my professional career even though I was a student of Applied Geophysics and eventually take up the positions of executive editor of this Journal and subsequently be the President of the society. After I joined Space Applications Center at Ahmedabad in the year 1991 my association with journal deepened. In fact, my first publication was accepted in the same journal on the quantitively estimation of Suspended Sediments along Tamil Nadu coast using multispectral IRS-1A/1B data. I happy to see that today JISRS is doing very well and the impact factor ofthe journal is increasing every year and as Executive Editor during the years 2019 to 2022 my editorial team could reduce the turnaround time (TAT) of paper publication and enhanced the number of associate editors for faster publications. The impact factor also rose from 0.98 to current 1.894. Today journal has international reach and authors from many Asian-African countries are publishing their work in JISRS.

On this happy occasion I wish that JISRS will attain higher heights and will attract cutting edge research for publications. I urge all the geospatial professionals and members of the society to published high quality research work in JISRS and this truly Indian Journal of International class in times to come. I would like to place on record my highest appreciations to all the past and present Chief Editors, Editors, Associate Editors and Editorial board members for their valuable contributions and to all past Presidents of the ISRS for sustained support to JISRS by society. I wish the golden jubilee function of ISRS and JISRS a grand success.

Dr. Prakash Chauhan
Director, NRSC
President, ISRS

Suvira Srivastav

Message

53 years of the glorious existence of the Indian Society of Remote Sensing is a success story written by an incredible number of people. Springer Nature is delighted and humbled to be part of this spectacular journey by publishing society's flagship publication- *the Journal of the Indian Society of Remote Sensing.*

In this half a century of promoting the spirit of research and collaboration, these celebrations are also a solemn occasion to pause and look back at the milestones that we have achieved together. From a quarterly journal that Springer started co-publishing with Volume 36 in 2008, the journal has become a monthly publication, receiving submissions, and enjoying dedicated readership from across the globe. Last year we touched another height when Impact Factor inched closer to 2 mark with 1.894.

In all these years, the journal has consistently dedicated to producing articles that push the edges of scholarship, thanks to the exemplary efforts of editorial board and society management. We would want to take a moment to pay our tribute to their vision and hard work that gave us the foundation for today.

My team is very excited to get an opportunity to support all of you in making our presence felt on global research landscape. We are committed to being a reliable partner in ensuring that the journal continues to attain new heights.

Suvira Srivastav
Publishing Director, Springer Nature

GOLDEN JUBILEE CELEBRATIONS

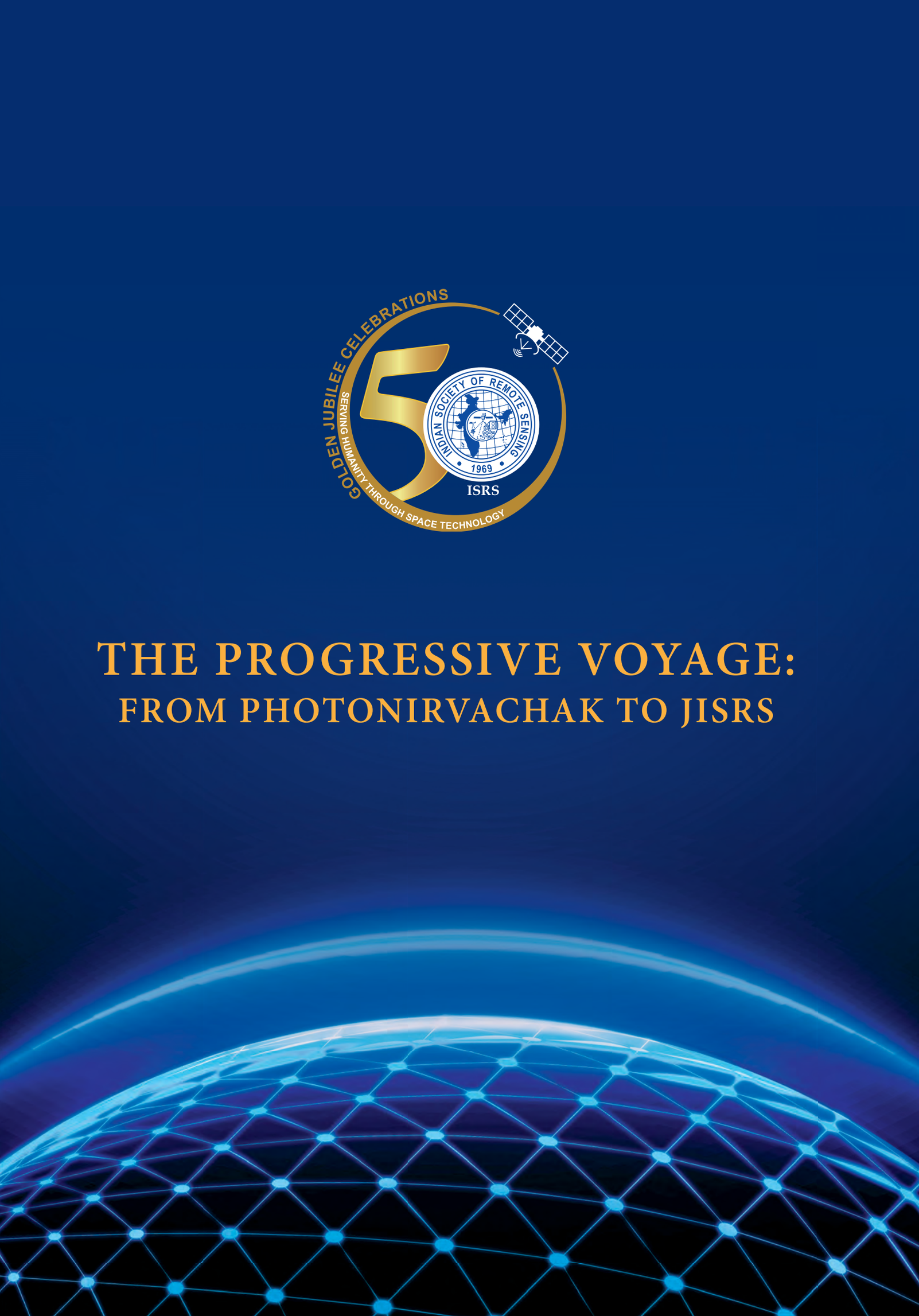
SERVING HUMANITY THROUGH SPACE TECHNOLOGY

INDIAN SOCIETY OF REMOTE SENSING

1969

ISRS

THE PROGRESSIVE VOYAGE:
FROM PHOTONIRVACHAK TO JISRS



THE PROGRESSIVE VOYAGE:
FROM PHOTONIRVACHAK TO JISRS

Dr. George Philip

Introduction

Journal of the Indian Society of Remote Sensing (JISRS), the flagship journal of the Indian Society of Remote Sensing (ISRS) is completing 50 years of its existence this year. It is remarkable to have this 50th anniversary for our journal together with the Golden Jubilee celebration of ISRS, the parent society. It is also a matter of our satisfaction and pride that while we witnessed an exponentially accelerating development of space science and remote sensing technology, JISRS maintained the relevance of founding principles of ISRS for half a century which addresses very deep, substantial societal needs, 'Serving mankind through space technology'. In recent years, the Journal has gained wider distribution, readership, and recognition across the world. However, on this occasion, it is a challenging task to record here a comprehensive account of all the contributions and achievements of our journal made in the past five decades. Nevertheless, this compendium is prepared after consulting available previous records, reports, and also personal communication. It is aimed at providing a panorama of the progressive growth of the journal and the milestone developments achieved thus far. This compendium also contains a separate section of 59 abstracts, reproduced from the research articles published in JISRS, which have won the 'ISRS-Best Paper Award' since its inception in 1991. Due to the non-availability of relevant records, we could not reproduce here three abstracts for the years 1998,1999, and 2000 while finalizing this compendium.

Birth of the Journal

It all began when the huge potential of aerial photographs for earth resources evaluation was recognized in our country. As early as 1920, aerial photographs were known to be used for land surveys in India. The records also mention that in the year 1926, air photos were used for flood assessment of the Indus River at Dera Ismail Khan, in Pakistan, then part of nonpartitioned India. Eventually, the air-photointerpretation techniques assumed great significance and its application was acknowledged amongst a large number of geologists, soil surveyors, foresters, engineers, geographers, and cartographers who also became proficient in the photointerpretation techniques. Sooner or later, the photo interpreter's community felt the need to have a professional body to share their experiences and explore new avenues to use this technique for wider applications.

According to Late Col. J. N. Sinha (1973), the concept of establishing the society of photo-interpretation and publishing a journal, exclusively devoted to the research and development activities, in the field of photogrammetry, photo interpretation, and remote sensing was engaging the attention of scientists at the then Indian Photointerpretation Institute (IPI), Dehradun. Accordingly, in the years of late sixties, a few like-minded researchers joined hands together and unanimously decided

to form a professional body within the framework of a scientific society. This society named as Indian Society of Photointerpretation (ISPI) was aimed at bringing together scientists, professionals, and academicians. As enumerated in the constitution of ISPI, a major objective of the society is to publish a scientific journal named 'Photonirvachak' and also other occasional research bulletins. Photonirvachak, the flagship journal of the society, was expected to be published as a regular research journal to serve as a medium of communication amongst photo-interpreters as well as other interested researchers towards the promotion of photointerpretation. It was also expected that in the long run, a significant number of research papers will be submitted for publication in Photonirvachak. This noble cause was realized in 1973 when the society brought out a provisional issue of the journal, a cyclostyled compilation, priced at Rs. 2/-. The first Chief Editor of this issue was Prof. B. N. Raina. From then on the printed version the journal was distributed free to its members for a very long period. Later on, online access has been provided to all members and limited copies (hard copies) to patron members.

First Issue in Print

In the early seventies, the society had only a few members enrolled. Therefore, the funds available to society were inadequate for meeting the cost of good-quality printing of the journal. It is against this background that an appeal for financial support by the way of a grant was made to the Department of Science and Technology, Government of India. By this time members of the society also grew to 80, which included a few sustaining members of the same. Meanwhile, few firms agreed to advertise in the first volume of 'Photonirvachak'. This was further, a means to generate revenue towards the printing cost. In the meantime, few other organizations and laboratories/institutes informed the society that they would become sustaining members after receiving a specimen copy of the volume of the journal. Finally, the first volume pertaining to 1 & 2 issues of the 'Photonirvachak', Journal of the Indian Society of Photo Interpretation, that contained 10 research articles were printed and published on July 1974, with additional financial support (Rs. 2,000/-) from Department of Science and Technology, Government of India, New Delhi. The inaugural issue of Photonirvachak began with the scholarly article by Dr. R.N. Colwell titled "Some recent developments in photographic interpretation".

Meanwhile, major changes were taking place in the field of remote sensing with the emergence of the new tool i.e., satellite images. Apollo photos received by the Indian Institute of Remote Sensing (IIRS), the then IPI, opened a new vantage point and a boon to the remote sensing community. The first printed volume of the Photonirvachak included an article on image analysis followed by a very systematic effort made by Prof. T. R. Srinivasan illustrating the use of satellite images for soil surveys. With the launch of the first Earth Resources Technology Satellite (ERTS) in July 1973, later renamed Landsat by the National Aeronautics and Space Administration (NASA), space images became widely available to researchers and users which opened new vistas in surveying, mapping, and monitoring of material resources. Eventually, the rapid developments in technology got reflected in research pursuits. This helped in raising the standard of scientific articles which were subsequently submitted to the journal in the succeeding years.

Transformation in Journal's Name

During the past 50 years, the journal has made substantial improvements, both in appearance and content. Interestingly the name of the journal changed several

times within a short span of intervals. From 1973-1978 the name of the journal was *Photonirvachak: Journal of the Indian Society of Photointerpretation*. However, several modifications in the name evolved during the late seventies. The change began with renaming the society. The name of the society, the Indian Society of Photo Interpretation, was reformed to the Indian Society of Photo interpretation and Remote Sensing. Consequently, 'Remote Sensing' was also added to the name of the Journal although *'Photonirvachak'* was retained in a passive form. Hence during 1979-1981, the journal name was modified to *Photonirvachak: Journal of Photointerpretation and Remote Sensing*. Later, the name was further modified by adding 'Indian' to the journal's name. Consequently, during the period 1982-1985, the name of the journal renamed as *Photonirvachak: Journal of Indian Society of Photointerpretation and Remote sensing*. With extensive use of aerospace data (both air-photos and satellite data) during 1986-2007, the name of the journal was further revised and began to publishing as *Photonirvachak: Journal of the Indian Society of Remote Sensing*. Of late, since 2008, '*Photonirvachak'* was removed from the title and the journal is rechristened as *Journal of the Indian Society of Remote Sensing.* During this transformation period, the cover page of the journal also got replaced several times (Fig.1). It is a matter of pride that currently, the Journal of the Indian Society of Remote Sensing is the only journal in our country, publishing research work exclusively based on remote sensing and its wide range of applications which has a significant societal impact. Undoubtedly over the past five decades, JISRS has made an enviable growth among other scientific research journals of our country.

Fig. 1. Cover pages of the journal from 1973 till date

Rise in publication

As the journal became known among researchers, more articles were submitted for publication. With the increase in the submission of research manuscripts to the journal, the frequency of issues per year has also progressively grown over the years. The first volume of the Journal in 1973 started with 1-2 issues, sometimes 3 issues until the year 1987. In the year 1988, the Journal began publishing four issues in a year. With a large number of research articles being submitted to the journal, the journal became a bimonthly publication in 2016. The number of articles and the number of pages per issue also grew to accommodate the rapidly expanding field of remote sensing. Eventually, in 2018, the journal became a monthly publication. Although we do not have a continuous and confirmable record of the number of submissions to the journal since 1973, figure 2 shows the manuscripts received for the period 2008-2022. Since 1973, we have published 2498 research articles including 27 review articles which are spread over 50 volumes and in 228 issues till December 2022 (Fig. 3).

