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**ALUMNI MAGAZINE** FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION **UNIVERSITY OF TWENTE** 

# ITC NEWS



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With music, traditional clothing, and welcoming words, 125 students, coming from 32 different nationalities, started their academic year at the Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente.

## NTRODUCTION

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ITC NEWS is published quarterly by ITC, Enschede, the Netherlands.

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September saw the official opening of the ITC Academic Year, which true to a new tradition was held in the Muziekcentrum in the centre of Enschede. Also true to tradition, you will find a report of the occasion in this, the third 2017 issue of ITC News (see page 3). At the ceremony an especially warm welcome was extended to the 125 new students who had travelled from all the corners of the Earth, leaving homes, work and family, to study at ITC. Many of our readers will be able to identify with these students as they listened to the speakers – with feelings of expectation, excitement, enthusiasm ... perhaps mixed with a goodly dose of trepidation.

According to Prof Veldkamp "ITC wants to contribute through its collaborative educational and research capacity development activities to advance the Global Sustainable Goal agenda." With the goal to improve life of people all around the world, ITC works on developing resilient and robust solutions to monitor progress. The new students now know what ITC expects from them and are all anxious to start on the 2017 core modules.

When it comes to the quest for new knowledge and solutions, they are in good company. Others have trodden this path before them and turning to page 7 you will find the PhD talks, our special feature this issue, where you can read several stories of the ITC PhD community. The phD community have united themselves in pITCom and for the first time ever they organized an event last October. During the pITCom Science Day PhDs got the opportunity to present their research with a poster, and discussed the challenges they faced during their PhD and thereafter.

So the new Academic Year officially opened on 28 September. But what of the preceding weeks? Lazy hazy days of summer? Well, no, not quite ... in fact not at all as far as ITC was concerned. An LANDAC conference in Utrecht (21), an alumni meet in Dar es Salaam (24), the world's first GEO Human Planet Forum (20) and 3D Geodata in Slovenia are among the topics to be found in this issue. So plenty to choose from, plenty to read; perhaps it's time to begin ...

Virtually yours,

Jorien Terlouw Editor

#### IN MEMORIAM

While composing this issue of the ITC News Magazine we were informed that Emeritus Professor Isaak (les) Zonneveld passed away at the age of 93 on 18 December 2017. Prof Zonneveld was an ITC alumnus from the soil survey course in 1955 and became ITC staff on 1 October 1966. On 1 January 1990 he retired as Professor of Vegetation Survey of the Department of Natural Resources. Em. Prof Zonneveld was present during the Opening Academic Programme in September 2017 as you can see on the picture on Page 4 *(front row, second from left)*. On behalf of the ITC community we send our sincere condolences to his family and friends.



## Opening of the Academic Programme 2017-2018

**Communication Department** 

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**With** music, traditional clothing, and welcoming words, 125 students, coming from 32 different nationalities, started their academic year at the Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente.

In the Muziekcentrum in the city center of Enschede, Dean Tom Veldkamp formally opened the Academic programme yesterday (28 September). The Schermerhorn lecture was provided by Gerard van der Steenhoven, director general at the Royal Netherlands Meteorological Institute KNMI. The ambassadors of Ghana and Malawi attended the ceremony, as well as a representative of the embassy of Bangladesh.

#### Sustainable future for the world

By referring to the sustainable development goals of the United Nations, Dean Tom Veldkamp opened the new academic year with the vision of the ITC. Veldkamp: "ITC wants to contribute through its collaborative educational and research capacity development activities to advance the Global Sustainable Goal agenda." With the goal to improve life of people all around the world, ITC works on developing resilient and robust solutions to monitor progress.

The president of the Student Association Board, Appau William Miller, welcomed his fellow students at the faculty, that "has been home" for so many scientists by now and shared his confidence that they will find in ITC "their new family of friends".

#### Schermerhorn Lecture

Last resort is a changing climate" is the title of this year's Schermerhorn Lecture, which was provided by Gerard van der Steenhoven, director general at the Royal Netherlands Meteorological Institute KNMI. He took the opportunity to give a lecture on the importance of early-warning systems. The rapidly changing climate not only leads to warming up of the earth and consequences as sea level rise, but will also trigger extreme weather conditions that may lead to impactful disasters. On page 5 a full article the schermerhorn lecture.



