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SPECTRUM

The Official Newsletter of the ISPRS Student Consortium

Advancing Forestry Research using **Geospatial Technology**

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FROM THE BOARD

Dear SpeCtrum Readers,

First and foremost, I wish everyone a Happy 2018 with full of health and peace!

Last year was an engaging and exciting time as we introduced you the first issue of Spectrum, the official Newsletter of the ISPRS Student Consortium (ISPRS SC). This year, we remain enthusiastic in bringing you interesting topics that would help you know more about our profession and our network.

In this issue, we will cover the different applications and various topics of remote sensing for forestry applications. The forests are called “lungs of the earth” since it take carbon dioxide out of the air and replace it with oxygen. Therefore, forests are of vital importance for humans and animals for our survival. Based upon the information provided by UN’s Food and Agriculture Organisation (FAO) report (Global Forest Resources Assessment 2015), the world lost 129 million ha of forest between 1990 and 2015. This area is approximately equal the size of the South Africa. Can you believe it? If so, we should timely monitor the forest environment and protect these areas. In this point, remote sensing technology with the advantages of synoptic view for the earth surface provides key advantages to monitor and detect the deforestation in any time period.

In this sense, this issue covers remote sensing methods and techniques including the use of Unmanned Aerial Systems (UAS) and open source tools used by our colleagues for forestry applications as well as how spatial information contributes to forest management. We also have our usual updates about the SC activities and upcoming summer schools. Also, don’t forget to check out the section about career opportunities including job openings, PhD and Master’s, fellowships and scholarships for those of you who want to further your careers.

I hope that you will find this issue interesting and enjoy reading it.

All the best!

Mustafa Üstüner
Social Media Coordinator
2016-Present

Advancing **Forestry Research** using Geospatial Technology

By John Joseph Dida
The International Forestry Students' Association (IFSA)
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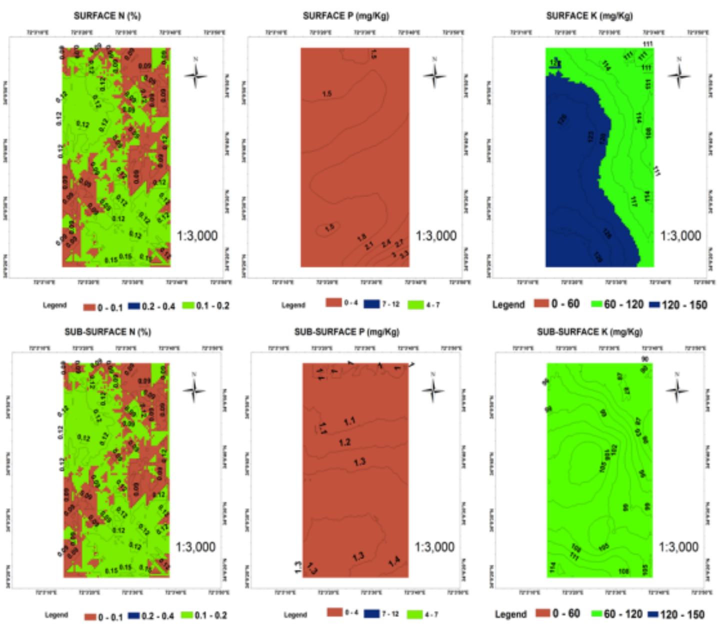
The International Forestry Students' Association (IFSA) is a non-political, non-profit organization based in Germany, that globally connects forestry students from around the world. IFSA encourages the cooperation among forestry students and promotes the expansion of knowledge and understanding to attain a world that appreciates forests. IFSA operates locally through its more than ninety (90) university-based student organizations called Local Committees (LC).

International Forestry Students' Symposium 2017 in South Africa

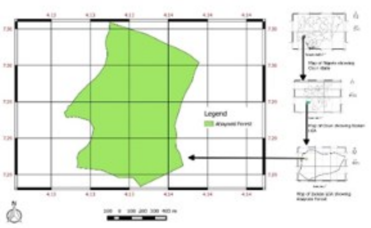
The organization maintains partnership with various institutions such as United Nations Food and Agriculture Organization (FAO), UN Convention on Biological Diversity (UNCBD), UN Forum on Forests (UNFF), UN Framework Convention on Climate Change (UNFCCC), Center for International Forestry Research (CIFOR), and International Union of Forest Research Organizations (IUFRO). Youth delegations, speaking engagements and side events during conferences are usually offered to IFSA by these institutions. These opportunities allow the forestry students to share their knowledge and voice out their thoughts as part of the youth sector. On the local level, forestry students are also engaged in research and studies that utilize Geographic Information System (GIS) and Remote Sensing techniques. Here are some of the studies conducted by forestry students:



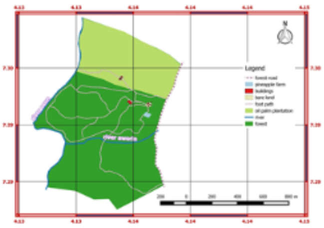
Maps showing different land conditions according to nutrients (M. Ayaz)

Muhammad Ayaz ***(muhammadayaz111@yahoo.com)*** from the Northwest A&F University Yangling in China analyzed soil fertility in Peshawar-Pakistan using geostatistical information system. Physico- chemical characterization of an agriculturally important soil and its fertility mapping was conducted by collecting 72 soil samples at two depths (0-15 and 15-30 cm) from the Research Farm of Amir Muhammad Khan Campus, The University of Agriculture, Peshawar-Pakistan. These samples were collected at grid pattern with 100 m distances and were sent for soil testing. The results indicated that the total nitrogen content of the surface soil ranges from deficient (9.72% of the soil sample), marginal (33.33% of the soil sample), and sufficient (56.95% soil sample). Meanwhile, the nitrogen content in the subsurface was deficient in 54.17% of the soil sample, marginal in 30.83% of the soil sample, and sufficient in 15% of the soil sample. The AB-DTPA extractable phosphorus was deficient in 97% surface and 100% sub-surface soils while potassium was at marginal to adequate levels in all samples with mean value of 150 mg kg-1. The potassium content of 58.33% of surface soil sample, as well as 86.11% of subsurface soil sample, was at adequate levels. After analyzing the data through geostatistical techniques and GIS applications, fertility maps were developed though Kriging that delineated the status of soil properties at every sampled and non-sampled locations that could be used during planning for fertility management. Spatial trend and semi-variogram were designed and spatial distribution of soil fertility status was further quantified and visualized. Kriging was used with three semi-variogram models (circular, spherical, and exponential). Mean Prediction Errors (MPE), Mean Standardized Prediction Errors (MSPE), and Root-Mean-Square Standardized Prediction Errors (RMSSPE) were used to evaluate the models. The results showed that the best model to generate soil fertility map was Kriging with all the three models on the best fitting formula, semi-variogram model (MPE and MSPE close to 0, and RMSSPE close to 1).