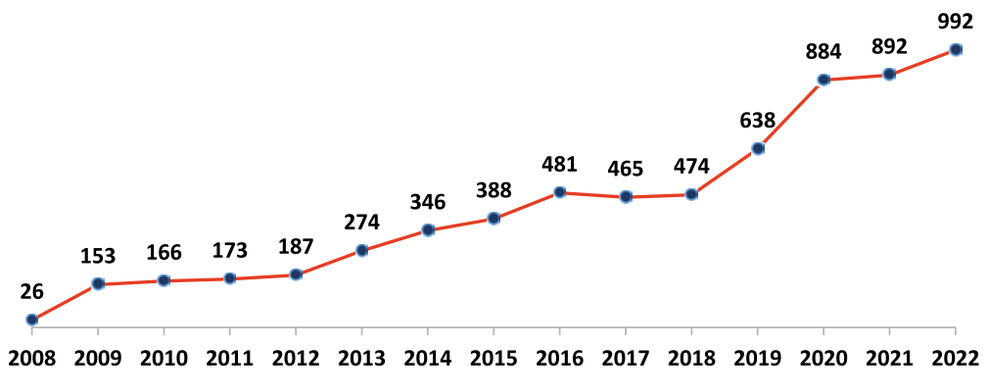


Fig. 2. Number of submissions to JISRS (2008-2022)

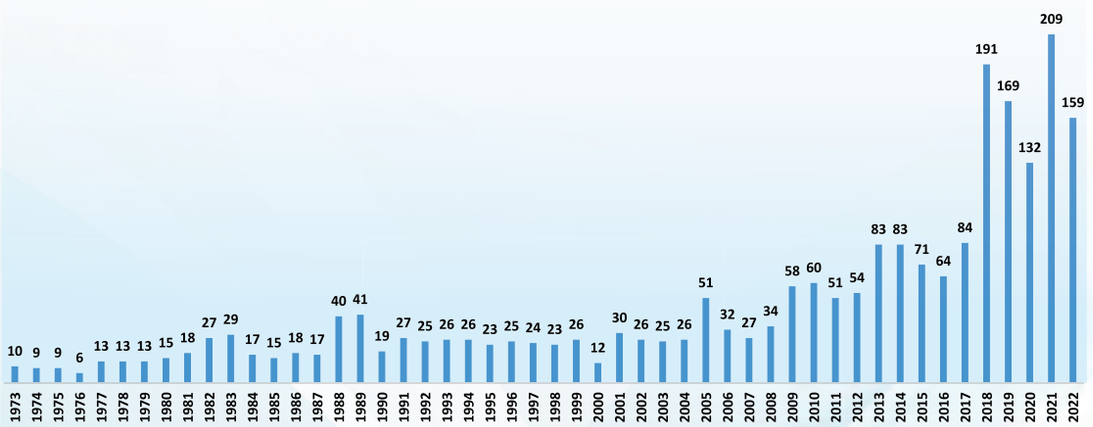


Fig. 3. Number of research articles published Yearwise (1973-2022)

Aims and Objectives of JISRS

The aims and scope of the Journal of the Indian Society of Remote Sensing are to help towards advancement, dissemination, and application of the knowledge of Remote

Sensing technology. This is deemed to include photo interpretation, photogrammetry, aerial photography, image processing, and other related technologies in the field of survey, planning, and management of natural resources and other areas of application where the technology is considered to be appropriate.

The research papers published in JISRS are of high quality and have original research contributions in all the related fields of remote sensing and its applications. Scientific papers in diverse fields such as remote sensing of the earth, oceans, atmosphere, data collection, analysis, interpretation and display, properties and characteristics of remote sensors and related instruments, digital data processing (hardware and software), pure and applied research in agriculture, forestry, ecology, geology, geomorphology, hydrology, hazard monitoring, environmental studies, meteorology, oceanography, marine resources, resource inventory and surveys, integrated rural and urban planning, cartography and economic surveys and cost/benefit analysis are considered for publication.

Former Printers

The first issue of the Journal was printed and published in 1974. That was the era of the painstaking process of manual composing, and page setting. Printing was performed manually as against modern computerized printing technology. It was in 1974 M/s Commercial Printers, Dehradun, printed the first issue of Photonirvachak, Vol.1 (1&2), and they continued to print the subsequent issues i.e., up to Vol.18, (1&2) till the year 1990. Thereafter M/s Jay Ess Printers, Dehradun was assigned the printing of a few issues of the journal i.e., up to Vol. 19(2) till 1991, for a shorter period. In the year 1991, M/s Vikalp Printers, Dehradun was assigned to print the journal from Vol. 19(3) to Vol. 31 (2). Since 2003, M/s Shiva Offset Press, Dehradun was entrusted to print Vol 31 (3) to Vol. 35 of Photonirvachak.

Contractual agreement with Springer Nature

As the journal subscription increased, the Editorial Board of Photonirvachak weighed up several factors, more importantly, a good publisher for wider distribution and international reach of the journal, which was very essential. Therefore, a larger and more experienced publisher of professional journals was preferred. After contemplating various proposals from the likely publishers to take the journal forward, the Editorial Board decided to go with Springer Nature. On 25th February 2008, ISRS agreed with Springer Nature India Private Limited (the then Springer India Private Limited) which acts in cooperation with Springer Science + Business Media, New York. This agreement was initially made to prepare and publish the electronic version of JISRS for worldwide dissemination via SpringerLink and to distribute the printed international version. In the year 2008, Springer Nature India Pvt Limited started publishing the journal from Volume 36 (1). Subsequently Springer also agreed to include the journal in its worldwide online consortia plans. This was a major milestone achievement of JISRS. Within the framework of the contract agreement made with periodical review and renewal, the printing and publication of JISRS is being continued till today with Springer Nature India Private Limited.

Mode of publication

Currently, JISRS is a hybrid open-access journal. Once the article is accepted for publication, authors will have the option to choose how their article is to be published.

This can be either in a traditional publishing model or in open access. In the traditional mode, the published articles are made available to institutions and individuals who subscribe to JISRS or who pay to read specific articles. On the other hand, in open access mode, when an article is accepted for publication, the author/s or funder/s pays an Article Processing Charge (APC). The final version of the published article is then free to read for everyone.

JISRS Special Issues

Unparalleled and rapid progress in sensors and their platforms has provided a major impetus for the use of remote sensing techniques in diverse fields. The results of these applications have been spectacular as many researchers have made interesting observations and important interpretations. Keeping this in view, in recent years JISRS encouraged to bring out Special Issues on different themes within the scope of the journal. These issues have provided a venue for research on emerging areas, highlighting important sub-disciplines, and showcasing multidisciplinary applications. Table-1 provides a list of special issues brought out by JISRS thus far.

Table-1: Special Issues Published in JISRS (1973-2022)

Sr. No.	Volume	Issue No.	Month	Year	Theme
1	39	3	September	2011	Earth Observation for Climate Change Studies
2	46	6	June	2018	Advances in Remote Sensing and GIS with Emphasis on Mountain Ecosystems
3	46	8	August	2018	Spatial Information for Resource Management
4	49	1	January	2021	25th Anniversary of the Launch of IRS 1C
5	49	3	March	2021	Advances in UAV Remote Sensing
6	50	2	February	2022	Advanced Geospatial Technologies for Agriculture with Special Emphasis on Field Level Applications
7	51	2	February	2023	Satellite Oceanography: Revolutionizing the "Blue Economy" (to be released in February 2023)
8	Under Preparation				Deep Learning for Remote Sensing Based Earth and Environment Resources Management
9	Under the Call				Forest Biomass Assessment using Multisource Earth Observation Data: Techniques, Data sets, and Applications

Editorial Board

During the last 50 years, the journal has made substantial improvements. It was the continuous efforts put in by all editors and the editorial board members of the journal since its inception. The greetings and messages from some of the editors are reproduced in the earlier part of this compendium. These messages loudly speak volumes about their determination, close association, and affection for ISRS and their hard labour rendered to the growth of JISRS.

Editing and publishing a good quality peer-reviewed journal is quite a stressful job for the Chief Editors. Although the developments in electronic publishing and the availability of manuscript management software have eased many issues, this was not so in the earlier years of JISRS. Particularly so when there were financial as well as human

resources constraints. Till the year 1988 the then Chief editors had to pass through such difficult phases when they had to single-handedly manage everything. The editor had to perform multiple jobs and race against time and schedule. Dr. Asis Bhattacharya, who made remarkable contributions to the journal meticulously describes, in his message in this compendium, such frustrating stages of publication while he remained as the Chief Editor of the journal. The testimony of many other editors is also not different from his. However, such hard times did not deter their determination and dedication. Besides, there were times a sufficient number of articles were lacking for publication. There were times the publication lagged for some time due to various reasons. Despite all odds, the editors strived to sustain the release issues of the journal. Sharing of some number of editorial responsibilities began with the induction of a formal Associate Editor from 1988 onwards. Prof. V. K. Jha was inducted as the first Associate Editor during the Chief Editorship of Dr. T. A Hariharan. Since then, JISRS increasingly added more Associate editors.

It was during the Editorship of Prof. R. P. Singh that the journal has occupied a higher ground when it received international recognition owing to its inclusion in the Thomson ISI Products, beginning with volume 34(1) 2006. This was a landmark achievement for the journal. This loudly attests to the fact that the journal by that time has risen to that status for an international audience and recognition. During his tenure, Prof. Singh further expanded the Editorial Board with more members, including seven researchers from abroad.

Another major milestone accomplishment was during the term of Prof. B. L. Deekshatulu, when it was decided to engage a professional publisher to improve the quality of the journal and for wider distribution and readership. The contract with Springer was inked during his tenure. The Editorial Board was also expanded with two Associate editors.

With the creation of an additional Editor's position in 2008, essentially meant to support and assist the Chief Editor, the Editorial Board has been further expanded. Dr. R. Krishnan served the JISRS for three years in this capacity. His hard work and meticulous approach to scrutinizing the submissions surely improved the standard of publication. Dr. V. K. Dadhwal became the Editor of the journal in 2011 and continues to function as the Editor of the journal even today. Known for his critical evaluation and uncompromising approach while selecting worthy articles helped elevate the benchmark of the journal. His close association and timely advice ensure the scientific integrity of the research articles being published in JISRS.

Dr. George Joseph associated with JISRS directly as Chief Editor, and was re-designated later on as Editor-in-Chief, for a longer period (2012-2021). Realizing the fast progress of JISRS, which has led to an increased assignment to the editorial team, he brought significant restructuring of the functions of the Editorial Board and inducted more Associate editors. Since 2018, during his tenure, the journal started publishing monthly issues.

The above account does not undervalue the sincere efforts of Dr. D. P. Rao, Prof. H.S. Iyer, Dr. M.L. Manchanda, Dr. Baldev Sahai, and Dr. PK. Sharma who remained as Chief Editors of the journal in the past. Their contribution to the growth of JISRS is remarkable. Their rigorous assessment of submissions to fulfill the aim to produce high-quality publications has served as a cutting-edge resource for researchers in the field of remote sensing. Tables 2-5 show the list of the former Editorial Board (1973-2020).

Table-2: Chief Editor/Editors/Editor-in-Chief of JISRS since 1973

Sl. No	Period	Name	Designation
1.	1973	Dr. B. N. Raina	Chief Editor
2.	1974-1978	Dr. D. P. Rao	Chief Editor
3.	1979-1983	Dr. A. Bhattacharya	Chief Editor
4.	1984	Prof. H. S. Iyer	Editor
5.	1985	Dr. M. L. Manchanda	Editor
6.	1986-1989	Dr. T. A. Hariharan	Editor
7.	1990-1995	Dr. Baldev Sahai	Chief Editor
8.	1996-2000	Dr. P. K. Sharma	Chief Editor
9.	2001-2007	Dr. Ramesh P. Singh	Chief Editor
10.	2008-2011	Dr. B. L. Deekshatulu	Chief Editor
11.	2012-2015	Dr. George Joseph	Chief Editor
12.	2016-2021	Dr. George Joseph	Editor-in-Chief
13.	2021-	Dr. Shailesh Nayak	Editor-in-Chief

Table-3: Associate Editors: 1988-2017

Sr. No.	Name	Duration
1.	Dr. V. K. Jha	1988-1991
2.	Dr. S. K. Saha	1992-2000
3.	Dr. L. M. Pande	2001-2002
4.	Dr. Sarnam Singh	2003-2007
5.	Dr. R. S. Dwivedi	2007-2010
6.	Dr. Sarnam Singh Dr. A. S. Rajawat	2011-2014
7.	Dr. Sarnam Singh Dr. A. S. Rajawat Dr. A. Senthil Kumar Dr. S. P. Aggarwal	2015-2017

Table-4: Editors/Executive Editors: 2008 onwards

Sl. No	Name	Designation	Period
1.	Dr. R. Krishnan	Editor	2008-2010
2.	Dr. V. K. Dadhwal	Editor	2011-
3.	Dr. A. Senthil Kumar	Executive Editor	2019-2020
4.	Dr. Prakash Chauhan	Executive Editor	2020-2022
5.	Dr. Shiv Prasad Aggarwal	Executive Editor	2022-

Table-5: Associate Editors: 2018-2020

Sr. No.	Theme	Name	Period
1.	Agriculture and Soil	Dr. Vinay Sehgal, Dr. K. R. Manjunath, Dr. Shibendu S. Ray	2018-2020
2.	Atmosphere and Climate Science	Dr. R. Krishnan	2018-2020
3.	Cryosphere	Dr. A. V. Kulkarni	2018-2020
4.	Earth Observation (Microwave)	Dr. Dharmendra Singh	2018-2020
5.	Earth Observation (Optical)	Dr. C. Jeganathan	2018-2020
6.	Forestry	Dr. S. P. S. Kushwaha Dr. C. S. Jha	2018-2020
7.	Geoscience	Dr. P. K. Verma Dr. Genyun Sun	2018-2020 2020-2021
8.	GIS	Dr. K. S. Rajan	2018-2020
9.	Hydrology	Dr. Rajendra Singh	2018-2020
10.	Human Settlements	Dr. Anjana Vyas	2018-2020
11.	Image Processing	Dr. B. K. Mohan Dr. J. K. Ghosh Dr. Onkar Dikshit	2018-2020
12.	Oceanology	Dr. P. N. Vinaychandran	2018-2020
13.	Photogrammetry	Dr. R. D. Garg	2018-2020

The present editorial team, under the proficient leadership and guidance of Dr. Shailesh Nayak, the Editor-in-Chief, strives to maintain and build on the scientific standing that the JISRS has achieved today. Dr. Nayak has long-standing interest and continued care towards the growth of JISRS. Even while he remained as the President of ISRS, his direct and indirect involvement has nurtured the growth of JISRS for what it is today. Despite his multiple scientific/academic and administrative responsibilities, a substantial amount of time and effort is dedicated to the objective of further raising the standard of JISRS as one of the top journals in the field of remote sensing.

The responsibility of Executive Editor is very significant as far as the major decisions related to the topics, and content as well as orienting the future direction of the journal is concerned. After founding a position of Executive Editor on the Editorial Board of JISRS, the first Executive Editor of JISRS, Dr. A Senthil Kumar accomplished the above in letter and spirit while he was also occupying the chair of Director, IIRS. In his short period, Dr. Senthil could bring innovative changes and sustained the regular publication of the journal. The role of Dr. Prakash Chauhan as Executive Editor has been very important in complementing the scope and mission of the journal. He worked diligently to enhance the profile of the journal by making opportune decisions. Induction of more Associate editors, besides creating a position of the Associate Managing Editor in the Editorial Board was one of the major decisions which has promoted the performance indices of the journal. Even while occupying the office of the current president of ISRS, his vision for JISRS to inherit wide credibility and acceptance makes the present standing of the journal.