#### **ITC PhD Publication Award**

The annual ITC PhD Publication Award was received by Nina Amiri for her paper "Estimation of regeneration coverage in a temperate forest by 3D segmentation using airborne laser scanning data". Nina is jointly enrolled at the Munich University of Applied Sciences and the ITC Faculty of the University of Twente. In the study, a comparison between ground plot data, with three airborne LiDAR images collected between 2009 and 2012, showed that the actual and estimated area of regeneration, agreed with a 70% accuracy. Further, as the amount of canopy cover increased the accuracy mapping forest regeneration decreased. In addition, regenerating forests were more accurately mapped under conifer over-story than deciduous over-story.

(See page 10 for a more elaborate article about her research.)



Prof Tom Veldkamp





Prof dr Gerard van der Steenhoven



Appan William Miller, President SAB

## Schermerhorn Lecture by Gerard van der Steenhoven "Last Resort in a Changing Climate"

#### Communication department

news-magazine@utwente.nl

**The** perfect weather forecast: meteorologists all over the world are ready to take up the challenge to improve the quality of their predictions: earlier, more accurate, and more localized. It is not just a matter of correctly forecasting whether you will need to take your jacket on an afternoon walk. As climate is changing, accurate weather information is crucial to prevent serious damage caused by extreme weather conditions. Gerard van der Steenhoven, director general at the Royal Netherlands Meteorological Institute (KNMI), delivered this year's Schermerhorn Lecture at the Opening of the Academic Programme, underlining the importance of Early Warning Systems.

#### Increasing risks

Recent strong hurricanes have had a major impact in and around the Caribbean, sweeping away complete cities and villages, costing the lives of many people, and leaving thousands of people homeless. It is hard to predict with great certainty to what extent these severe weather conditions will increasingly occur.

With the rising sea level and oceans warming up, the risks are substantially increasing. "The melting of the north pole cap might be the most visible effect of climate change resulting from human activity," says Van der Steenhoven, "But oceans are heating up as well. Slowly, but it does happen. The seas expand as they are heating up, with sea levels rising 20 centimeters higher than 100 years ago. The growth rate is increasing as well. We thought we knew exactly how the ice shelves on the Antarctic would behave. Only recently, we found a more rapid slide that may lead to a substantial sea level rise. This might be disastrous for many islands in the pacific."

#### Preventing damage

Gerard van der Steenhoven: "The challenge for us is to prevent damage and problems that may arise as a result from the changing weather conditions. The probability that these hazards will occur simultaneously is increasing. Extreme weather might be one of the most dangerous aspects of climate change." Not only hurricanes, but also more often occurring weather conditions such as extreme rains, storms, and droughts are bound to happen in the next decades. "It is even claimed that there is a relation between armed conflicts and climate change," says Van der Steenhoven. "Policy measures have been taken to reduce CO2, but we are not reducing it fast enough to adequately adapt. That is where the importance of early warning systems comes in."

#### Getting the numbers right

The changing climate significantly increases the need for accurate information. The total destruction that recent hurricanes have brought is still far from clear, but early estimates put the total at



Prof dr Gerard van der Steenhoven

billions of euros. It raises the question: what could we have done to minimize the damage? And at what cost? How does investing in an early warning system weigh up to the damage it is preventing?

From that perspective, getting the numbers right may not be an issue. "We do not only see great destruction resulting from, for example, drought in India or forest fires in Indonesia," Van der Steenhoven states. "The Netherlands are affected as well. Last year, a heavy storm caused ice balls with staggering damages: it costs five million euros, as massive damage was done to the greenhouses with their thin glass roofs. So, in developed countries like the Netherlands as well, early warning systems are well worth the investment."

#### Taking up the challenge

Van der Steenhoven: "We are facing an enormous scientific and technological challenge. But there is also good news: as the KNMI, we are battling for funds to establish an Early Warning Center in the Netherlands. Improvements can be made with the use of more geodata, better computers, and better algorithms. If you are able to predict heatwaves two weeks in advance, you can ask people to take adequate measurements to reduce the impact."

Being successful in establishing Early Warning Centers around the globe brings two challenges. "First of all, we need new geoinformation experts. We need people like you everywhere," Van der Steenhoven says to the crowd. "Furthermore, we need to make sure that we use all the data that we can acquire. Through crowdsourcing, using data from privately owned weather stations, improving the use of data from aircrafts, and the internet of

things. These all provide valuable data that we can use to improve the quality of our predictions and enable us to not only forecast an average, but also, and more important, by making predictions for individual spots around the world, to get a better understanding of the impact."