Adewole T.A. ***(samuelteamy@yahoo.com)*** and **Alo A.A.** ***(sharonvaltt@gmail.com)*** from the University of Ibadan in Nigeria did land use/land cover mapping and change detection of Abayomi Forest Estate at Ikoyi, Osun State using remote sensing techniques. The study aimed at providing a georeferenced map for Abayomi forest Estate at Ikoyi in Osun State taking into consideration the land cover and land use types present in the study area over the period of 2006-2016. The period was necessary to assess the changes that occurred at the study area over the years. Historical images from Google earth were used in cooperation with a planar map obtained from the forest manager. Maps were generated for the study years and measurement was done to assess the changes with the help of Quantum GIS Software.



Map of the study area (Adewole T.A.)

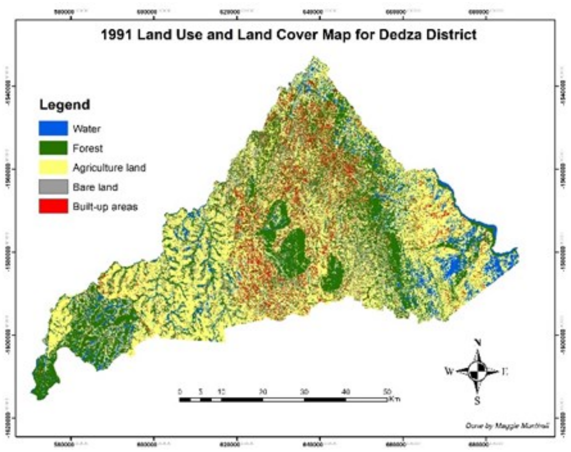


Map of Abayomi forest estate in year 2016 (Adewole T.A.)

Stream in the Forest (Adewole T.A.)

Tree with dense herbaceous undergrowth (Adewole T.A.)

Maggie Munthali ***(nyaunthali2011@gmail.com)*** from the University of Pretoria in South Africa analyzed and modelled the land use and land cover changes in Dedza District, Malawi using GIS and remote sensing techniques. The research aimed at assessing the land use and land cover changes that have taken place in Dedza district, Malawi from 1991 to 2016. It predicted the possible changes that might take place in the study area in the next 30 years by comparing different land use/cover change modelling approaches: Land Change Modeller (LCM) and Markov-Cellular Automaton (M-CA). The results of the study will be used by policy makers as a basic planning tool so that Dedza District could avoid the associated problems of a growing and expanding town like many other towns in Malawi.



Land Use/Land Cover Map and field work conducted in Dedza District (M. Munthali)

More studies and projects utilizing GIS and remote sensing have been and are currently being undertaken by various IFSA members around the globe. These technologies have been useful in understanding forest dynamics. The emergence of various studies in GIS and remote sensing opens the door for more people to understand and appreciate the importance of forests.

UAS-BORNE LASER SCANNER SUPPORTING FOREST INVENTORY

Wieser Martin [(1)], Di Wang [(1)], Markus Hollaus [(1)], Norbert Pfeifer [(1)], Günther Bronner [(2)]

(1) Department of Geodesy and Geoinformation, Technische Universität Wien, Austria (martin.wieser@geo.tuwien.ac.at) ; (2) Umweltdata GmbH, Austria

Forest management relies on several common parameters and characteristics such as tree species, tree height, diameter at breast height (dbh), taper function (stem curve), stem volume, tree position, etc. These parameters are usually estimated on plot level by in-situ measurements and are the basis for area wide estimations of forest parameters using statistical approaches. With the recent emergences of advanced technologies, several of these forest parameters can be derived by remote sensing technologies. Today, 3d point clouds derived from Airborne Laser Scanning (ALS) and from Image Matching are seen as state-of-the-art in directly deriving some of these parameters, like tree position and tree height, for large scale applications (e.g. Hollaus, 2015). Unmanned aerial systems (UAS) equipped with lightweight laser scanner (ULS) are promising to produce high-density point clouds for accurate 3d modelling of a complete forest scene, including individual stems. Therefore, the question of which forest parameters can be obtained from such high-resolution ULS-based 3d point clouds and which accuracies can be achieved, arises.

We show two examples how ULS can be used: (a) as reference data for ALS-based tree height estimation; and (b) for deriving dbh and taper functions.

To derive parameters from ULS measurements, some additional pre-processing steps are needed. For UAS equipped with a laser scanner, a geometric alignment of the acquired strip-wise point clouds must be done, especially for UAS with lower quality inertial sensors because this is not always straight forward and need to be addressed carefully. For example, a strip adjustment can be done by applying ICP methods on the point cloud as described by Glira et al. (2016) and implemented in OPALS (2017). Once the geometric alignment is obtained, the point cloud must be normalized in relation to the DTM. This allows calculating tree heights and stem diameters at different relative heights.

(a) ULS data as reference for ALS-based tree height estimations to investigate penetration of ALS into the tree canopy

For the first investigation, we used ULS data to have a closer look into the penetration of ALS into the canopy of deciduous trees. Wieserd et al (2016) described the comparison of the penetration two airborne laser scanner systems (Infrared -ALS: Riegl LMS-Q-1560; Bathymetric-ALB: Riegl VQ-880-G) and the ULS (Riegl VUX-SYS). The data was taken in leaf-off condition, from February to March 2015. The flying height of the ALS and ALB was around 600 m above ground which resulted in a footprint size of 15 cm for the ALS and 60 cm for the ALB. While the ULS with a flying height of about 50 m resulted in a footprint size of around 3 cm at the ground. In figure 1, point clouds for a single tree of the different systems can be seen, while figure 2 provides a closer look into the crown of two trees. It is already visible that the ALS with their design and footprint size were not always able to generate echoes from the highest point of the crown. This is highly dependent on the crown structure and the aperture design. While the ULS with its small footprint (under 2 cm at crown height) was able to show a detailed resolution of the crown. The results for 66 trees show a mean difference of the highest point of -0.60 m ± 0.40 m for ALS and -0.30 m ± 0.20 m for ALB.