The Editorial Board of JISRS continues to include researchers and academicians from several reputed institutions of our country who ensure high-quality rigorous peer review during the editorial processing of the submissions. The credit should go to the dedication and selfless services of all the past and present editors who contributed to the journal from time to time. The editorial board gets restructured from time to time. Lately, in the year 2021, the Editorial Board has been restructured and expanded by including more Associate Editors due to the increasing number of submissions to the journal. Currently, the board consists of 25 members. A list of the current Editorial Board is given in Table-6a&b.

Table-6a: Current Editorial Board of JISRS

Sr. No.	Name	Designation	Organization
1.	Dr. Shailesh Nayak	Editor-in-Chief	NIAS, Bengaluru
2.	Dr. V. K. Dadhwal	Editor	NIAS, Bengaluru
3.	Dr. S. P. Aggarwal	Executive Editor	NESAC, Umiam
4.	Dr. Subrata Nandy	Managing Editor	IIRS, Dehradun
5.	Dr. George Philip	Associate Managing Editor	ISRS, Dehradun

Table-6b: Associate Editors – Theme

Sr. No.	Name	Organization	Theme
1.	Dr. N. R. Patel	IIRS, Dehradun	Agriculture and Soil
2.	Dr. Atul Varma	SAC, Ahmedabad	Atmosphere and Climate Science
3.	Dr. Som Kumar Sharma	PRL, Ahmedabad	
4.	Dr. A. V. Kulkarni	IISc, Bangalore	Cryosphere

5.	Dr. Gulab Singh	IIT, Mumbai	Earth Observation (Microwave)
6.	Dr. C. Jeganathan	BIT, Mesra,	Earth Observation (Optical)
7.	Dr. Mehul R. Pandya	SAC, Ahmedabad	
8.	Dr. Sarnam Singh	Dehradun	Forestry
9.	Dr. C. Sudhakar Reddy	NRSC, Hyderabad	
10.	Dr. Rajesh V.J.	IIST, Thiruvananthapuram,	Geoscience
11.	Dr. Tapas Ranjan Martha	NRSC, Hyderabad	
12.	Dr. Milap Punia	JNU, New Delhi	GIS
13.	Dr. P. G. Diwakar	NIAS, Bengaluru	GIS
14.	Dr. Rajendra Singh	IIT, Kharagpur	Hydrology
15.	Dr. Sanjay Jain	NIH, Roorkee	
16.	Dr. Anjana Vyas,	CEPT University, Ahmedabad	Human Settlements
17.	Dr. Sandeep Maithani	IIRS, Dehradun	
18.	Dr. Rashmi Sharma	SAC, Ahmedabad	Oceanology
19.	Dr Nitant Dubey	SAC, Ahmedabad	Photogrammetry and Image Processing
20.	Dr. R.D. Garg	IIT, Roorkee	

Review of submissions to JISRS

Reviewing a manuscript is very essential to assure the quality of the manuscript published in any journal. At its inception, the journal had no explicit criteria and no process of peer review as it exists today. The reviewers were the researchers mostly from different ISRO centers. With the increase in submissions, the Editorial Board instituted a peer review process for submissions JISRS relies on the efforts and kindness of the reviewers in assessing the suitability of a manuscript for publication. This drive was to scale up the scholarly status of the journal. JISRS is committed to upholding the integrity of the scientific record and its publication. Therefore, the focus of JISRS is to scale high and strive to keep up the standards and the requisite review processes. Today the journal follows a double-blind reviewing procedure. This means that the author will remain anonymous to the reviewers throughout the peer review. JISRS has a large team of experts as reviewers from different organizations and academia. The inputs of reviewers are frequently used in improving the quality of a submitted manuscript. With the advent of sophisticated software to cross-check manuscripts against published literature, we have challenging times setting the parameters of what constituted plagiarism and determining what similarity with existing literature can be considered appropriate. Our manuscript rejection rate has also risen sharply to >70%. We expect that this rate may reduce as our rising status qualifies us to attract higher-quality submissions in the near future.

Credibility of JISRS

The credibility of a journal can only be assessed by examining several key factors which JISRS satisfies today. JISRs has a well-defined aim and scope and are being published by a well-known publisher today. We have maintained the publishing quality and innovative

research that is at par with other journals in the field of remote sensing. JISRS has outstanding editors and editorial board members supported by quality and constructive reviewers. The journal is indexed in Web of Science and enjoys good metrics in terms of Impact factor, cite score, etc. Finally, for any author, JISRS has a simple submission procedure with clear author guidelines. Today, JISRS enjoys a high reputation among the remote sensing community and researchers both nationally and internationally with its rising performance indices. A glimpse of the performance indices of JISRS for recent years is illustrated in the figures 4 & 5.

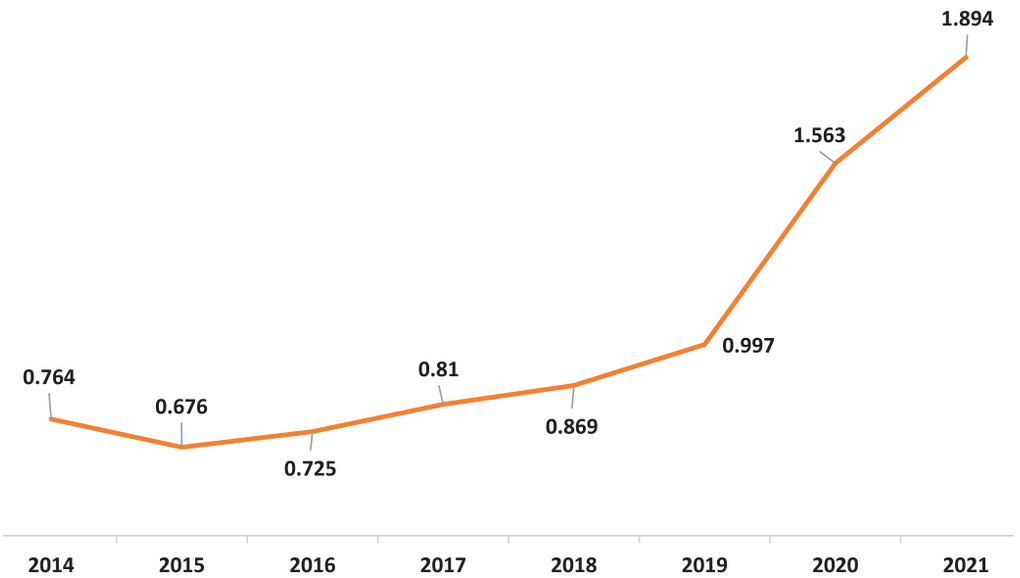


Fig. 4. Impact Factor of JISRS

(As per Journal Citation Reports by Clarivate)

Fig. 5. Yearly downloads of JISRS research articles

Contributions to JISRS

The journal was originally introduced to showcase photointerpretation and remote sensing studies carried out in India, but its current scope has been widened to disseminate interesting research outputs across the globe to a large remote sensing community. The demographics of authorship also changed over time. This demonstrates the increasingly global nature of the journal in its authorship over time. Indeed, JISRS is today recognized as an international rather than a local journal with a considerable proportion of manuscripts being contributed from outside the country (Fig.6). This also reflects the increased popularity of JISRS among the international scientific community. We look forward to the future with the publication of new articles that will continue to advance our knowledge of the fast-growing remote sensing technology. We wish that JISRS to scale up to the stature of a leading journal to be a platform for the rapid dissemination of the latest developments in the field of remote sensing and geospatial technology.

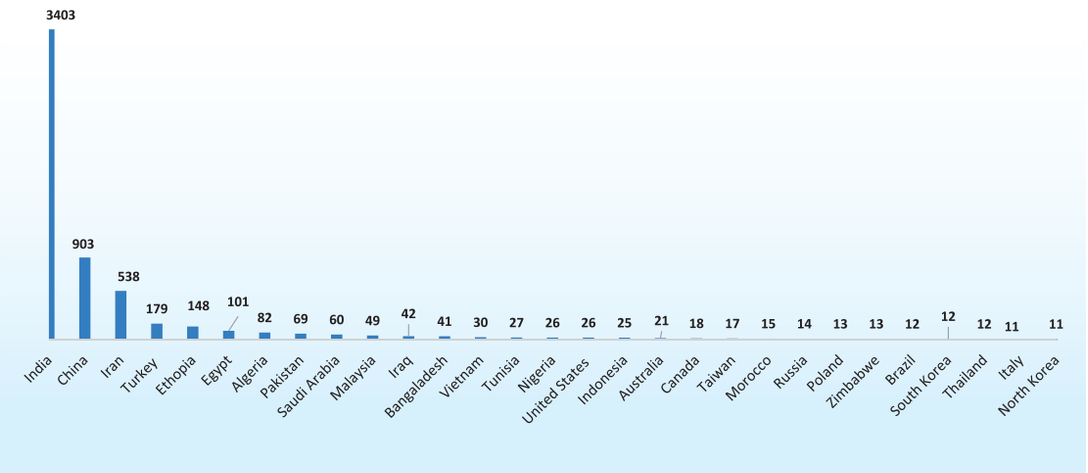


Fig. 6. Manuscripts (>11) received for the period (2008-2022)

Digitization of Back Volumes

In view of the surge in readership over the past years, the digitization of all the back issues of the journal was carried out by Springer and is currently made available electronically through SpringerLink. With this, all the issues of the journal since 1973 are available online to readers. The office of ISRS also preserves an archive of the hard copies of all the back issues of the journal as well.

Acknowledgments

We are deeply indebted to the founders of ISRS and JISRS. The generosity, sincerity, and integrity of their service, opportune advice, and actions have strengthened the growth of this journal from its infancy to its present status. We use this platform to extend our sincere thanks to all of the individuals who have contributed to the growth, development, and success of the journal over the past 50 years. This list is too long. Among so many, we are extremely grateful to all the past and present Chief Editors/Editors-in-Chief, Executive Editors, and Editors of JISRS. Some of them have also held the office of the

President of ISRS at one time or the other. Undeniably each of them had made several landmark contributions to the growth of the journal.

We are grateful to all the past and present Executive Council of ISRS for their unconditional and continuous support to JISRS all through the years. Many of the past presidents of ISRS had also shouldered the responsibility of the Editorship of the journal at one time or the other. This testifies to their keen interest and association with JISRS. However, few of them continued to support the JISRS without holding any responsible positions directly. JISRS genuinely acknowledge Dr. R. R. Navalgund for his sustained interest, timely encouragements and valuable advice being offered even today towards its right line of growth.

The journal's success is largely because the editorial team gave their time and talent to help authors to publish high-quality manuscripts. We appreciate and value the contributions made by both past and present Associate Editors and Members of our Editorial Board. For them, it was a task to meet the often very tight deadlines. Their expertise and guidance have been instrumental to maintain high standards and rigor for the selection of the best articles we publish.

While most of the editorial members have consistently contributed to the growth of the journal, it will not be fair if we missed mentioning explicitly about Dr. S.K. Saha and Dr. Sarnam Singh who have not only contributed richly to the journal but also preserved a long and close association with JISRS and witnessed its present growth. Even today Dr. Sarnam Singh continues to be part of the Editorial board. JISRS sincerely thank both of them in a very special manner.

We thank all reviewers, one and all, for their excellent contributions and critical and constructive evaluations. A large number of scientists have given support, direction, and guidance to the journal whose contributions cannot be ignored while accounting for the historical perspective. However, the list is too long to mention them individually. The overwhelming responses from the authors and readers have been a real motivation and support in taking forward JISRS to this extent.

At this juncture, we do convey our gratitude to the past printers of the journal for their services while bringing out the journal issue within the stipulated time. We have established a partnership with Springer Nature India Pvt. Ltd for the past 16 years as they print and publish JISRS. Our special thanks are to Ms. Suvira Srivastav, Ms. Sonal Choudhary and the Springer Journal office staff for their timely support and the Production Office for their high-quality work.

ISRS and JISRS Editorial office is housed on the IIRS campus. We gratefully acknowledge Chairman ISRO for providing all the infrastructural facilities to smoothly function within the IIRS premises. Indeed, we are also grateful to all the previous Heads and Directors of IIRS and specially to Dr. R. P. Singh, the present Director of IIRS, for their benevolence and wholehearted support to ISRS and JISRS activities without which it would have been not possible for the uninterrupted publication of JISRS.

This compendium would have been unfinished without the support and advice of Dr. S. P. Aggarwal, who maintained a close and long-standing association and have made rich contributions to ISRS and JISRS in various capacities. Since joining as an Associate Editor and subsequently as Managing Editor and lately the Executive Editor of JISRS, Dr. Aggarwal has been shouldering significant responsibilities of the journal. Dr. Subrata

Nandy, the Managing Editor, is a great support in scrutinizing and monitoring the submissions until the last stage, even before they appear online and in print.

This compendium attempts to highlight the major milestones of the journal beside the mention of contributions of the ISRS fraternity. However, if there is any omission in this account, it is certainly not intentional.

The journal during its long voyage had to pass through many thick storms also at several phases. The reasons were many. However, we could overcome them successfully. We feel committed to the ethos of ISRS and will strive to maintain and build on the scientific standing that it has achieved. Therefore, our mandate remains clear and unchanged. We wish the journal, JISRS, continued success as it embarks on its next 50 years.