'We are facing an enormous scientific and technological challenge'



Prof dr Gerard van der Steenhoven in discussion with Emeritus Prof Verstappen



**The** ITC Research programme defines the scientific scope of knowledge development, which is underpinned by the scientific expertise of ITC and tailored to the international research agenda. It addresses problems related to the management of space and resources and problems related to the provision of relevant, timely and reliable geospatial information through the execution of demand-driven research projects in its six research themes, led by ITC professors and supported by expert staff members. In this Special feature several Phd candidates showcase their research and you can read about the first

In this Special feature several Phd candidates showcase their research and you can read about the first pITCom Science day organized by the ITC Phd community.

## pITCom Science Day

Harm-Jan Benninga

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**The PhD ITC** Community, pITCom, represents the PhD community of ITC. It was officially established on 1 January 2017. pITCom aims to foster and extend scientific and academic support between PhDs, stimulate and initiate research related activities, assist PhDs who newly joined ITC, and support social cohesion among the PhDs.

On 27 October 2017, pITCom organized the Science Day. This event gave PhDs the opportunity to share their research and to discuss current trends in research and data management. In addition, the attendees could get some insights into career expectations after a PhD and learned about how to write an awardwinning paper.

#### Presentations

The programme opened with a presentation by Marga Koelen about the services that LISA and the ITC Library provide to support researchers. Both open access publishing and data management are becoming increasingly important, which is reflected in research funders' policies and requirements. The discussions during and after the presentation demonstrate that there is much more to say about these intriguing subjects.

Elnaz Neinavaz (postdoc at ITC) and Sandro Meucci (R&D scientist at Micronit) told their stories about finding a place as employees in academia and industry, respectively. The experiences and skills obtained during her PhD help Elnaz a lot in her current work as a postdoc, for example regarding time management. Sandro likes to work in industry, because this is closer to the final applica-



tion of his research interests. He explained that it is important to make a well-considered choice at a certain moment, as you cannot keep switching between academia and industry. The ITC publication award winner of 2016, Xi Zhu, presented his paper with the title *"3D leaf water content mapping using terrestrial laser scanner backscatter intensity with radiometric correction"*. Innovative research and a good presentation helped Xi to win the award.

#### Poster sessions

During two poster sessions, eleven PhDs shared their research results with fellow PhDs, staff and students. It was interesting to see the variety of research topics addressed by PhDs and to exchange viewpoints across different fields of expertise.

A jury assessed the posters anonymously and selected the best poster. The jury members were Tom Rientjes (WRS department), Valia Drakou (GIP department), Festus Ihwagi (PhD at the NRS department) and Adish Khezri (PhD at the PGM department). The main criteria were the poster's design, and how well the presenters were able to explain their work in simple words and in a fairly short time to the diverse audience.

The jury granted the best poster award to Matthew Oliver Dimal (PhD at the ESA department) for his poster with Professor Victor Jetten, entitled "Exploring Stated Preference Valuation Techniques in Understanding Soil Economic Value". The poster presented their analysis on soil's stated value, for Norzagaray, Bulacan, in the Philippines. The research estimates the farmers' willingness-to-pay (WTP) for soil conservation, using the contingent valuation method. This study is part of a three-year collaborative research project on the economic valuation of soil, utilizing various non-market based approaches. Matthew explained the design of his poster: "The need for economic valuation of the environment, especially for soil resources, may not be directly evident. On the poster, we made sure that we not only highlighted the significant findings of the research, but also included a strong argumentation and background on the importance of this field."

#### **Closing words**

The board of pITCom, as organizers of the pITCom Science Day, regarded the event not only as a successful afternoon which highlighted the scientific work done by ITC PhDs, but also as an opportunity to meet PhDs across research departments and get

insights into other aspects of research. In the words of Professor Alfred Stein: "I am convinced that this initiative is one of the most important ones in the recent years: it shows the creativity and commitment of young, international people to science. They can display and discuss, interact and learn." The ambition is to make the pITCom Science Day an annual event.