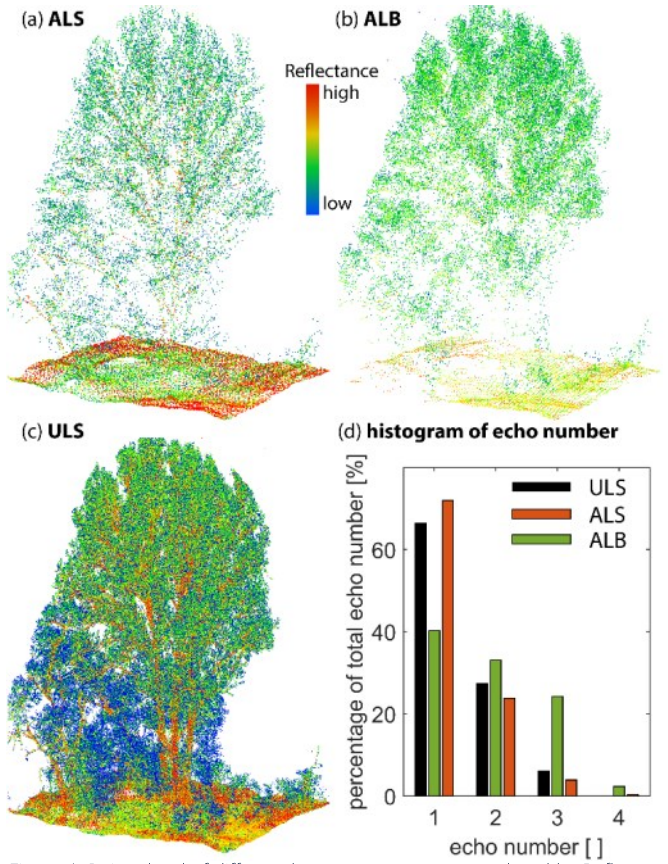
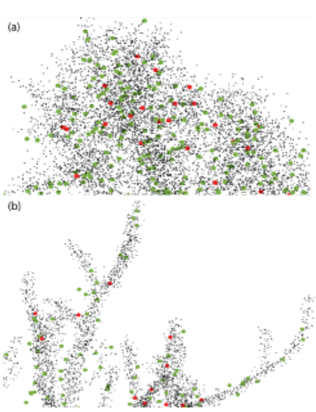


Figure 1: Point cloud of different laser scanner systems colored by Reflectance; (a) ALS; (b) ALB ; (c) ULS ; (d) Echo number distribution; from Wieser et al. (2016).



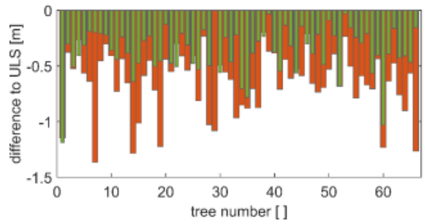


Figure 2 (Left): Point clouds of two tree crowns. Black: ULS; Green: ALB; Red: ALS; from Wieser et al. (2016)

Figure 3 (Right): Height differences of the highest canopy echo compared to ULS. Green: ALB; Red: ALS; from Wieser et al. (2016)

(b) ULS for deriving dbh and taper function

For this investigation, ULS, Terrestrial Laser Scanning (TLS) and in-situ measurements were collected in a coniferous forest stand located in Austria. The capability and accuracy of 3d stem modelling (dbh and taper-function) from ULS compared to TLS and in-situ measurements were investigated. The modelling contains the tree positions, stem diameters at different heights along the stem (=taper function), and tree height. The results show centimeter accuracy of the modelled stem and height.

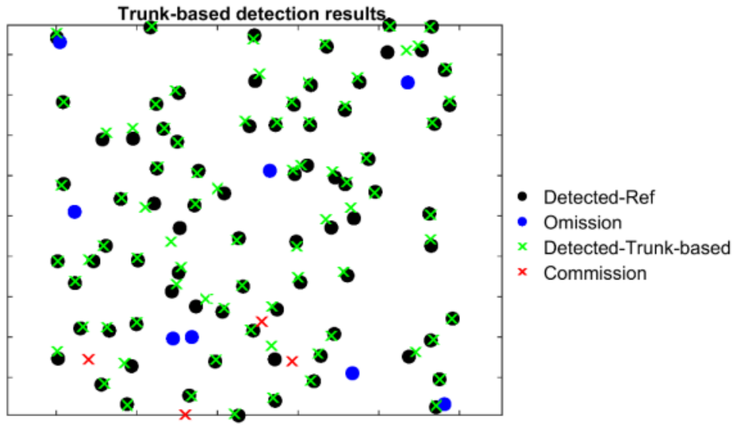


Figure 4: Single tree detection example from ULS data.

Figure 4 shows an example of single tree detection from ULS using the method proposed by Wang et al. (2016). Tree stems were detected by vertically aggregating the z-component of normal vectors and point cloud density into grids. The correct detection rate was 90.9% with a commission error of 4.5%, which is comparable to that of TLS. The taper function of a single tree can be modeled by fitting a series of cylinders along the detected stem points (Figure 5). The cylinders were fitted using the random sample consensus (RANSAC) method to achieve robust estimation, as the point density can be reduced in the lower section of the canopy due to the data acquisition configuration of ULS.