Dr. George Philip
Associate Managing Editor, JISRS

IMPORTANT MILESTONES OF JISRS

1973

Birth of the Journal "**PHOTONIRVACHAK**" as a biannual Research Journal (A -cyclostyled compilation released, priced at Rs.2/)

1974

Published First Printed version (Volume 1 & 2)

1973-1978

Name of the Journal remained as *"Photonirvachak: Journal of the Indian Society of Photointerpretation"*

1979-1981

Journal's name changed to *"Photonirvachak: Journal of Photointerpretation and Remote Sensing"*

1982-1985

Journal's name changed to *"Photonirvachak: Journal of Indian Society of Photointerpretation and Remote sensing".*

1988

Journal became a Quarterly Publication

1988

Introduction of Associate Editor in the Editorial Board

1986-2007

Journal's name changed to *"Photonirvachak: Journal of Indian Society of Remote sensing".*

2006

Since Vol. 34 (1), Journal included in Thomson ISI Listing

2007

Editorial Board expanded: Inclusion of members in the Editorial Board besides Associate Editors

2008

Contract signed with Springer Nature for Publication from Vol. 36 (1)

2008

Journals name changed to **Journal of the Indian Society of Remote Sensing** (JISRS) with adoption of new cover page

2016

Journal became a Bimonthly Publication

2018

Journal starts monthly Publication

2019

Adopted several Associate Editors based on specializations

2021

Restructured and expanded the Editorial Board

GOLDEN JUBILEE CELEBRATIONS

SERVING HUMANITY THROUGH SPACE TECHNOLOGY

INDIAN SOCIETY OF REMOTE SENSING

1969

ISRS

BEST PAPERS

over the years

ISRS

BEST PAPER
1991

Relation of Wheat Yield with Parameters Derived from a Spectral Growth Profile

Author: R. P. Dubey, N. D. Ajwani, and R. R. Navalgund
Affiliation: Space Applications Centre, Ahmedabad
Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 19, No. 1, pages. 27–44

ABSTRACT

An attempt has been made to generate crop growth profiles using multi-date NOAA AVHRR data of wheat-growing season of 1987–88 for the districts of Punjab and Haryana states of India. A profile model proposed by Badhwar was fitted to the multi-date Normalised Difference Vegetation Index (NDVI) values obtained from geographically referenced samples in each district. A novel approach of deriving a set of physiologically meaningful profile parameters has been outlined and the relation of these parameters with district wheat yields has been studied in order to examine the potential of growth profiles for crop-yield modelling. The parameter 'area under the profile' is found to be the best estimator of yield. However, with such a parameter time available for prediction gets reduced. Combination of different profile parameters shows improvement in correlation but lacks the consistency for individual state data.

https://doi.org/10.1007/BF02991920

ISRS

BEST PAPER
1992

Normalisation of Multi-date Digital Remote Sensing Data Using Scene Statistics

Author: A. Narayana
Affiliation: Space Applications Centre, Ahmedabad
Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 20, No. 2, pages.165–172

ABSTRACT

Some of the studies involving digital temporal data require normalisation. Many of the normalisation methods need information on prevailing atmospheric conditions, sensor-related details etc., whereas some other methods use only the information which are within the data set. A study was conducted in Kudremukh Iron Ore miningsite, Karnataka using multi-date data from Landsat MSS of 1976 and 1985. A normalisation method using only the scene statistics of the images is suggested which brings the multi-date data at par. This method is compared with some of the other methods which use only the information content of the data set. Comparison of these methods was made by scattergrams, distance measure etc. By generating scattergrams for various combinations of non-normalised and normalised images, different methods were compared. Based on ground information, some changed and unchanged classes were noted on the various normalised and original images. Using the distance measure for classes in different images, the normalisation procedures were compared. The proposed method turned out to be the best among the methods compared.

DOI: https://doi.org/10.1007/BF02999213

ISRS

BEST PAPER
1993

Land Productivity Assessment and Mapping Through Integration of Satellite and Terrain Slope Data

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[2]Indian Institute of Remote Sensing, NRSA, Dehra Dun

Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 21, No. 3, pages.157–166

ABSTRACT

Evaluation and mapping of spatial variations of land productivity is very important for effective landuse planning. The present study was undertaken in watershed of the Song river (Dehra Dun district, U.P.), for assessing and mapping land productivity using modified Storie Index following integrated approach. This approach utilizes soilscape information (derived from digital IRS-IA LISS-II data), soil characteristics (field observed and laboratory analysed) and terrain slope information (obtained from Survey of India topographical maps). The approach consists of preparation of Storie Index productivity rating factors such as: A (soil profile character), B (soil texture), X (soil physical and fertility conditions), and C (land slope), and computerised integration of these maps to generate land productivity map. The results indicate that in the watershed 30.6%, 19.6%, 12.2%, 11.8% and 18.8% areas have been found to be under good, fair, poor, very poor and not suitable, land productivity classes, respectively.

DOI: https://doi.org/10.1007/BF02992111

ISRS

BEST PAPER
1994

Procedures for Computation of Saturation Radiances: A case Study for Proposed Sensors Onboard Indian Remote Sensing Satellite-1C

Author: Tara Sharma and T. T. Medhavy

Affiliation: Land Resources Division, Remote Sensing Applications Group, Space Applications Centre, Ahmedabad

Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 22, No. 1, pages. 9–20

ABSTRACT

Saturation radiance (SR) is one of the important parameters required while designing a sensor and it depends on application requirements as well as sensor requirements. This study describes the procedures for computation of SR values using theoretical calculations of earth atmosphere radiances as well as radiances observed by existing satellites such as IRS-1A/1B LISS-I, Landsat TM and SPOT sensors. A possible set of saturation radiances for IRS-1C LISS-III, WIFS and PAN sensors has been suggested.

DOI: https://doi.org/10.1007/BF03015116

ISRS

BEST PAPER
1995

A rule-based system for forest land use planning

Author: [1]S. P. S. Kushwaha and [2]G. Oesten

Affiliation: [1]Indian Institute of Remote Sensing, Dehradun
[2]Institute for Forest Economics, Albert Ludwigs University, Freiburg, Germany

Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 23, No. 3, pages. 115–124

ABSTRACT

This paper reports the results of an exercise on the development and application of a rule-based software program, Combine for integration of thematic information in simplest possible way. The program was used for forest land use planning in a shifting cultivation area in north-east India. The program can integrate 28 thematic information layers with upto 256 classes in each layer using 8-bit data. Additionally the software can be used for many per pixel image processing operations like merging of digitally and visually classified images, merging of a large number of thematic classes into a few wanted ones, density slicing, image thresholding etc. conveniently.

DOI: https://doi.org/10.1007/BF02995699

ISRS

BEST PAPER
1996

Hybrid optical processing of sea surface imagery for the estimation of wave parameters

Author: O. P. Bajpai and S. Subramaniam

Affiliation: National Remote Sensing Agency, Hyderabad

Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 24, No. 3, pages. 185–192

ABSTRACT

With the availability of high spatial resolution space-borne sensors, the wave parameters like wave propagation direction, wavelength of the dominant wave etc., are estimated from the Fourier spectra of ocean scene imageries. The hybrid optical processor is the most suitable for the analysis of imageries, since it utilises the parallel processing capability of the optical processor for generating the Fourier spectra. An attempt has been made to use a hybrid processor with wedge-ring sampling detector array for the estimation of wave parameters and the results are encouraging.

DOI: https://doi.org/10.1007/BF03007331

ISRS

BEST PAPER
1997

Oil slick identification from imageries using optical power spectra

Author: O. P. Bajpai and S. Subramaniam

Affiliation: National Remote Sensing Agency, Hyderabad

Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 25, No. 1, pages. 35–40

ABSTRACT

A new method for semi-automatic identification of oil slick on ocean/sea surface from space borne imagery using optical power spectra has been suggested. This method is based on the fact that the presence of the oil slick in the ocean suppresses the normal wave pattern that will be present in the ocean area without oil slick and the power spectra of the image area having the oil slick will be devoid of the peak corresponding to the dominant wave. In addition, the general shape of the oil slick will increase the low frequency content in the power spectra. The method has been applied for test areas containing oil slicks and the results are encouraging.

DOI: https://doi.org/10.1007/BF02995416

ISRS

BEST PAPER
2001

Chlorophyll — A Concentration Along West Coast of India Using IRS-P3 MOS-B Data

Author: R. K. Sarangi, Prakash Chauhan and Shailesh Nayak

Affiliation: Marine and Water Resources Group, Remote Sensing Application Area Space Applications Centre (ISRO), Ahmedabad

Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 29, No. 4, pages. 197–201

ABSTRACT

Remote sensing of ocean colour yields information on the constituents of sea water, such as the concentration of phytoplankton pigments, suspended sediments and yellow substances. It is well understood that the study of ocean colour is significantly related with the primary production and zonation of potential fishing sites in coastal and oceanic waters. The major pigment constituent is predominated by chlorophyll-a (ocean colour pigment of phytoplankton). The chlorophyll mapping on regular basis plays a major role in assessing water quality and classifying different water types. IRS P-3 MOS-B satellite data for three consecutive passes of path 94, during the period of January-February 1997 have been used to derive chlorophyll-a concentration. The present study emphasizes on the chlorophyll mapping using IRS-P3 MOS-B data for the coastal and offshore water of Maharashtra coast, India.

DOI: https://doi.org/10.1007/BF02995724

ISRS

BEST PAPER
2002

Influence of surface and vegetation characteristics on C-band radar measurements for soil moisture content

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Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 30, No. 4, pages. 229–244

ABSTRACT

Soil moisture estimation using microwave remote sensing faces challenges of the segregation of influences mainly from roughness and vegetation. Under static surface conditions, it was found that Radarsat C-band SAR shows reasonably good correlation and sensitivity with changing soil moisture. Dynamic surface and vegetation conditions are supposed to result in a substantial reduction in radar sensitivity to soil moisture. A C-band scatterometer system (5.2 GHz) with a multi-polarization and multi-angular configuration was used 12 times to sense the soil moisture over a tall vegetated grass field. A score of vegetation and soil parameters were recorded on every occasion of the experiment. Three radar backscattering models Viz., Integral Equation Model (IEM), an empirical model and a volume scattering model, have been used to predict the backscattering phenomena. The volume scattering model, using the Distorted Born Approximation, is found to predict the backscattering phenomena reasonably well. But the surface scattering models are expectedly found to be inadequate for the purpose. The temporal variation of soil moisture does show good empirical relationship with the observed radar backscattering. But as the vegetation biomass increases, the radar shows higher sensitivity to the vegetation parameters compared to surface characteristics. A sensitivity analysis of the volume scattering model for all the parameters also reveals that the radar is more sensitive to plant parameters under high biomass conditions, particularly vegetation water content, but the sensitivity to surface characteristics, particularly to soil moisture, is also appreciable.

DOI: https://doi.org/10.1007/BF03000366

ISRS

BEST PAPER
2003

Land use alterations and its possible impact on premonsoon climatic variables

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Affiliation: [1]Atmospheric Science Research Group, Physics Department, Jadavpur University, Kolkata and Department of Geography

[2]Environmental Management, Vidyasagar University, West Medinipore

Published: Photonirvachak

Journal of the Indian Society of Remote Sensing, Vol. 31, No. 4, pages. 261–269

ABSTRACT

Changes in land surface characteristics have become a matter of great concern in the recent years. It is particularly important when the mesoscale phenomena control the climatic variables of a region. Gangetic West Bengal with its neighbourhood is such a region where during premonsoon season, mesoscale phenomena, i.e., sea breeze circulation and severe convective development, control the local climate of the season. It is also reported that a drastic changes in land use pattern has taken place in recent period over the region, which might affect the local climate, resulting in severe water crisis over the semi-arid part of the region. A detailed study has been undertaken to investigate the changes in land use pattern through satellite data over the area and its possible impact on the local climate through numerical modeling. Satellite (IRS-IC and Landsat 4 and 5) data shows a sharp change in dynamic vegetation during this period, which is due to, increased agricultural practices in the recent years. Mesoscale model indicates that agricultural practices hinder the development of sea breezes over the coastal and inland places, causing less incursion of moisture towards inland. This may be associated with less number of convective developments over the coastal and neighbouring places.

DOI: https://doi.org/10.1007/BF03007346

ISRS

BEST PAPER
2004

New findings on the course of river Sarasvati

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Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 32, No. 1, pages. 1–24

ABSTRACT

Numerous studies have been carried out during last 20-25 years by different agencies to trace the courses of palaeo river Sarasvati. Varying number of courses of river Sarasvati have been suggested by the different workers in the north-western region. Taking advantage of the developments in satellite/ sensor and digital image processing technologies an attempt has been made to rediscover the course of river Sarasvati and solve the controversy regarding its exact course, in the sand covered Thar desert region. Data available from a variety of ground investigations carried out by different agencies working in this area have been analyzed in support of confirmation of palaeo channels, along the courses mapped under the present study. The results indicate that the river Sarasvati had its course through river Ghaggar and did not drain along the Aravalli hills. Also it did not shift its course drastically and continuously from east to west, as suggested by earlier workers. The image anomalies indicate that river Sarasvati flowed parallel to the river Indus as an independent river system (closer to the north-western Indian border) and did not flow through present course of river Nara. The findings raise the doubt that 'Rise along Delhi-Hardwar ridge' as suggested by earlier workers was the main cause for west-ward shift of Sarasvati river and ultimate drainage desiccation in the northwestern region. The analysis indicates towards rise in Himalayas/ Siwaliks and consequent displacements in the Siwaliks and its foot hills region (in the form of Yamuna and Satlej tear faults) as the main cause for drainage desiccation and disappearance of river Sarasvati.

DOI: https://doi.org/10.1007/BF03030845

ISRS

BEST PAPER
2004

Study of cloud liquid water path and total precipitable water from irs-p4/msmr and numerical weather prediction model output

Author: [1]S. Das, [2]A. S. K. A. V. Prasad Rao, [2]U. C. Mohanty, [1]A. K. Mitra and [1]D. Rajan

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Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 32, No. 2, pages. 175–184

ABSTRACT

A global weather analysis-forecast system is used to produce six hourly analysis of meteorological fields at roughly 150 km × 150 km resolution at the National Center for Medium Range Weather Forecast (NCMRWF). In this paper, we have studied the Total Precipitable Water Content (TPWC) and Cloud Liquid Water Path (CLWP) derived from the Indian Remote Sensing (IRS-P4) Satellite over the Indian Ocean region in relation to operational numerical weather prediction (NWP) model analysis and short-range forecasts. An objective analysis was carried out by introducing the observations of CLWP, TPWC and their values (six hour forecasts) from the T80 model as the first guess, for a 20 days period of August 1999 using the standard Cressman's technique. The reanalysis could capture the signature of TPWC and CLWP data from IRS-P4 satellite. In general the observed values of TPWC and CLWP from IRS-P4 have a positive bias compared to NCMRWF analysis over the region where the satellite passed. The CLWP values have been compared with Special Sensor Microwave/Imager (SSM/I) products from the Defense Meteorological Satellite Program (DMSP) satellites. Results indicate that the model derived CLWP values were within acceptable limits, whereas the observations from the Multi-channel Scanning Microwave Radiometer (MSMR) showed slightly larger values.

DOI: https://doi.org/10.1007/BF03030874

ISRS

BEST PAPER
2005

Qualitative and quantitative analysis of snow parameters using passive microwave remote sensing

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Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 33, No. 3, pages. 381–393

ABSTRACT

Snow cover is an important variable for climatic and hydrologic models due to its effect on surface albedo, energy, and mass balance. Satellite observations successfully provide a global and comprehensive hemispheric-scale record of the short-term, as well as inter-seasonal variations in snow cover. Passive microwave sensors provide an excellent method to monitor temporal and spatial variations in large-scale snow cover parameters, overcoming problems of cloud cover. Using microwave remote sensing data, snow parameters (snow surface temperature, snow water equivalence, scattering index, emissivity, snow depth) have been retrieved to integrate with the snow cover simulation model developed by SASE for avalanche risk assessment on regional basis. Multispectral and multitemporal brightness temperature data obtained from the Special Sensor Microwave Imager (SSM/I), flown onboard the DMSP satellites, for the period November 2000 to April 2001 and from November 2001 to February 2002 have been analysed. A comparative data set on snow measurements and meteorological observations of a region covering large area of Pir-Panjal and the Greater Himalayan range, available on near real time basis from SASE field observatories were also used. Model calculations were carried out to study the effects of atmospheric transmission on the microwave radiation emitted from the snow covered and snow free ground and atmosphere. The sensitivity of combinations of the SSM/I channels at 19, 37 and 85 GHz, in both horizontal and vertical polarizations, in respect to snow depth, surface temperature of the snowpack have been carried out. Decision rule based algorithms are developed to identify snow cover and non-snow area.