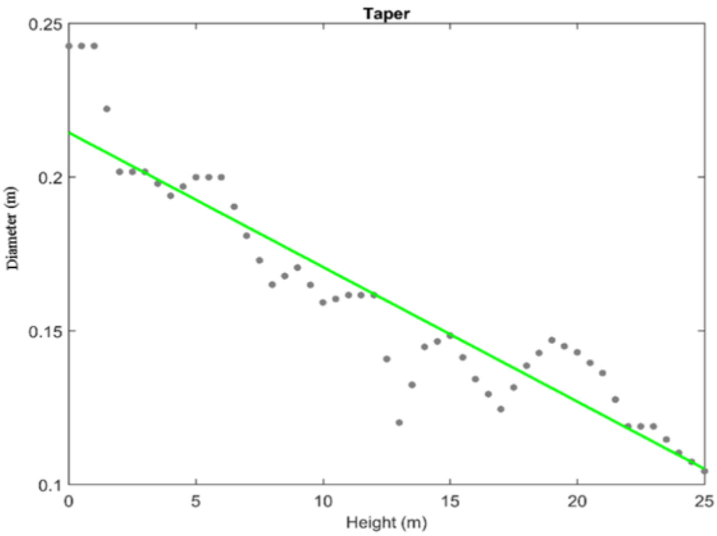


Figure 5: Taper function of a single tree modeled from ULS data.

Figure 6 shows examples of dbh modeling for trees with various stem sizes from TLS and ULS, respectively. The dbh estimation from ULS becomes difficult when stem size is small, as the point coverage becomes low, especially in a dense forest where the canopies can block laser beams from reaching the stems.

The described examples show the high potential of ULS data for supporting forest inventories. ULS may be a future source for calibration of ALS data to derive standard deviations of heights or crown coverage for single tree estimations, as well as a source for modelling of the complete stem over larger areas. This could lead to more accurate volume estimations and could provide information about the wood quality.

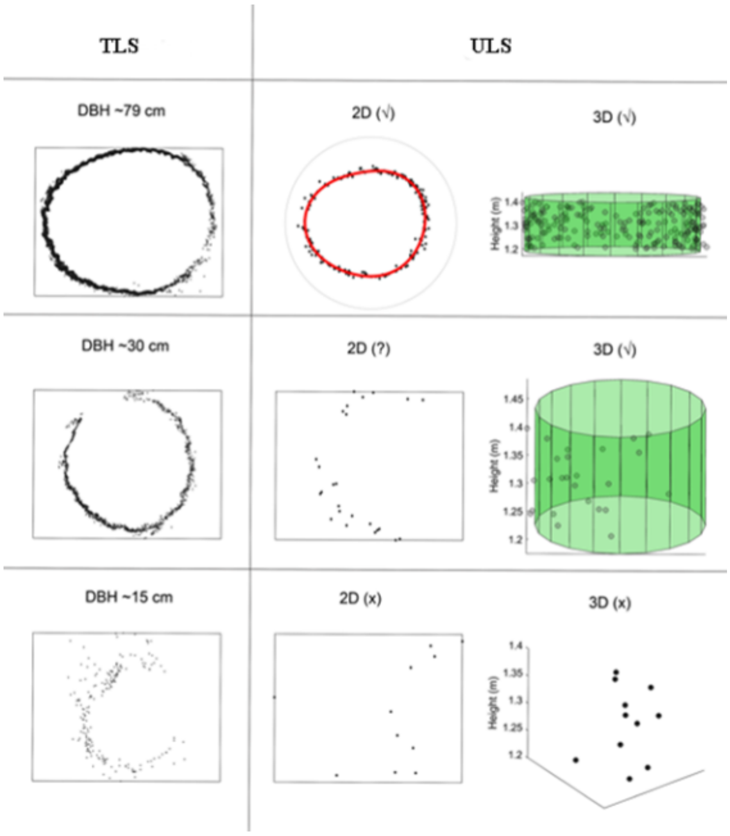


Figure 6: Comparison of dbh estimation from TLS and ULS by 2D cross-section fitting and 3D cylinder fitting for trees with various stem sizes.

Acknowledgments

The work was supported by the Austrian Research Promotion Agency (FFG): "Feasibility Studie: Gewinnung von Baum- und Waldparametern aus Laserscanningdaten von Multicopterflügen"

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RS and GIS in **Forest Management**

Krzysztof Stereńczak, Marek Lisańczuk, Grzegorz Krok, Aneta Modzelewska

Department of Forest Resources Management, Forest Research Institute, 05-090 Raszyn, Poland

For many years, forests were considered mainly as a source of timber. Such way of thinking started to change in the 19th and 20th centuries, when societies recognized other forest functions such as ecosystem and non-timber forest products. This multifunctional role of forests needs proper management, which can be done on different scales: global, national, and local. Remote sensing (RS) and Geographic Information System (GIS) are useful management tools on each of the scales mentioned.

Global scale forest resources estimation is usually carried out with the use of satellite data, due to the specificity of acquiring large-area datasets. Development of new technologies to map forests on the global scale is one of the objectives for remote sensing agencies of the National Aeronautics and Space Administration (NASA), European Space Agency (ESA), and Japan Aerospace Exploration Agency (JAXA) (Lefsky, 2010) due to the possibility of getting accurate information about pools and fluxes of the global carbon cycle (Drake et al. 2002) or mapping forest biodiversity (Turner et al. 2003). For instance, ESA has recently released a global mapping product - the result of the GLOBBIOMASS project (www.globbiomass.org).

On smaller scales, airborne systems are used more frequently. Recent major topics related to RS data application in forestry include: forest tree species classification, forest health monitoring, and estimation of woody biomass as well as other stand features, like stem volume, dominant height, diameter at breast height, and basal area. Among the aforementioned characteristics, tree species composition, especially at the stand level, is a crucial element to be studied. Species composition within stands can be obtained using remote sensing data of different range and scale, and for this, airborne and satellite images, point clouds, and radar data are useful (Fassnacht et al, 2016). Recently, hyperspectral images – a highly informative and complex – data are more frequently used.

From the forest management view, tree/wood volume was always the most important characteristic. In the past, airborne or spaceborne images were used as supportive materials in inventory of the stand volume (Kangas et al. 2018). It was not until the 90s that the commercial use of Light Detection and Ranging (LiDAR) systems arose and revolutionized the perception and actions undertaken in different domains (Harpold, 2017; fig. 1a, 1b, 1c). LiDAR data have been intensively analyzed for their applicability in forestry since the 1990s. They have now become the most important source of data for volume and other forest characteristics assessment (Næsset, 2002). Additionally, with the use of an airborne LiDAR data, a single tree level analysis is possible (fig. 1d).