DOI: https://doi.org/10.1007/BF02990009

ISRS

BEST PAPER
2006

Yield estimation of summer crops grown in a mixed cropping area, a spectral growth curve profile approach

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Published: Photonirvachak

Journal of the Indian Society of Remote Sensing, Vol. 34, No. 3, pages. 279–288

ABSTRACT

Estimation of crop production in advance of the harvest has been an intensively researched field in agriculture. Spectral parameters derived from the spectral growth profile being indicator of growth and development characteristics of the crop have a direct utility in crop-yield modeling. The present study is undertaken in a mixed cropping area of Karveer taluka, Kolhapur district, Maharashtra, to assess feasibility of multi-date moderately coarse WiFS data in developing spectral growth curves following Badhwar model (1980) for summer groundnut and paddy. The analysis highlighted potential of moderately coarse resolution WiFS data in discriminating the crops grown in fragmented conditions, provided detailed and adequate ground truth is used. The regression models using spectral parameters explained 94 % variation in paddy yield. However, model using ground information as peak LAI in addition to spectral variables, could explain 91 % variation in groundnut yield; thus for prediction of low-yielding and poorly managed crop a convergent model is essential. Vegetative growth rate during the pre-heading phase and total growing season absorbed photosynthetically active radiation (APAR) indicated by the area under the curve are the main predictors.

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ISRS

BEST PAPER
2006

GCP collection for corona satellite photographs: Issues and methodology

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Affiliation: Department of Civil Engineering, Indian Institute of Technology, Kanpur

Published: Photonirvachak

Journal of the Indian Society of Remote Sensing, Vol. 34, No. 2, pages. 153–160

ABSTRACT

Use of high-resolution and historic CORONA satellite photographs for mapping and other purposes requires Ground Control Points (GCPs), as ephemeris data and image parameters are not available. However, the alterations in landscape in last 34 years (i.e., since the acquisition of these photographs) prevent identification and collection of large number of GCPs in the field. This paper presents a methodology for collection of GCPs for CORONA photographs. The advantages and limitations of the methodology are discussed. For a study site, situated in Siwaliks and Lower Himalayas, the GCPs were identified in CORONA photographs and their WGS84 coordinates were estimated through a process of datum transformation and georeferencing. Estimated GCP coordinates from the topo sheets and 2D and 3D views of photographs, helped in identifying the GCP locations in field, which were observed using DGPS. Investigations were carried out to relate Differential Global Positioning System (DGPS) accuracy with base line length and time of observation. Abase line of 350 km and half an hour observation were found appropriate to yield accuracy in GCP collection by DGPS method, which conforms to CORONA resolution of 3 m.

DOI: https://doi.org/10.1007/BF02991820

ISRS

BEST PAPER
2007

Methane emission modelling using MODIS thermal and optical data: A case study on Gujarat

Author: Reshu Agarwal and J. K. Garg

Affiliation: Space Applications Center (ISRO), Ahmedabad

Published: Photonirvachak

Journal of the Indian Society of Remote Sensing, Vol. 35, No. 4, pages. 323–331

ABSTRACT

Wetlands are one of the most important sources of atmospheric methane (CH_4) contributing about 22% to the global methane budget. But to improve estimates of CH_4 emission at regional and global scales there is a need to observe the sources such as wetlands frequently and develop process-based models. In this regard, wetland inventory using satellite remote sensing data has conventionally been carried out by analysis of optical data. Due to thermal inertia differences emittive thermal channels data has shown promise to provide highly critical information about wetlands such as water spread, aquatic vegetation and mud flats etc. Thermal channels data of MODIS (Moderate Resolution Imaging Spectroradiometer) sensor with a spatial resolution of 1km and swath of 2330 km is emerging as the key source of remote sensing data for global/ regional wetland estimation and assessment of green house gas emission. In the present study MODIS thermal channels (31 and 32) and optical channels (1,2, and 3) data have been used for evaluating methane emission from wetlands in Gujarat. An empirical model based on temperature and productivity has been used to investigate the response of methane emission from different sources. Model has the potential to estimate country level methane emission based on satellite remote sensing in conjunction with collateral data/information. In this study. MODIS data of two dates pertaining to Gujarat have been analyzed and results compared with respect to methane emission.

DOI: https://doi.org/10.1007/BF02990788

ISRS

BEST PAPER
2007

Spectral studies of lunar equivalent rocks — A prelude to lunar mineral mapping

Author: R. S. Aarthy and S. Sanjeevi

Affiliation: Space Applications Center (ISRO), Ahmedabad

Published: Photonirvachak

Journal of the Indian Society of Remote Sensing, Vol. 35, No. 2, pages. 141–152

ABSTRACT

Hyperspectral remote sensing technique is widely applied for geological studies including the study of extra-terrestrial rocks. Since it has many spectral bands, discrimination between rocks and minerals can be done more precisely. To perform chemical and mineralogical mapping and to study the rocks on the lunar surface, India has proposed to launch its first lunar remote sensing satellite Chandrayaan-1 in the year 2008. For mineralogical mapping, the mission will carry a Hyperspectral Imager (HySI) instrument, which operates in the VNIR region. This paper presents-an attempt to study the spectral response of lunar-akin terrestrial rocks, in the VNIR region (as in the case of the proposed HySI on-board Chandrayaan-1). For this purpose, rocks similar to those present on the lunar surface were collected and their spectral response in the 64 simulated bands of HySI sensor were studied using a spectro-radiometer. Petrographic studies and modal analysis were carried out using thin sections of the rock samples. On studying the spectral response of the lunar-like rock samples in the 64 HySI bands, it is seen that there are distinct absorption features in bands 58 (923.75nm-927.5nm) and 63 (942.5nm-946.25nm) of the NIR wavelength ranges, for basalt rocks; distinct reflectance features in band 20 (590nm to 600nm) for ganmbbro: distinct reflectance features in band 19 (580nm to 590nm) and absorption in band 18 (570-580nm) for gabbroic anorthosite and distinct reflection features in band 63 (942.5nm to 946.25nm) for anorthosite. Thus, this study demonstrates the possibility of identifying the minerals and rocks on lunar surface using the hyperspectral approach and the spectral signatures of lunar-like rocks present on Earth.

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ISRS

BEST PAPER
2007

Extraction and validation of cartosat-1 DEM

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Published: Photonirvachak
Journal of the Indian Society of Remote Sensing, Vol. 35, No. 2, pages. 121–127

ABSTRACT

CARTOSAT-1 satellite, launched in May, 2005 is a dedicated along track stereo mission providing high quality data for topographic and cartographic applications. The present paper describes the evaluation of the Cartosat-1 stereo data, mainly through the generation and validation of DEM for moderately undulating and hilly areas. Photogrammetric techniques have been used for generation of DEM and Orthoimage for two cases i.e. 1) using RPCs (Rational Polynomial Coefficients) and 2) using RPCs along with ground control points. Root Mean Square Error (RMSE) in elevation values for the moderately undulating (Dehradun) and hilly area (Shimla), are found to be 4.38 and 3.69m respectively.

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ISRS

BEST PAPER
2008

Flood risk analysis in the Kosi river basin, north Bihar using multi-parametric approach of Analytical Hierarchy Process (AHP)

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[2]Department of Humanities, IIT Kanpur

Published:
Journal of the Indian Society of Remote Sensing, Vol. 36, No. 4, pages. 335–349

ABSTRACT

The Kosi river in north Bihar plains, eastern India presents a challenge in terms of long and recurring flood hazard. Despite a long history of flood control management in the basin for more than 5 decades, the river continues to bring a lot of misery through extensive flooding. This paper revisits the flooding problem in the Kosi river basin and presents an in-depth analysis of flood hydrology. We integrate the hydrological analysis with a GIS-based flood risk mapping in parts of the basin. Typical hydrological characteristics of the Kosi river include very high discharge variability, and high sediment flux from an uplifting hinterland. Annual peak discharges often exceed the mean annual flood and the low-lying tracts of the alluvial plains are extensively inundated year after year. Our flood risk analysis follows a multi-parametric approach using Analytical Hierarchy Process (AHP) and integrates geomorphological, land cover, topographic and social (population density) parameters to propose a Flood Risk Index (FRI). The flood risk map is validated with long-term inundation maps and offers a cost-effective solution for planning mitigation measures in flood-prone areas.

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ISRS

BEST PAPER
2008

Fractal compression of satellite images

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ABSTRACT

Fractal geometry provides a means for describing and analysing the complexity of various features present in digital images. In this paper, characteristics of Fractal based compression of satellite data have been tested for Indian Remote Sensing (IRS) images (of different bands and resolution). The fidelity and efficiency of the algorithm and its relationship with spatial complexity of images is also evaluated. Results obtained from fractal compression have been compared with popularly used compression methods such as JPEG 2000, WinRar. The effect of bands and pixel resolution on the compression rate has also been examined. The results from this study show that the fractal based compression method provides higher compression rate while maintaining the information content of RS images to a great extent than that of JPEG. This paper also asserts that information loss due to fractal compression is minimal. It may be concluded that fractal technique has many potential advantages for compression of satellite images.

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ISRS

BEST PAPER
2009

Automatic road extraction using high resolution satellite image based on texture progressive analysis and normalized cut method

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ABSTRACT

In this paper the approach for automatic road extraction for an urban region using structural, spectral and geometric characteristics of roads has been presented. Roads have been extracted based on two levels: Pre-processing and road extraction methods. Initially, the image is pre-processed to improve the tolerance by reducing the clutter (that mostly represents the buildings, parking lots, vegetation regions and other open spaces). The road segments are then extracted using Texture Progressive Analysis (TPA) and Normalized cut algorithm. The TPA technique uses binary segmentation based on three levels of texture statistical evaluation to extract road segments where as, Normalized cut method for road extraction is a graph based method that generates optimal partition of road segments. The performance evaluation (quality measures) for road extraction using TPA and normalized cut method is compared. Thus the experimental result show that normalized cut method is efficient in extracting road segments in urban region from high resolution satellite image.

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ISRS

BEST PAPER
2009

Automatic urban road extraction using airborne laser scanning/altimetry and high resolution satellite data

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Published:
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ABSTRACT

Automatic road extraction from remotely sensed images has been an active research in urban area during last few decades. But such study becomes difficult in urban environment due to mix of natural and man-made features. This research explores methodology for semiautomatic extraction of urban roads. An integrated approach of airborne laser scanning (ALS) altimetry and high-resolution data has been used to extract road and differentiate them from flyovers. Object oriented fuzzy rule based approach classifies roads from high resolution satellite images. Complete road network is extracted with the combination of ALS and high-resolution data. The results show that an integration of LiDAR data and IKONOS data gives better accuracy for automatic road extraction. The method was applied on urban area of Amsterdam, The Netherlands.

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ISRS

BEST PAPER
2010

Entropy-based fuzzy classification parameter optimization using uncertainty variation across spatial resolution

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ABSTRACT

In the past researchers have suggested hard classification approaches for pure pixel remote sensing data and to handle mixed pixels soft classification approaches have been studied for land cover mapping. In this research work, while selecting fuzzy c-means (FCM) as a base soft classifier entropy parameter has been added. For this research work Resourcesat-1 (IRS-P6) datasets from AWIFS, LISSIII and LISS-IV sensors of same date have been used. AWIFS and LISS-III datasets have been used for classification and LISS-III and LISS-IV data were used for reference data generation, respectively. Soft classified outputs from entropy based FCM classifiers for AWIFS and LISS-III datasets have been evaluated using sub-pixel confusion uncertainty matrix (SCM). It has been observed that output from FCM classifier has higher classification accuracy with higher uncertainty but entropy-based classifier with optimum value of regularizing parameter generates classified output with minimum uncertainty.

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ISRS

BEST PAPER
2010

Mining Land Cover Information Using Multilayer Perceptron and Decision Tree from MODIS Data

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ABSTRACT

Land cover (LC) changes play a major role in global as well as at regional scale patterns of the climate and biogeochemistry of the Earth system. LC information presents critical insights in understanding of Earth surface phenomena, particularly useful when obtained synoptically from remote sensing data. However, for developing countries and those with large geographical extent, regular LC mapping is prohibitive with data from commercial sensors (high cost factor) of limited spatial coverage (low temporal resolution and band swath). In this context, free MODIS data with good spectro-temporal resolution meet the purpose. LC mapping from these data has continuously evolved with advances in classification algorithms. This paper presents a comparative study of two robust data mining techniques, the multilayer perceptron (MLP) and decision tree (DT) on different products of MODIS data corresponding to Kolar district, Karnataka, India. The MODIS classified images when compared at three different spatial scales (at district level, taluk level and pixel level) shows that MLP based classification on minimum noise fraction components on MODIS 36 bands provide the most accurate LC mapping with 86% accuracy, while DT on MODIS 36 bands principal components leads to less accurate classification (69%).

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ISRS

BEST PAPER
2011

Climate Change Studies Using Coupled Model: Land Surface Perspective

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Published:

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ABSTRACT

Community Climate System Model (CCSM3), a coupled model developed by National Center for Atmospheric Research (NCAR) containing atmosphere, ocean, sea-ice and land processes, simulation have been analysed for suitability in the Indian Monsoon region. A long control run of CCSM3 with constant forcing at every year has been done and the model climatology has been generated using 20 years of simulation. Atmospheric component of the model has been able to capture the large scale phenomena, however, regional monsoon variability not fully captured by the model simulation. A suitable modification in the flux coupler and the convective parameterization process in regional scale certainly improve the atmospheric part of the climate system. Another major component of the climate model is the representation of Land Surface Processes (LSP). A successful inclusion of LSP in climate model must address the issues related to the regional scale variation of the properties of LSP. A proper understanding of land surface processes is very crucial for climate simulations using numerical models. To understand the LSP-monsoon coupling, the offline Community Land Model (CLM), taken from CCSM3 land component, simulation forced with three hourly atmospheric boundary conditions have also been analyzed and compared with the CLM version of coupled CCSM mode. The distribution of surface heat flux in CCSM coupled mode shows some discrepancies compared to the offline CLM. Both the simulation results are compared with existing climatological features and assessment to improve CCSM3 for the regional climate change studies is made.

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ISRS

BEST PAPER
2011

An Integrated Multistage Framework for Automatic Road Extraction from High Resolution Satellite Imagery

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ABSTRACT

Automated procedures to rapidly identify road networks from high-resolution satellite imagery are necessary for modern applications in GIS. In this paper, we propose an approach for automatic road extraction by integrating a set of appropriate modules in a unified framework, to solve this complex problem. The two main properties of roads used are: (1) spectral contrast with respect to background and (2) locally linear path. Support Vector Machine is used to discriminate between road and non-road segments. We propose a Dominant singular Measure (DSM) for the task of detecting linear (locally) road boundaries. This pair of information of road segments, obtained using Probabilistic SVM (PSVM) and DSM, is integrated using a modified Constraint Satisfaction Neural Network. Results of this integration are not satisfactory due to occlusion of roads, variation of road material, and curvilinear pattern. Suitable post-processing modules (segment linking and region part segmentation) have been designed to address these issues. The proposed non-model based approach is verified with extensive experimentations and performance compared with two state-of-the-art techniques and a GIS based tool, using multi-spectral satellite images. The proposed methodology is robust and shows superior performance (completeness and correctness are used as measures) in automating the process of road network extraction.

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ISRS

BEST PAPER
2012

Identification of Loriya Fault, Its Reactivation Due to 2001 Bhuj Earthquake, (Using Remote Sensing Data) and Its Bearing on the Kachchh Mainland Fault, Kachchh District, Gujarat

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Published:

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ABSTRACT

The 2001 Bhuj earthquake (Mw 7.7), one of the most severe earthquakes in the recent history of India, reactivated various existing active faults. It is manifested in the form of coseismic ground fissures/cracks and upheaval of land in the form of bumps. Identification and reactivation of Loriya Fault is established by 1—Geomorphic changes with the help of digital imagery (LISS III images). 2—Coseismic changes through ground checks and 3—Geophysical signatures through magnetic and gravity survey. A lineament cutting the north-western part of the Pur River alluvial fan has been revealed by satellite imagery. The streams flowing along the lineament add to the evidences of a weak plane, while the occurrence of coseismic ground fissures confirms the existence of an active fault. No dip slip movement is recorded in the trenches made across the Loriya active fault while the en-echelon pattern of ground fissures suggest strike slip movement along the fault due to 2001 earthquake.

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ISRS

BEST PAPER
2012

DEM Generation for Lunar Surface using Chandrayaan-1 TMC Triplet Data

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Published:

Journal of the Indian Society of Remote Sensing, Vol. 40, No. 4, pages. 551–564

ABSTRACT

Digital Elevation Model (DEM) is an important prerequisite for understanding the lunar surface. However, making accurate DEM is a very challenging task due to (a) lack of support of projection parameters in COTS packages (eg. PCI Geomatica), which are to be used in generation of Lunar DEM and (b) unavailability of Ground Control Points (GCPs). In the present study, DEM generation of lunar surface was attempted without GCPs using Rational Function (RF) model from Chandrayaan-1 TMC triplet images. In the study, a good correlation (of almost same order) is observed between Nadir-Fore (NF), Nadir - Aft (NA), Fore - Aft (FA) and Fore - Nadir - Aft (FNA) image pairs. The results suggest that DEM for lunar surface can be created without GCPs using RF model.

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ISRS

BEST PAPER
2013

Genetic Algorithm Based Feature Subset Selection for Land Cover/ Land Use Mapping Using Wavelet Packet Transform

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Published:

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ABSTRACT

A genetic algorithm based approach is used in this paper for the selection of a subset from the combination of Wavelet Packet Statistical and Wavelet Packet Co-occurrence textural feature sets to classify the LISS IV satellite images using neural networks. Generally, adding a new feature increases the complexity of training and classification. Hence there is a need to differentiate between those features that contribute ample information and others. Many current feature reduction techniques such as Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) involve linear transformations of the original pattern vectors to new vectors of lower dimensions. Hence a multi-objective Genetic Algorithm has been employed to reduce the complexity and increase the accuracy of classification. Four indices - user's accuracy, producer's accuracy, overall accuracy and kappa co-efficient are used to assess the accuracy of the classified data. Experimental results show that the proposed Genetic Algorithm approach with lesser number of optimal features produces comparable results with that of our earlier approach using more features.

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ISRS

BEST PAPER
2013

Understanding the Spatial Variability of Chlorophyll a and Total Suspended Matter Distribution Along the Southwest Bay of Bengal Using In-Situ and OCM-2 & MODIS-Aqua Measurements

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ABSTRACT

Spatial and temporal distribution of chlorophyll a (chl a) and Total Suspended Matter (TSM) and inter comparison of Ocean Color Monitor-2 (OCM-2) and Moderate Resolution Imaging Spectro-radiometer (MODIS-Aqua) derived chlorophyll a and TSM was made along the southwest Bay of Bengal (BoB). The in-situ chl a and TSM concentration measured during different seasons were ranged from 0.09 to 10.63 μgl^{-1} and 11.04–43.75 mgl^{-1} respectively. OCM-2 and MODIS derived chl a showed the maximum (6–8 μgl^{-1}) at nearshore waters and the minimum (0–1 μg^{l-1}) along the offshore waters. OCM-2 derived TSM imageries showed the maximum (50–60 mgl^{-1}) along the nearshore waters of Palk Strait and the moderate concentration (2–5 mgl^{-1}) was observed in the offshore waters. MODIS derived minimum TSM concentration (13.244 mgl^{-1}) was recorded along the offshore waters, while the maximum concentration of 15.78 mgl^{-1} was found along the Kodiakarai region. The inter-comparison of OCM-2 and MODIS chl a data ($R^2 = 0.549$, $n = 49$, $p < 0.001$, SEE = ±0.117) indicate that MODIS data overestimates chl a concentration in the nearshore waters of the southern BoB compared to the OCM-2. The correlation between OCM-2 and MODIS-Aqua TSM data ($R^2 = 0.508$, $N = 53$, $P < 0.001$ and SEE = ±0.024) confirms that variation in the range of values measured by OCM-2 (2–60 mgl^{-1}) and the MODIS (13–16 mgl^{-1}) derived TSM values. Despite problems in range of measurements, persistent cloud cover etc., the launch of satellites like OCM-2 with relatively high spatial resolutions makes job easier and possible to monitor chl a distribution and sediment discharges on day to day basis in the southwest BoB.

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ISRS

BEST PAPER
2014

A Case Study on Forewarning of Yellow Rust Affected Areas on Wheat Crop Using Satellite Data

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Published:
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ABSTRACT

Objective of this study was to identify stripe rust affected areas of wheat crop as well as evaluation of remote sensing (RS) derived indices. Moderately low temperature and high humidity favour the growth of yellow rust. Most affected areas of Punjab are the foothill districts such as Gurdaspur, Hoshiarpur and Ropar. Occurrence of yellow rust is possible when maximum temperature for day is below 15 °C and Temperature difference of day's maximum and minimum temperature is less than 5 °C during the early growth of wheat. Forecast of the infestation was done using 3 days forecast of weather data obtained from Weather Research and Forecasting (WRF) model at 5 km resolution. Weather forecast used was obtained from Meteorological and Oceanographic Satellite Data Archival System (MOSDAC) site and post infestation, identification of specific locations were done using multi-date IRS AWiFS data. It is an attempt for early detection through 3 days advance forewarning of weather which will be handy tool for planners to expedite relief measures in case of epidemic with a more focused zones of infestation as well as for crop insurers to know the location and extent of damage affected areas.

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BEST PAPER
2014

Developing Basic Design and Mathematical Framework for a Mobile Mapping System—a Case Study Using Available Sensors

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ABSTRACT

There is a growing demand for technologies that support capturing of comprehensive and good quality 3D spatial data at a faster rate with low investment and minimal effort, while also causing least disturbance to other activities in the area. Mobile mapping systems (MMS), which are being developed in a few western countries, solve this problem but their import is highly expensive. While the components of a MMS are easily available off-the-shelf at lower cost, the main reason for their high cost is the intellectual property involved in the sensor design, integration, calibration, and the related software. Developing the intellectual property locally can bring down the cost of MMS to a large extent. Keeping this in mind, a MMS has been developed in this research using the locally available sensors. This paper describes the methodology to integrate navigation and mapping sensors including the developed calibration procedures. It further describes the time synchronization technique developed for multi-sensor data fusion and algorithms implemented by software package for data processing. The sensors integrated in the MMS include a standard GPS, IMU and a standard laser scanner. A Kalman filter is implemented to integrate the GPS and IMU data, which provides position and orientation information for the sensors. A simulation software package is also developed to verify, understand and develop the equations used in MMS. Field tests have been performed using the developed MMS and the results are shown for a few cases. Results validate the designed algorithms and indicate the successful development of the MMS, which has potential to be further developed and used in field. Though a number of papers are available on MMS, the thrust of this paper is to present a complete methodology for developing a MMS using locally available sensors. Unlike available papers, this paper outlines all aspects of design, calibration and operation, where each of these aspects is handled in a novel way as demanded by the available sensors. This is particularly useful for individuals or organizations interested in procuring sensor components off-the-shelf and develop their own (low cost) Mobile Mapping system.

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ISRS

BEST PAPER
2015

A new 2D/3D Phase Unwrapping Strategy of Differential Interferograms SAR

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Published:

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ABSTRACT

3D space-time phase unwrapping is a major problem in many disciplines including SAR interferometry, where elevation models and displacement measurements can be obtained after phase unwrapping and removing the ambiguity modulo 2π. The unwrapping of these phases can be performed in two different approaches, the first is to place the differential phases in the 2D plane and the second approach is to unwrap the phase taking into account the phase discontinuity in the time series. The latter quantifies the space-time deformation. In this context, we propose a strategy of 3D phase unwrapping which focuses on two methods: the first one is based on locating and tracking the unwrapping path of the best quality three-dimensional factor and the second method enables to unwrap the phase voxels regardless of the path avoiding the lines and planes cut. The proposed strategy has been tested on a series of simulated interferograms to show the use of voxel phase unwrapping 3D versus the 2D unwrapping (pixel to pixel temporally). It is then applied to the differential interferogram generated from a series of ERS1/ERS2 radar images acquired over a region of southern Algeria affected by the problem of land subsidence and the presence of scalable tectonic faults.

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ISRS

BEST PAPER
2015

Prior Knowledge-Based Automatic Object-Oriented Hierarchical Classification for Updating Detailed Land Cover Maps

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ABSTRACT

Automatic information extraction from optical remote sensing images is still a challenge for large-scale remote sensing applications. For instance, artificial sample collection cannot achieve an automatic remote sensing imagery classification. Based on this, this paper resorts to the technologies of change detection and transfer learning, and further proposes a prior knowledge-based automatic hierarchical classification approach for detailed land cover updating. To establish this method, an automatic sample collection scheme for object-oriented classification is presented. Unchanged landmarks are first located. Prior knowledge of these categories from previously interpreted thematic maps is then transferred to the new target task. The knowledge is utilized to rebuild the relationship between landmark classes and their spatial-spectral features for land cover updating. A series of high-resolution remote sensing images are experimented for validating the effectiveness of the proposed approach in rapidly updating detailed land cover. The results show that, with the assistance of preliminary thematic maps, the approach can automatically obtain reliable object samples for object-oriented classification. Detailed land cover information can be excellently updated with a competitive accuracy, which demonstrates the practicability and effectiveness of our method. It creates a novel way for employing the technologies of knowledge discovery into the field of information extraction from optical remote sensing images.

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ISRS

BEST PAPER
2015

Waveform Classification and Water-Land Transition over the Brahmaputra River using SARAL/AltiKa & Jason-2 Altimeter

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Published:
Journal of the Indian Society of Remote Sensing, Vol. 43, No. 3, pages. 475–485

ABSTRACT

With technology development and reduced foot print size of recent altimeters, estimation of water level height of inland water bodies with sub-meter level accuracy at the global scale with reasonable temporal and spatial resolution is possible. SARAL/Altika is the first altimeter working in very high frequency of Ka (36.5GHz) band. SARAL has 500 MHz bandwidth so the pulse width is reduced to 2 ns and effective footprint is reduced to 1.3 km for calm surfaces. The Brahmaputra River is one of the biggest rivers of the India located in the northeastern part of the country. Here in this study we have done waveform classification of Ka band and Ku band waveforms for Saral and Jason 2 respectively. We have analysed total 3000 Ku band waveforms of Jason-2 and 1000 Ka band waveforms of SARAL. We have classified different types of waveforms like Brown shaped, spiked, double spiked, multi spikes in leading edge, multi spikes in trailing eadge, very low power waveforms on the basis of their shape. Here we have studied the land to water and water to land transition of satellite altimeter derived from the change in the shape of wavefrom as a first step towards the waveform retracking for the water level estimation. As satellite approches from land to water, midpoint of leading edge shifts, power increases and number of peaks in the trailing edge decreases. The reverse pattern can be seen the water to land transition. We also showed seasonal variability of water spread of the Brahmaputra River. Geophysical corrections have major impact on the retrieval of water level from altimeter waveforms. We have also analyzed DTC (Dry Tropospheric Correction), WTC (Wet Tropospheric Correction) and IC (Ionospheric Correction) which we have applied to the range for the water level estimation of Brahmaputra River.

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BEST PAPER
2015

A Qualitative study of Some Meteorological Features During tropical Cyclone PHET Using Satellite Observations and WRF Modeling System

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ABSTRACT

The satellite derived meteorological parameters are quite useful for understanding the genesis of a tropical cyclone. This paper analyses some of the characteristic features of the tropical cyclone (TC) PHET using satellite derived meteorological observations, and numerical model simulations while investigating the performance of various cumulus parameterization schemes using Weather Research and Forecasting (WRF) modeling system. The genesis of the TC is primarily discussed using the observed meteorological parameters including the outgoing long-wave radiation, quantitative precipitation estimate (or rainfall), sea surface temperature, relative vorticity and upper tropospheric humidity. These satellite derived parameters show suitable meteorological condition for the development and propagation of the TC. The qualitative analysis of WRF simulated results indicates that Kain-Fritsch cumulus scheme (Kain and Fritsch, 1990 and 1993; Kain, 2004) performs relatively better in predicting various parameters in relation to the genesis and propagation of PHET.