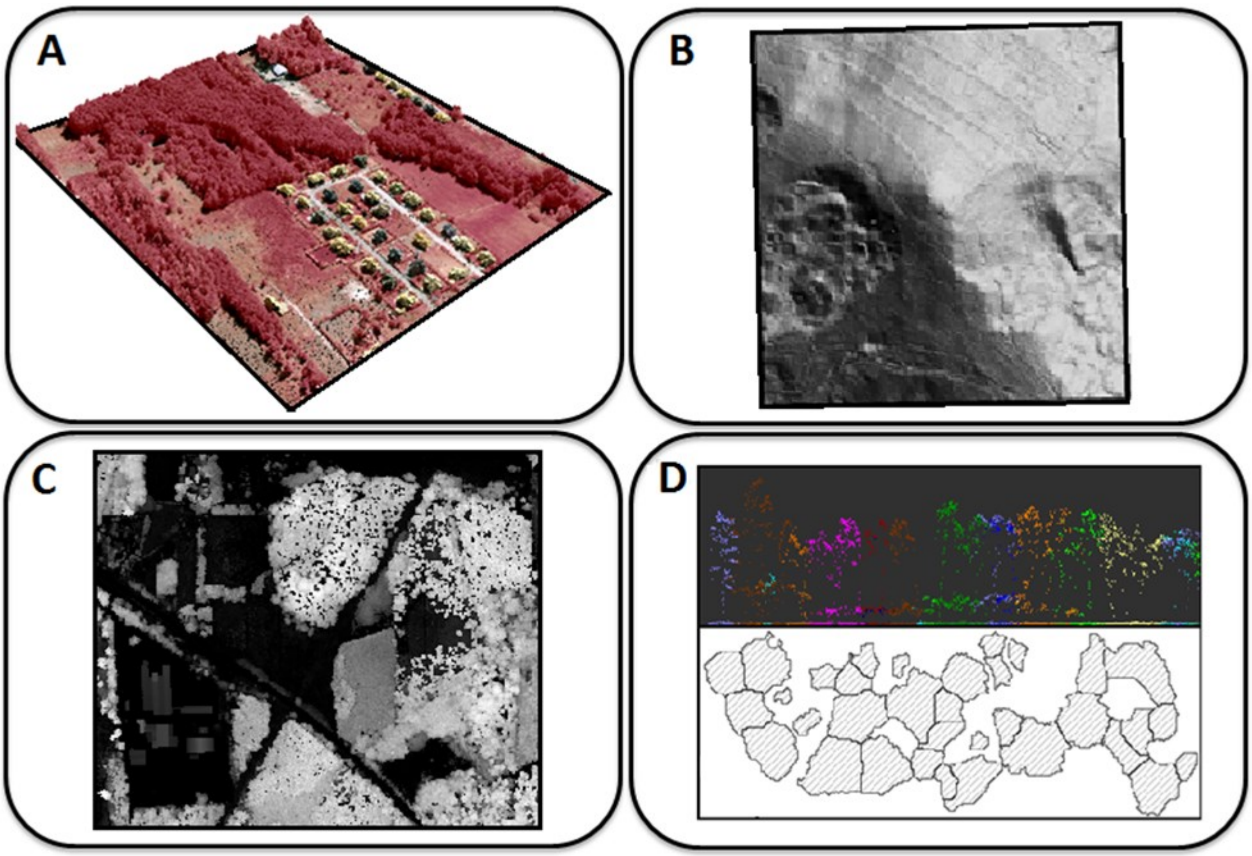

Figure 1 – Different products of Airborne Laser Scanning: A – Infra red colored point cloud; B – Digital Terrain Model; C – Crowns Height Model; D – Cross section of ALS point cloud with detected crowns.

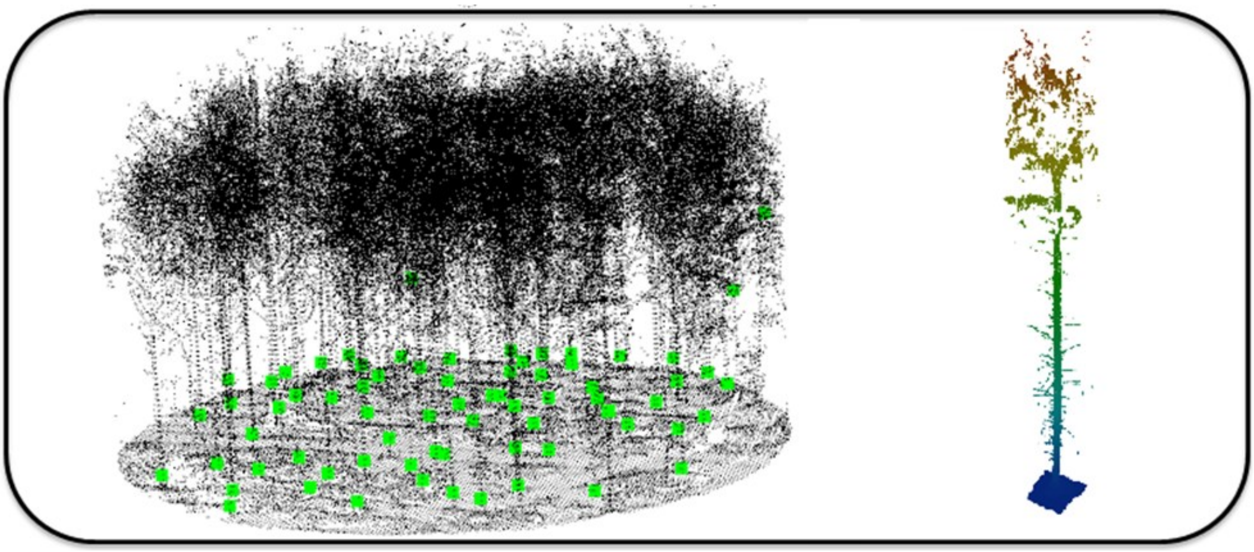

Figure 2 – Point cloud from Terrestrial Laser Scanner presenting scanned stand and extracted single tree, green dots presents automatically detected trees in the point cloud.

Example of ground RS measurement tool is terrestrial laser scanner (TLS; fig. 2). TLS provides the most detailed information about the forest and allows analysis at the leaf or branch levels.

To summarize, we can state that RS is capable of describing forest characteristics at any scale and geographical extent, and thus can be used for management of the forest from stand to global level.

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RSGISLib as an Automation Tool for Data Processing and Image Classification

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mari.estomata@giz.de

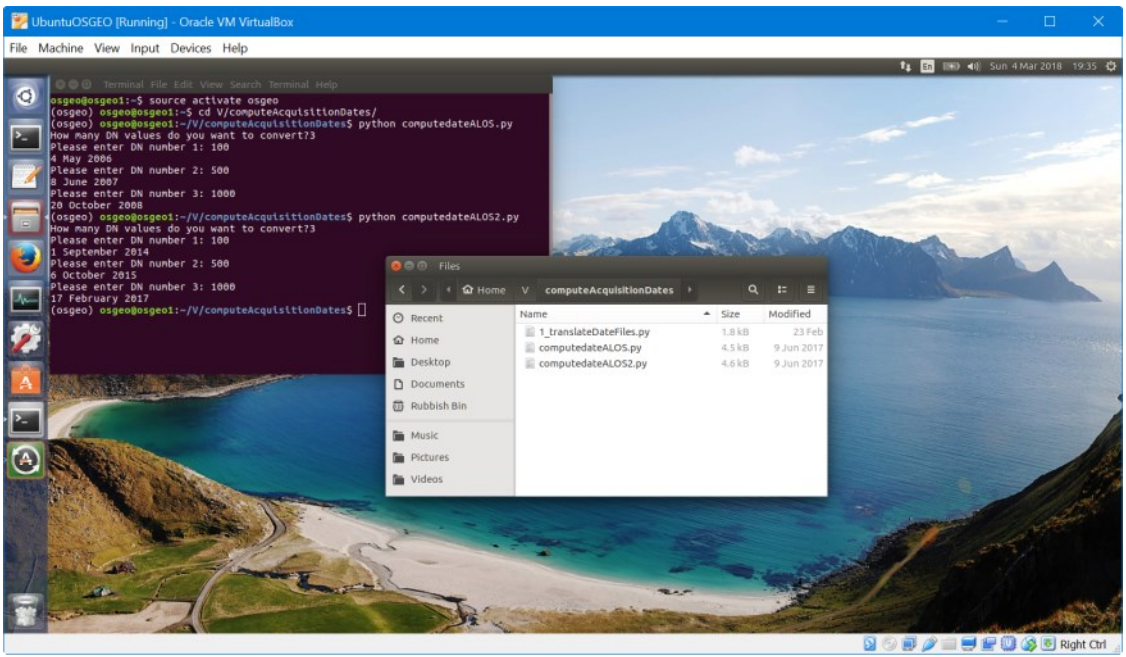
Pre-processing of any satellite data can be very tedious, depending on the processes that the data has to go through. For radar satellite images, it usually begins with speckle filtering to remove the salt and pepper effect that naturally occurs in radar images. The next typical procedure after speckle filtering is the calculation of radar cross-section values. For ALOS PALSAR data, other additional ratios, such as the HH/HV, are utilized to extract more information from the radar data. Therefore, this HH/HV ratio and other ratios needed have to be calculated. Sometimes, the generation of the covariance of specific bands can be included to further improve image analysis and classification. Once produced, all bands and ratios have to be stacked into one file, for additional registration steps and/or for image classification. To make sure that only useful radar data are being utilized during image analysis and image classification, the conversion of the radar effects mask into a binary mask must be done and have to be applied on the stacked bands and ratios. To do all these steps is not only time consuming but is very tedious. The repetitiveness of the steps is likely to lead to possible errors/blunder, especially if manually implemented.

In order to veer away from manual pre-processing and to maximize processing time, Python scripts utilizing the Remote Sensing and GIS Software Library (RSGISLib) can be used instead. This library is a free collection of tools used to process remote sensing and GIS datasets. From the basic band math commands of the commercial software ENVI, to the zonal statistics tools of ArcGIS, and even to the more sophisticated image segmentation capabilities of eCognition, RSGISLib has the tools to do all these processes.

As the Library is freely available to any user, and many ready-to-use scripts are available online and through some RSGISLib tutorials and training manuals, users with even basic Python knowledge can utilize the scripts and the tools for data processing, image analysis and classification. Users can also opt to improve their Python programming skills to better maximize the capabilities of the library and to even make their own scripts to automate any steps that they would like to avoid doing manually, such as calculating the acquisition date of a radar image based on its digital number (DN).

The RSGISLib is very flexible that it is also able to utilize the machine learning library for Python called "scikit-learn". Through this library, all sorts of classification, regression, and clustering algorithms, some of which used to be available only in ENVI, can be used to analyze satellite data. Some of the algorithms that are available are support vector machines, k-means, decision trees, and random forests. The last algorithm, which has been mentioned in many papers, is said to perform really well in terms of classification especially forest cover. Scikit-learn, through integration with RSGISLib, has an improved version of the random forest algorithm called "Extra Trees Classifier."

Through all these Python libraries, data pre-processing, image analysis, and image classification can all be done within one software; and through a number of Python scripts coupled with good quality training samples, all these processes could be done within a few minutes. This implies that processing one satellite image would not have to take days and automating the processes through Python scripts would actually enable users to process more images at shorter times.



The author utilizes a Dell laptop with core i7 processor (Intel Core i7-7500U), 8.00 GB RAM, and a Windows 64-bit operating system. All the scripts are run in a VirtualBox at 5GB RAM and 2 processors, and a final classification result can be obtained from a newly downloaded ALOS PALSAR data within two hours. It used to take the author two hours, in ENVI, to manually pre-process and prepare the radar data for registration then classification. Pre-processing now only takes 5-10 minutes through RSGISLib. The software is available for download at: https://www.rsgislib.org/

What Students Have to Say about the ISPRS Summer School: Dehradun 2017

By Charles Jjuuko and Angelica Monzon

Following the Asian Conference on Remote Sensing held in India in October 2017, the Indian Institute of Remote Sensing held an ISPRS Summer School entitled Geo-processing Tools and Technologies in Citizen Science in Dehradun, Uttarakhand, India.