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ISRS

BEST PAPER
2016

Wavelet Based Feature Extraction Techniques of Hyperspectral Data

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ABSTRACT

Hyperspectral data have many applications and are being promoted over multi-spectral data to derive useful information about the earth surface. But this hyperspectral data suffers from dimensionality problem. It is one of the challenging tasks to extract the useful information with no or less loss of information. One such technique to extract the useful information is by using wavelet transformations. In this paper, a series of experiments have been presented to investigate the effectiveness of some wavelet based feature extraction of hyperspectral data. Three types of wavelets have been used which are Haar, Daubechies and Coiflets wavelets and the quality of reduced hyperspectral data has been assessed by determining the accuracy of classification of reduced data using Support Vector Machines classifier. The hyperspectral data has been reduced upto four decomposition levels. Among the wavelets used for feature extraction Daubechies wavelet gives consistently better accuracy than that produced from Coiflets wavelet. Also, 2-level decomposition is capable of preserving more useful information from the hyperspectral data. Furthermore, 2-level decomposition takes less time to extract features from the hyperspectral data than 1-level decomposition.

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ISRS

BEST PAPER
2016

Development of '3D City Models' using IRS Satellite Data

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ABSTRACT

Urban models are computer-based solutions used for testing theories about spatial location and interaction between land uses and related activities. They also provide digital environments for testing the consequences of physical planning policies on the future form of cities. Earlier, 3D city models were prepared using stereo aerial photography, topographic data and conventional surveying. The geospatial information was extracted using either visual or digital classification techniques. Presently the 3D city models is prepared with the help of ALTM data along with very high resolution imagery, which is costly and time consuming. As alternatives, Cartosat-1 stereo data of the order of 2.5 m resolution, it becomes more practical and economical to generate digital surface model (DSM) with an accuracy of 4 m. Cartosat-II data with 1 m resolution fused with LISS-IV data give high resolution images for building footprint extraction. The availability of high resolution Cartosat-I stereo satellite data assists urban planners and municipal authorities to create a model and visualize the urban space in three dimensions. 3D visualization models have a variety of applications in urban studies. The studies includes urban morphological mapping, disaster management, updation, virtual reality and generation of fly through etc. The primary interest of the planners is not limited towards the extraction of urban features from satellite data. Planners also have interest in creation of 3D models of buildings and terrain surface for detailed urban planning. Therefore, to develop 3D city models 2.5 m Cartosat-1 stereo data fused with 1 m merged product of Cartosat-II and LISS-IV to create DSM and building footprints respectively. Keeping the significance of use of stereo satellite data, an attempt has been made to generate a 3D building model for Ahmedabad and Hyderabad cities. The 3D building model generated by employing geoinformatics techniques with Level of Details (LOD-1). The primary aim of this study was to develop geoinformatics techniques for the extraction of urban features based on object oriented classification techniques with level of details 1 (LOD-1) using photogrammetric DEM. This paper discusses all these techniques and their usefulness in 3D city modeling exercises.

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2016

Evaluation of SARAL / AltiKa Measured Significant Wave Height and Wind Speed in the Indian Ocean Region

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ABSTRACT

Significant wave height (SWH) and wind speed (WS) estimated by AltiKa are evaluated using in situ measurements and Jason-2 observations over the Indian Ocean region (30°S – 30°N and 30°E – 120°E). SARAL carried a Ka-band altimeter (AltiKa) along with a dual frequency radiometer onboard. This is the first altimeter operating in such high frequency of 35.75 GHz. Advantage of this high frequency is the narrow foot print of the satellite, which is useful for studies related to coastal regions, with the limitation of high attenuation to rain. From the validation exercise with in situ data for 21 cycles of AltiKa high resolution 40 Hz data, it is observed that the SWH is good while little underestimation of WS is observed. The root mean square error (RMSE) and bias of SWH are 0.21 m, −0.04 m respectively with a scatter index of 0.13; whereas in the case of WS, the RMSE and bias are 1.75 m/s, 0.25 m/s respectively with scatter index of 0.30. Inter-comparison is carried out between AltiKa and Jason-2 at all the cross over points in the Indian Ocean region and the SWH and WS of these two altimeters are in good concurrence with each other with the bias and RMSE of 0.03 m and 0.35 m for SWH and 0.01 m/s and 1.45 m/s for WS. From this study of Ka-band altimeter, it is inferred that the quality of the products is extremely good which is also capable of picking up accurate SWH during extreme events.

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BEST PAPER
2016

Statistical Retrieval of Ozone and Meteorological Parameters Using SHADOZ Observations and Radiative Transfer Model

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ABSTRACT

A statistical retrieval algorithm has been developed using SHADOZ ozonesonde observations and radiative transfer model simulations for the retrieval of vertical profiles of temperature, water vapor and ozone. Retrieved profiles of ozone and meteorological parameters are compared with corresponding in-situ ozonesonde observations and IASI observations to test accuracy of the retrieval algorithm. The standard deviation error in the temperature profile, estimated using retrieved and ozonesonde observed profiles, is found to be in the range of 0.7–2.7° K. The percentage root mean square error (RMSE) estimated using retrieved and actual profiles of ozone and water vapor are found to be in the range of 5–30 % and 10–30 %, respectively. The standard deviation error in temperature (2 to 3.5° K) and RMSE in water vapor (~35–55 %) estimated using actual IASI observations (retrieved and observed) is relatively higher than the retrieval errors from the simulated radiances. The RMSE in the retrieval of total column ozone is also estimated using simulated and actual IASI radiances. The RMSE for simulated data is found to be 1.9 ± 1.4 %. The RMSE in the total column ozone estimated for actual IASI observations is found to be 3.8 ± 3.2 %. Inclusion of the zenith angle as a predictor in the regression coefficients has improved retrieval error of atmospheric parameters. The standard deviation error for temperature is improved by 0.2–0.3° K and RMSE for ozone and water vapor is improved by 2–4 % and 4–7 % respectively in different atmospheric regions.

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2017

Evaluation of RISAT-1 SAR Radiometric Calibration Using Extended Amazon Rainforest

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Published:

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ABSTRACT

The single-frequency Radar Imaging Satellite-1 (RISAT-1) Synthetic Aperture Radar (SAR) (launched in April, 2012) is designed to provide a wide variety of imaging options compared to the prevailing SAR missions. The scale of the calibration task for the RISAT-1 mission is increased with the inclusion of multiple beams and polarizations (single, dual and quad) along with circular/hybrid polarization capabilities, for the first time from space. Significant efforts have been made in the evolution of SAR processor for the provision of radiometrically and geometrically calibrated products to the users. After the commissioning phase, RISAT-1 was put into routine operations in Oct. 2012. Since then extensive beam coverage of Amazon rainforest in various modes was carried out to evaluate the calibration parameters and SAR processor performance. Subsequently, the processor version 1.2.0 was improved to version 1.3.0 and with further modifications to version 1.4.0. This article details the analysis carried out at each processor version, by quality evaluation team, to quantify the parameter behaviour and to give feedback on the processor performance to the SAR processor team. The various radiometric quality parameters evaluated and monitored are shape of the antenna pattern, gamma-naught, backscattering coefficient (sigma-naught), speckle index, radiometric resolution and Noise Equivalent Sigma Zero (NESZ). Data studied for the analysis is in Single Look Complex (SLC) for stripmap mode and multilook (Ground range) for ScanSAR and stripmap mode in dual and circular polarizations. The performance of version 1.4.0 for all the beams (near-to-far) is found to be consistent and meeting the mission specifications for the product.

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BEST PAPER
2017

Spatial-Correlation Based Persistent Scatterer Interferometric Study for Ground Deformation

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ABSTRACT

Interferometric Synthetic Aperture Radar (InSAR), nowadays, is a precise technique for monitoring and detecting ground deformation at a millimetric level over large areas using multi-temporal SAR images. Persistent Scatterer Interferometric SAR (PSInSAR), an advanced version of InSAR, is an effective tool for measuring ground deformation using temporally stable reference points or persistent scatterers. We have applied both PSInSAR and Small Baseline Subset (SBAS) methods, based on the spatial correlation of interferometric phase, to estimate the ground deformation and time-series analysis. In this study, we select Las Vegas, Nevada, USA as our test area to detect the ground deformation along satellite line-of-sight (LOS) during November 1992–September 2000 using 44 C-band SAR images of the European Remote Sensing (ERS-1 and ERS-2) satellites. We observe the ground displacement rate of Las Vegas is in the range of −19 to 8 mm/year in the same period. We also cross-compare PSInSAR and SBAS using mean LOS velocity and time-series. The comparison shows a correlation coefficient of 0.9467 in the case of mean LOS velocity. Along this study, we validate the ground deformation results from the satellite with the ground water depth of Las Vegas using time-series analysis, and the InSAR measurements show similar patterns with ground water data.

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ISRS

BEST PAPER
2017

Development of CityGML Application Domain Extension for Indoor Routing and Positioning

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ABSTRACT

CityGML is an open data model for storage and exchange of 3D city models. It is categorised into thirteen thematic classes, i.e., buildings, tunnels, bridges, etc., lacking the other themes such as indoor routing and positioning. With the amplified use of indoor routing and positioning, the need for prerequisite notion of detailed semantic, as well as geometric information of the 3D building data has grown. We intend to extend the CityGML schema to add attributes of indoor features using the facility of Application Domain Extension (ADE) provided by the OGC CityGML 2.0. In this study, we aim to showcase the formation of Indoor Routing and Positioning ADE along with the process concerning its development, such as the 3D model design, network dataset creation, routing, positioning and Unified Modeling Language based ADE application schema generation. This research would help the users to easily store and exchange 3D city data on which they can perform routing and positioning inside the buildings with enhanced semantic and geometric properties.

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ISRS

BEST PAPER
2018

Geospatial Mapping of Soil Organic Carbon Using Regression Kriging and Remote Sensing

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Journal of the Indian Society of Remote Sensing, Vol. 46, No. 5, pages 705–716

ABSTRACT

Geo-spatial mapping of soil organic carbon using regression kriging was performed for Lalo khala sub-watershed (a part of Solani watershed) located in western Uttar Pradesh, India. Soil organic carbon was predicted using eight predictor variables derived from the advanced space borne thermal emission and reflection radiometer satellite images and digital elevation model. The soil organic carbon was determined in 248 soil samples collected randomly within a 300 m2 grid overlaid on the study area. Out of the eight predictor variables used in simple regression, the normalized difference vegetation index has the maximum correlation with the soil organic carbon (0.64) followed by vegetation temperature condition index (0.60), brightness index (– 0.60), greenness index (0.57) and wetness index (0.51). Standardized principle components of the predictor variables were used in the prediction model so as to address the multicollinearity problem. The regression kriging predicted SOC value ranged from 0.19 to 1.93% with a mean value of 0.64 and standard deviation of 0.29. The SOC values were higher in upper piedmont with moderate forest followed by Siwalik hills while low values were found in the upper alluvial plains. The RMSE of the predicted SOC map was only 0.196 indicating the closeness of predicted values to the observed values. Regression kriging predicted SOC map can be used for spatial agriculture planning and consider as an ideal input for spatially distributed models. The higher efforts for its preparation are justified when quality, spatial distribution and accuracy are considered.

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ISRS

BEST PAPER
2018

A Tool Assessing Optimal Multi-Scale Image Segmentation

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ABSTRACT

Image segmentation to create representative objects by region growing image segmentation techniques such as multi resolution segmentation (MRS) is mostly done through interactive selection of scale parameters and is still a subject of great research interest in object-based image analysis. In this study, we developed an optimum scale parameter selector (OSPS) tool for objective determination of multiple optimal scales in an image by MRS using eCognition software. The ready to use OSPS tool consists of three modules and determines optimum scales in an image by combining intrasegment variance and intersegment spatial autocorrelation. The tool was tested using WorldView-2 and Resourcesat-2 LISS-IV Mx images having different spectral and spatial resolutions in two areas to find optimal objects for ground features such as water bodies, trees, buildings, road, agricultural fields and landslides. Quality of the objects created for these features using scale parameters obtained from the OSPS tool was evaluated quantitatively using segmentation goodness metrics. Results show that OSPS tool is able determine optimum scale parameters for creation of representative objects from high resolution satellite images by MRS method.

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ISRS

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2018

Species mapping using citizen science approach through IBIN portal: use case in foothills of Himalaya

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Published:
Journal of the Indian Society of Remote Sensing, Vol. 46, No. 10, pages 1725–1737

ABSTRACT

In this era of rapid global change, biodiversity monitoring and improving species repository to meet requirements toward conservation is costly affairs and needs a practical solution to identify and locate species with habitats. The integrated approach of citizen science and information technologies has proven to be effective solution for geographical and taxonomical data collection with public engagement, covering local to national scale. As a first step, a mobile app is designed and developed for the IBIN (Indian Bioresource Information Network), a digitized collection of the biological resources of India that serves as a common platform to access spatial and non-spatial information on biorecources can host their data through this single and intuitive platform with full privileges and authenticity. IBIN mobile app can be seen as an efficient and rapid solution to record data on species, utilizing GPS and camera features of mobile devices. Present paper deals with the citizen science approaches, its contribution in biodiversity field, outlines the design and development of IBIN mobile app and its first case study carried out at foothills of Himalaya.

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ISRS

BEST PAPER
2018

Spatial Prediction of Rainfall-Induced Landslides Using Aggregating One-Dependence Estimators Classifier

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Journal of the Indian Society of Remote Sensing, Vol. 46, No. 7, pages. 1457–1470

ABSTRACT

In this study, the spatial prediction of rainfall-induced landslides at the Pauri Gahwal area, Uttarakhand, India has been done using Aggregating One-Dependence Estimators (AODE) classifier which has not been applied earlier for landslide problems. Historical landslide locations have been collated with a set of influencing factors for landslide spatial analysis. The performance of the AODE model has been assessed using statistical analyzing methods and receiver operating characteristic curve technique. The predictive capability of the AODE model has also been compared with other popular landslide models namely Support Vector Machines (SVM), Radial Basis Function Neural Network (ANN-RBF), Logistic Regression (LR), and Naïve Bayes (NB). The result of analysis illustrates that the AODE model has highest predictability, followed by the SVM model, the ANN-RBF model, the LR model, and the NB model, respectively. Thus AODE is a promising method for the development of better landslide susceptibility map for proper landslide hazard management.