The ISPRS-SC Board Members Charles Jjuuko and Angelica Monzon had the privilege to meet and chat with some of the participants of the Summer School and here's what they had to say:

Entrance to the Indian Institute of Remote Sensing in Dehradun

"There are a lot of things that we can get out of the Summer school like the development of the ----applications, the collaboration and sharing the knowledge which is very useful for me to develop a career in GIS and Remote Sensing sector… I think this (summer school) is good for all of us, if we are studying, if we are doing professional work or consultancy, we need to collect all the knowledge from the different countries, what they are doing, and then we can input our own (experience) and collaborate…" - Nalaka Kodippili, Sri Lanka

"The highlight of the summer school was meeting different students, professors and different people from a lot of countries who knows a lot who are actually doing it (Remote Sensing) …"

"…We focused mainly on learning citizen science tools and geoprocessing tools… learning geoprocessing tools is awesome!"

"I'd like to invite all those students who to come and attend the summer school. Have a great experience, meet people, network and have fun!"

(L-R) Milan Subedi, Abinash Subedi, Saurav Guatam, Sandip Dhungana, Kabiraj Rokaya and Smaran Dahal from Nepal

"Summer school has given me a new technology on how to use mobile apps on collecting data that I can use to give very wonderful output and visualisation for Remote Sensing… I advise people, especially from the Remote Sensing background, to join this wonderful network and organisation …"

- Mohammed Sultan, Yemen

"As our first summer school, we want to give thanks to the ISPRS Student Consortium for giving such a wonderful environment with different people from different countries…"

"Dehradun is a very nice place as a campus, thank you to IIRS and the Student Consortium for organising a wonderful summer school. It has been my third time to talk with the people from different parts of the country and the summer school has been a very very good platform to interact with them and know the different aspects and areas of research in Remote Sensing…"

"The most important thing that I learned is citizen science and geoprocessing tools – and this is something that I never learned in college – like crowd sourcing, these are the things that I'd like to take and share with all my classmates. To educate them also. These are all helpful."

(L-R): Ashish Kingsly, Himanchal Bhardwaj, Juhi Priyanka Horo, Swetha Sigilipalli, Tripti Jayal and Vivek Priyadarshi from India

We'd like to thank all the participants who spared the time to give us these amazing words of appreciation and feedbacks. We look forward to seeing you again in future ISPRS Summer Schools! For more details on upcoming Summer School programs and activities, please visit *http://sc.isprs.org/home.html* !

IMPORTANT | FOCUSED | OUTSTANDING | VALUABLE

Questions prepared by Angelica Kristina Monzon and Sheryl Rose Reyes

Hooman Latifi

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You have undertaken various research using Remote Sensing for forestry applications. Can you briefly share a particular work or project that you personally enjoyed working on? (Please share the project's goal; RS techniques you used in the study; it's significance in the field of forestry, and; the reason you enjoyed working on this project.)

I have been working in the field of forestry applications of remote sensing since 2003. since then, I have been involved in numerous small-, mid- and large-scale projects on various national and international levels. Although it is a real challenge pointing out one and only one study or project that I particularly enjoyed, I do have one. It was a collaboration, a "gentlemen's club" if you may, that we established together with a handful of other, partially internationally renowned scientists and practitioners working all over central Europe. The project is an initiative called "Data Pool for Bohemian Forest Ecosystem." It aims to maximize the collaboration amongst the partner institutions on sharing integrated data acquisition, data analysis and methods on various forestry applications, including state-of-the-art LiDAR and hyperspectral based forest inventory, characterization and monitoring of bark beetle affected stands and intensive research works on remote sensing of Essential Biodiversity Variables (EBVs). I had the privilege to be amongst the pioneer group of those establishing the project and contributed to a number of research and educational activities within the network. I was garnered by the fruitful collaborations, professional interactions with the core working group and beyond. For more information, please visit this website: https://www.researchgate.net/project/Data-Pool-Initiative-for-the-Bohemian-Forest-Ecosystem

What are some challenges that you encounter in doing Remote Sensing research for forestry applications?

Most particular challenge faced by, I assume, not only me, is to conceptualize, establish and maintain sustainable networks on data acquisition, especially when it comes to the provision of very high resolution airborne data. Here, I particularly stress the word "sustainability", which can be simply translated to efforts to maintain long-term collaborative networks based on transparency, bi-, and mostly, multi-lateral understandings and exhaustive discussions to find and materialize mutual interests on the whole analytical chain, starting from data provision down to data analysis and dissemination and communication of the obtained results to the remote sensing, forestry and ecology communities.

What is your experience in using various datasets (e.g. optical data, radar data, laser scanning data, etc.) for forestry mapping? What is your most preferred dataset for forestry mapping among these? Why?

I think you would also agree that this a pretty easy, though tricky, question to ask, whose answer is simply more than difficult. However, the short answer would be the following: I have worked, and am working, with a variety of datasets including satellite based (optical multispectral data in various temporal and spatial resolutions) and particularly airborne (LiDAR and optical multispectral) data. Out of all research works to which I contributed, I was mostly astonished by the ability of airborne LiDAR products for the analysis of forest structural attributes. With my passion for small-scale forest inventory, there is nothing more beautiful than a clean, dense LiDAR dataset acquired over a mixed forest landscape.

Especially in this generation when we have the Sustainable Development Goals, how do you communicate the results of your research to decision-makers, policy makers and other beneficiaries of your study? What are the challenges and how did you address it?

The most serious challenge towards disseminating and communicating my research works, in particular in the fields related to forest structural analysis, is to build a bridge between what I communicate (mostly scientific research and review works published in peer reviewed journals) and what most forest practitioners read and are convinced by (practical papers and technical reports). In my role as an academician, I always put my effort on filling this gap. That is why I always, and will continuously in the future, maintain my communications with practitioners via strengthening ties with my colleagues at forest research institutes, who are indeed the connecting parts of the chain from science to practice.

What's your encouragement for students and young researchers wanting pursue research on Remote Sensing for forestry applications? Which areas of forestry related research do you see a need for more people to look into?

My first and most crucial suggestion to young remote sensing and forestry researchers is to keep their eyes wide open for the nature around us: go to the nature, try to (simply visually) understand the ecosystem dynamics (e.g. growth, species concurrence and replacements, and occurrence and dynamics of sub canopy elements) by observing them right behind the door. This will definitely help you define and conceptualize more pragmatic, realistic and practice-oriented research questions. My second, and for now, last suggestion would be to invite you to get more familiar with issues like field sampling designs for remote sensing methods and implementing them in the field. No in-depth knowledge on field campaigns would also result to the lacking of in-depth understanding of the underlying remote sensing data and what one could extract from them.

Professor Hooman Latifi is an Assistant Professor at the Dept of Photogrammetry and Remote Sensing of the K. N. Toosi University of Technology and an Associate Professor at the Dept. of Remote Sensing of the University of Würzburg. He is also the representative of the working group "Ecology and Environment" of the German region of the International Biometric Society (IBS-DR). In addition to his research activities, he has been involved in numerous internal and external teaching events on LiDAR Remote Sensing, open-source image processing software and RS-assisted of forest and environmental management. *(http://remote-sensing.eu/author/hooman-latifi/)*

ISPRS MIDTERM SYMPOSIA 2018

I	II	III	IV	V
ISPRS TC I Sensor Systems	ISPRS TC II Photogrammetry	ISPRS TC III Remote Sensing	ISPRS TC IV Spatial Information Science	ISPRS TC V Education and Outreach
"Innovative Sensing - From Sensors to Methods and Applications"	*"Towards Photogrammetry 2020"*	*"Developments, Technologies and Applications in Remote Sensing"*	*"3D Spatial Information Science - The Engine of Change"*	*"Geospatial technology – Pixel to People"*
PLACE: Karlsruhe, Germany	Riva del Garda, Italy	Beijing, China	Delft, The Netherlands	Dehradun, India
TERM: October 9-12	June 4-7	May 7-10	October 1-5	November 20-23
APPLICATION DEADINE: July 31, 2018	March 19, 2018	March 19, 2018	July 31, 2018	Sept 30, 2018

ISPRS SC AND TC III SUMMER SCHOOL 2018

3-6 May 2018, Beijing, China

Background

The summer school is an international event which aims to provide an opportunity for students and young researchers to participate in a series of lectures and practical sessions at a minimum cost and interact in a more comfortable environment through social events and recreational tours, as well as experience the culture of the host country. It will also introduce ISPRS activities and potential opportunities to the participants and widen their professional networks.

The summer school is jointly-organized by the ISPRS TC III and ISPRS Student Consortium (SC). It is sponsored and hosted by Beijing University of Civil Engineering and Architecture (BUCEA).

It will be held from May 3 to 6, 2018, just before the ISPRS TC III Midterm Symposium on **"Developments, Technologies and Applications in Remote Sensing"**. It's very convenient for the participants of the Summer School to attend the following ISPRS TC III midterm symposium.

Themes and Programme

The lectures will mainly focus on innovative practical and methodological skills to survey and map complex urban environments using earth observations and terrestrial remote sensing techniques, including:

- SAR-enhanced Disaster Risk Monitoring, Mapping and Assessment
- Remote Sensing for Forest Ecosystem Monitoring
- Frontier of Lidar for Forest Environment
- Remote Sensing and Public Health
- Urban sensors and sensing for Urban and infrastructure mapping
- Image data fusion and processing for high-precision mapping
- Construction and Application of Chinese SDI
- Chinese Beidou and its urban GNSS applications
- Policy to Support the Foreign Students Studying in Beijing

The University and the Venue

JIANBEN HALL

Lecture Room in the Library Building

Beijing University of Civil Engineering and Architecture, located in the Capital City of China, was established in 1936, has 15 colleges for undergraduate and graduate degree programs. Currently more than 7500 full-time students study in 2 campuses.

The Summer School will take place in the Daxing campus, which covers 501,000 square meters, and with very good facilities and beautiful environment.

ZHEN GARDEN

Campus Cafeteria

For more information, please refer to the ISPRS TC III symposium website at *http://www.isprs-tc3.tianditu.com/*

PhD & Post-doctoral positions and scholarships

1. PostDoc Position in Remote Sensing of Material Stocks, Humboldt-Universität zu Berlin
Deadline: 18 April 2018
https://euraxess.ec.europa.eu/jobs/292908

2. Postdoctoral Research Assistant in Satellite Remote Sensing of the Earthquake Cycle, Department of Earth Sciences, University of Oxford
Deadline: 18 May 2018
https://www.recruit.ox.ac.uk/pls/hrisliverecruit/erq_jobspec_version_4.display_form?p_company=10&p_internal_external=E&p_display_in_irish=N&p_process_type=&p_applicant_no=&p_form_profile_detail=&p_display_apply_ind=Y&p_refresh_search=Y&p_recruitment_id=134151

3. PhD position in the Geomatics Division – Remote Sensing Department, Centre Tecnològic de Telecomunicacions de Catalunya
Deadline: 30 April 2018
http://www.cttc.es/career/call220181/

4. Two doctoral students and one post-doctoral positions for machine learning, sparse signal processing and beyond 5G wireless systems (fully funded, 4 years positions), University of Oulu
Deadline: 30 April 2018
https://euraxess.ec.europa.eu/jobs/285457

5. PhD. Influence of fine sediments on the morphodynamics of an alternate gravel bar system in a harnessed mountain river, IRSTEA
Deadline: 18 May 2018
http://www.irstea.fr/en/join-us/phd/phd-campaign

6. PhD Position, Leverage Multi-Source Remote Sensing data via machine learning to improve Crop Monitoring Systems, Irstea
Deadline: 18 May 2018
http://www.irstea.fr/en/join-us/phd/phd-campaign

7. PhD Position in Earth Observation and Remote Sensing on Exploration of bistatic Synthetic Aperture Radar Signals for Spaceborne Applications, Institute of Environmental Engineering, Swiss Federal Institute of Technology - ETH Zurich
Deadline: Unspecified
https://academicpositions.eu/ad/eth-zurich/2018/phd-position-in-earth-observation-and-remote-sensing-on-exploration-of-bistatic-synthetic-aperture-radar-signals-for-spaceborne-applications/108781

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Mabuhay!

Please visit our SC web page **sc.isprs.org** where you will find more information about Student Consortium, our previous Newsletter issues, SC activities, photo galleries from previous Summer Schools, interesting links etc.