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ISRS

BEST PAPER
2019

Dense DSM and DTM Point Cloud Generation Using CARTOSAT-2E Satellite Images for High-Resolution Applications

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Published:

Journal of the Indian Society of Remote Sensing, Vol. 47, No. 12, pages. 2085–2096

ABSTRACT

The primary objective of this study is to provide a methodology to generate a dense point cloud of digital surface model (DSM) and digital terrain model (DTM) from 0.6 m GSD stereo images acquired by CARTOSAT-2E satellite of the Indian Space Research Organization. These products are required for many high-resolution applications such as mapping of watersheds and watercourses; river flood modeling; analysis of flood depth, landslide, forest structure, and individual trees; design of highway and canal alignment. The proposed method consists of several processes such as orienting the stereo images, DEM point cloud extraction using the semi-global matching, and DSM to DTM filtering. The stereo model is built by performing aero triangulation and block adjustment using the ground control points. The semi-global matching algorithm is used on the epipolar images to generate the DSM in the form of dense point cloud corresponding to one height point for each pixel. The planimetric and height accuracies are evaluated using orthoimages and DSM and found to be within 3-pixel (~ 2 m) range. A method for extracting DTM by ground point filtering, to discriminate the probable ground points and the non-ground points, is provided by using discrete cosine transformation interpolation. This robust method uses a weight function to differentiate the noise points from the ground points. The overall classification efficiency kappa (κ) value averages at 0.92 for ground point classification/DTM extraction. The results of benchmarking of the GPS-aided GEO augmented navigation GPS receiver by operating it over IGS station, in static mode for collecting the checkpoints, also are presented.

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ISRS

BEST PAPER
2019

Ship Classification in SAR Images Using a New Hybrid CNN–MLP Classifier

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Published:
Journal of the Indian Society of Remote Sensing, Vol. 47, No. 4, pages. 551–562

ABSTRACT

Ship detection on the SAR images for marine monitoring has a wide usage. SAR technology helps us to have a better monitoring over intended sections, without considering atmospheric conditions, or image shooting time. In recent years, with advancements in convolutional neural network (CNN), which is one of the well-known ways of deep learning, using image deep features has increased. Recently, usage of CNN for SAR image segmentation has been increased. Existence of clutter edge, multiple interfering targets, speckle and sea-level clutters makes false alarms and false detections on detector algorithms. In this letter, constant false alarm rate is used for object recognition. This algorithm, processes the image pixel by pixel, and based on statistical information of its neighbor pixels, detects the targeted pixels. Afterward, a neural network with hybrid algorithm of CNN and multilayer perceptron (CNN–MLP) is suggested for image classification. In this proposal, the algorithm is trained with real SAR images from Sentinel-1 and RADARSAT-2 satellites, and has a better performance on object classification than state of the art.

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ISRS

BEST PAPER
2019

Application of a Geographic Information System to Analyze Traffic Accidents Using Nantou County, Taiwan, as an Example

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ABSTRACT

A geographic information system (GIS) is a commonly used method for analyzing traffic accidents. Through a GIS, data regarding traffic accidents can be presented visually, and traffic accident locations can be analyzed. By identifying locations where traffic accidents frequently occur and highway sections with high accident rates, traffic authorities can adopt preventive measures and enforce traffic regulations to reduce the frequency of traffic accidents, deaths, injuries, and financial losses. The present study analyzed tourist traffic accidents in Nantou County, one of the most popular tourist areas in Taiwan for domestic and international travelers, and tabulated statistical data that were subsequently input into a GIS database to determine dangerous locations and areas where traffic accidents are prone to occur. First, administrative regions in Nantou County were identified and kernel density estimation and repeatability analysis were performed to determine locations with high accident rates. The results showed that in Nantou County, traffic accidents often occur between 12:00 and 18:00 at intersections and on sloped roads and windy roads. The most dangerous locations were Provincial Highway 21 (areas around Sun Moon Lake) and Provincial Highway 14A (areas with access to Qingjing and Hehuanshan). The results of this study could serve as a reference for traffic authorities to develop measures for preventing and regulating traffic accidents.

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ISRS

BEST PAPER
2019

Estimation of Leaf Chlorophyll Concentration in Turmeric (Curcuma longa) Using High-Resolution Unmanned Aerial Vehicle Imagery Based on Kernel Ridge Regression

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ABSTRACT

High-resolution information is needed for precision agriculture to achieve precise management of inputs. High spatial and temporal resolution is requisite to get the actionable information for the timely response. The objective of the present study is to estimate the leaf chlorophyll Concentration using high-resolution (2 cm) images captured from UAV-mounted multispectral sensors for crop health monitoring. In this study, a hexacopter was flown at an elevation of 25 m to capture the images in green, red, red edge and NIR bands of turmeric plots grown at ICAR Research Complex, Northeast Hilly Region, India. A handheld SVC spectroradiometer having spectral range from 350 to 2500 nm was also used to collect the spectra of sample plants to support the UAV study. We evaluated an advanced machine learning algorithm kernel ridge regression combined with spectral information and ground-truth chlorophyll data to model the chlorophyll estimation. The multivariate analysis was also applied on spectroradiometer and UAV data, which recommended red band for chlorophyll prediction with R2 value greater than 0.6. We also found that kernel ridge regression is a robust method for developing chlorophyll estimation model with lesser training time. The results indicate that kernel ridge regression with a radial basis kernel function with four multispectral input bands can be utilized to evaluate the leaf chlorophyll concentration with an root mean squared error RMSE = 0.10 mg/g and regression coefficient R2 = 0.7452. However, this study is site specific and needs to be practiced in different crop sites in order to generalize this method for precision agriculture.

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ISRS

BEST PAPER
2020

Spatiotemporal Variability of Soil Organic Carbon Content Over India Based on an Ecosystem Model and Regional Databases

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ABSTRACT

A study on spatiotemporal variability of soil organic carbon content (SOC) over India is carried out based on a remote sensing data-driven terrestrial ecosystem model and the regional databases. The model is initialized with the equilibrated solutions corresponding to undisturbed balanced biosphere condition and then marched forward with realistic forcing for the recent decades. Both the model solution and regional data show a good agreement between them with a large SOC values with mean 12 kg m^{-2} for the forest and cropland-dominated regions, a moderate value (8 kg m^{-2}) for the mixed shrub and grassland, and small for the grassland regions (4 kg m^{-2}) correspondingly for 30 m upper active layer of the soil. The model SOC shows a significant seasonal variability across all the vegetation types with peak value during spring season (March–April) and trough during the autumn (September–October). The SOC budget of the country is around 13 Pg for the top active layer of the soil. It has shown a significant increasing trend of 22 Tg $year^{-1}$ for the study period resulted from the positive growth rate of 25 Tg $year^{-1}$ for the cropland and negative growth rate of 3 Tg $year^{-1}$ for the forest region. The extrapolated annual national SOC budget is 25 Pg correspondingly for 1 m depth soil layer.

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2020

Image Stitching using AKAZE Features

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ABSTRACT

Accelerated KAZE (AKAZE) is a multi-scale 2D feature detection and description algorithm in nonlinear scale spaces proposed recently. This paper presents an image stitching algorithm which uses a feature detection and description algorithm; AKAZE and an image blending algorithm; weighted average blending. The whole process is divided into the following steps: First of all, detect feature points in the image and then get feature descriptors of detected points using AKAZE. Next, obtain corresponding matching pairs by using K-NN (K nearest neighbors) algorithm and remove the false matched points by MSAC (M-estimator SAmple Consensus) algorithm. MSAC is a variant of the RANSAC (Random Sample Consensus) algorithm and more accurate than RANSAC. Thereafter, calculate the homography matrix from correct matches. At last, blend the images by using weighted average blending algorithm. Comparison of proposed AKAZE-based algorithm with SIFT-, SURF- and ORB-based algorithms is also presented. According to the experiments, the proposed AKAZE-based image stitching algorithm minimizes stitching seam and generates a perfect stitched image, and also this algorithm is faster than previous algorithms.

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BEST PAPER
2020

Investigation of Spatiotemporal Changes in the Incidence of Traffic Accidents in Kahramanmaraş, Turkey, Using GIS-Based Density Analysis

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ABSTRACT

Owing to their social and economic consequences, the spatial densities of traffic accidents need to be investigated to solve and prevent related problems. In this study, we aim to determine the spatial densities of traffic accidents over the long term and identify the spatiotemporal changes in the high-density areas of Kahramanmaraş City. Initially, a spatial database of accident features and locations was prepared. Between 2008 and 2015, 14,317 traffic accidents were identified. The hotspot and kernel density estimation (KDE) methods, which were developed to determine the spatial densities in geographical information systems, are commonly used to successfully detect high traffic-accident-density areas. In this study, z scores determined by hotspot analysis were used as weight value for weighted KDE. These areas were obtained separately for each year, and an accident time series was created. The spatiotemporal changes to these areas occurring between 2008 and 2015 were determined. Traffic accidents increased in density at important intersection points of the city, and these areas changed over time during urban development. The results of this study are expected to be beneficial for determining priority areas for preventing traffic accidents in Kahramanmaraş.

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COVID-19 Pandemic and City-Level Nitrogen Dioxide (NO2) Reduction for Urban Centres of India

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ABSTRACT

Air pollution poses a grave health risk and is a matter of concern for researchers around the globe. Toxic pollutants like nitrogen dioxide (NO_2) is a result of industrial and transport sector emissions and need to be analysed at the current scenario. After the world realised the effect of COVID-19 pandemic, countries around the globe proposed complete lockdown to contain the spread. The present research focuses on analysing the gaseous pollution scenarios, before and during lockdown through satellite (Sentinel-5P data sets) and ground-based measurements (Central Pollution Control Board's Air Quality Index, AQI) for 8 five-million plus cities in India (Delhi, Ahmedabad, Kolkata, Mumbai, Hyderabad, Chennai, Bengaluru and Pune). The long-term exposure to NO_2 was also linked to pandemic-related mortality cases across the country. An average of 46% reduction in average NO_2 values and 27% improvement in AQI was observed in the eight cities during the first lockdown phase with respect to pre-lockdown phase. Also, 53% of Corona positive cases and 61% of fatality cases were observed in the eight major cities of the country alone, coinciding with locations having high long-term NO_2 exposure.

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2021

Cause and Process Mechanism of Rockslide Triggered Flood Event in Rishiganga and Dhauliganga River Valleys, Chamoli, Uttarakhand, India Using Satellite Remote Sensing and in situ Observations

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ABSTRACT

The catchments of Rishiganga and then Dhauliganga valleys in the Chamoli district of Uttarakhand were impacted by a catastrophic flood triggered due to a massive rockslide, caused by wedge failure on 7th February, 2021. It is estimated that the massive rockslide of ~ 23 million cubic meter volume containing base rock, deposited ice, and snow got detached from the northern slopes of the Trishul mountain range near Ronti Glacier and created a vertical fall of almost 1700 m before severely impacting the Ronti Gad valley located at 1.5 km downstream of Ronti Glacier snout. The huge detached mass of rock and ice (GLIMS ID: G079733E30381N) swiftly moved downstream through the glaciated valley entraining snow, debris, mud on its way, caused rapid fluidization, created massive water/slush waves, and washed away partially or completely the hydel power projects and bridges in its route. It is estimated that ~ 0.93 Peta Joules of potential energy led to the generation of a significant amount of kinetic and thermal energy, good enough to trigger above-mentioned processes. Post-event analysis of high-resolution satellite data shows flood water marks in the valley and on the rock outcrops reaching up to ~ 80–150 m height on the way to Raini Village. The mud and the slush produced through this process led to the formation of a dammed lake and temporarily blocked one of the tributaries of the Rishiganga joining from the northeast. This study provides an insight into the sequence of events as they unfolded, through multi-temporal satellite image analysis, aerial survey, seismological data in conjunction with various other geo-spatial and geo-visualization tools for unraveling the flood event that has happened on February 7, 2021. We also discuss the potential cause of rockslide and the process mechanism of this unique event, causing loss of lives and property besides widespread devastation.

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Pansharpening of Satellite Images with Convolutional Sparse Coding and Adaptive PCNN-Based Approach

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ABSTRACT

In remote sensing, Pansharpening process has great significance in many practical applications like map updating, hazard monitoring, target recognition and object classification. Satellite sensors capturing panchromatic and multispectral images with complementary characteristics due to tradeoff between IFOV (instantaneous field of view) and SNR (signal-to-noise ratio). Pansharpening is a process of combining PAN (panchromatic) image of high spatial resolution with MS (multispectral) image of high spectral resolution to get image of high spectral and spatial resolution. In Pansharpening, balancing between extraction of information and injection of information is crucial point; misbalancing can cause intensity distortion. Proposed method is a combination of CSC (convolution sparse coding) and adaptive PCNN (pulse coupled neural network) approach. NSST (non-sub-sampled shearlet transform) is used for band separation of PAN and MS image. CSC is used for fusing low pass sub-bands, and adaptive PCNN method is employed for fusing high pass sub-bands. Five datasets with different geographical areas like mountain, urban and vegetation area are used for experiment purpose. Visual results and quantitative index analysis reflect the superiority of proposed method in preserving spectral details in pansharpened image.

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Comprehensive Airborne Laser Scanning (ALS) Simulation

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ABSTRACT

The 3D topographic data generated by airborne laser scanning (ALS) has numerous applications such as urban planning, transportation planning, flood modeling and mapping. Various types of LiDAR (light detection and ranging) datasets are needed for testing and development of algorithms for these applications. Such datasets are not readily available as the LiDAR data capturing process is complex, time-consuming and expensive. Simulated ALS data can be a low-cost alternative to the expensive LiDAR datasets. This paper presents the development of a simulator (called Limulator 4.0) for ALS data. Limulator includes four components, namely 3D model component, camera component, laser component and LiDAR data generation. The first component provides a user, the facility to input user-defined 3D models of various objects. The laser component mathematically models the scanner movement and flight trajectory to generate simulated ALS parameters. The camera component takes user-defined parameters to generate images captured by a virtual camera. The effects of external and internal forces on flight movement and various errors are also modeled mathematically. Software for this simulation is developed in C++, and its user-friendly GUI is developed using QT Creator 5.6. Limulator can serve as the ideal testbed for developing, testing and validation of various algorithms.

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OGC CityGML 3D City Models Enriched with Utility Infrastructures for Developing Countries

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ABSTRACT

Momentous studies have substantiated semantically enriched 3D city models with numerous urban related applications. Utility networks plays a vital role, hence detailed 3D data modeling of utility networks along with 3D urban space can perform various simulations and analysis on urban planning, utility and asset management. Detailed representation of utility networks is not yet studied till now, as they are least considered in city modeling. Subsurface utility infrastructures are connected to several network components that can be installed 'on-surface', 'above-surface' or 'below-surface'. CityGML is excessively used for 3D city modeling, hence CityGML compliant utility network modeling is proposed. The study proposes OGC CityGML-based detailed 3D modeling approach of 'subsurface and overhead' networks along with several 'overhead, on-surface and subsurface' network components. Data modeling approach is implemented with a modified version of CityGML Utility Network Application Domain Extension (ADE) to hold geometric and semantic aspects of subsurface and overhead infrastructures. Also, various Levels of Details (LOD) have proposed in the study. Related relevant applications of utility network modeling are also discussed. Several use cases such as (1) network analysis and (2) affects of utility network excavation on street space; are implemented with CityGML Utility Network ADE data. This study can be considered as a unique study dealing with detailed modeling of utility networks at different levels of details.

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