Interesting discussions during the poster sessions



Matthew Dimal's award-winning poster

#### **PHOTO CONTEST**

All participants were invited to submit a photo of their nicest or most terrible moment in the field, in the lab, at a conference, or behind their desk. During the event, 40 attendees took the opportunity to vote for their favourite photo. The photo submitted by Festus Ihwagi received the most votes. The photo, taken by Nicole Dangoor, shows Festus monitoring elephants in Samburu National Reserve in Kenya. Festus is a wildlife biologist at Save the Elephants, a charitable organization that conducts elephant research in Africa. Festus' PhD research is about mapping the poaching risk and the behavioural adaptation of the elephants in northern Kenya.



The award-winning photo, Festus Ihwagi while monitoring elephants in Samburu National Reserve, Kenya. Photo: Nicole Dangoo

## Using Laser Scanning Data for Forestry Applications

Nina Amiri

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I was born in Iran, where I obtained a BSc degree in Geomatics engineering. Afterwards, I received the Erasmus Mundus scholarship for the MSc Programme of Geo-Information Science and Earth Observation for Environmental Modelling and Management (GEM) in order to obtain a double degree from Lund University (Sweden) and Faculty ITC (University of Twente, the Netherlands). At the moment, I am doing my PhD research as a collaboration between ITC and the department of Geoinformatics, Munich University of Applied Sciences, Munich, Germany.

In my PhD research, I am working on developing methods and algorithms using laser scanning data for forestry applications. I started with an opportunity to explore full waveform airborne laser scanning data acquired from the Bavarian Forest National Park (Germany) in 2012. This forest is one of the most vulnerable natural forests in Germany due to the effects of natural hazards caused by insect outbreaks. Especially, the European bark beetle is among the most destructive factors affecting forest health in the various geographical regions of the park. Accurate and updated knowledge about the spatial distribution of forest structures, such as trees with different ages, is critical for forest managers to effectively plan appropriate countermeasures and predict future forest dynamics. My initial focus was on tiny, small trees in the forest, defined as "regeneration" in ecologic scientific literature. Regeneration plays an important role in forest biodiversity. However, these small trees are often difficult to find and count by way of manual field work. Therefore, it is necessary to develop automatic methods using remote sensing techniques and products to estimate regeneration coverage in forest areas.

Airborne laser scanning in the forestry sector has developed significantly over the last 20 years. The full waveform laser systems have the advantage of being able to completely record the reflected laser beam. This means that the canopy and floor of the forest, as well as the intermediate forest layer, are captured in detail. Therefore, in order to be able to use the advantages of this technique, the existing methods of data analysis at 3D level must be revised and expanded. The core of our method for regeneration coverage estimation is a segmentation of 3D point clouds into segments associated with regeneration trees. Our initial findings in this work showed that we can correctly detect up to 70% of the regeneration coverage using airborne laser scanning data. It is worth mentioning that the regeneration mainly exists in areas where taller trees have a lower density. The results would help the forest management department of the Bavarian Forest National Park to manage the regeneration as a forest resource in a sustainable manner. Figure 1 shows one of the sample plots with regeneration coverage located in the area of our experiment. I feel excited about continuing to work on my research plan, since it is really interesting to see how computer science techniques are used to tackle the technical issues in remote sensing and are useful afterwards in practical cases of forestry.

Recently, I presented an innovative study on single tree stem detection by 3D shape descriptors using high-density laser scanning data in the Laser Scanning workshop (Geospatial week 2017) in Wuhan, China. In this study, we propose a three-tier method which works on the point, segment, and object levels. The main goal is to detect linear structures in the 3D point clouds which are likely to represent single tree stems. The method proceeds as follows: first, the likelihood of points belonging to a



Figure1 Sample plot with regeration coverage

tree stem is estimated. Second, the segments containing points which are most likely to represent tree stems are detected in the 3D point clouds. Finally, the segments are merged through hierarchical clustering to produce single tree stems. As a result, one of the most innovative solutions was a method based on laser scanning technology that enables access to the stems of single trees. Such a method would form the basis for effective management in both present and future planning for the mixed forest areas. Moreover, during the research, by incorporating the single tree stem positions into a segmentation algorithm, it was predicted that this model can improve the reliability of single tree detection and delineation. This model can be used as a proper method for counting the presence/absence of single trees at forest sites in the future.





schede, The Netherlands, 28 September 2017



Prof.Mr. J.W.J. Besemer Chair ITC Foundation



To read the full article of Nina Amiri please see: https://webapps.itc.utwente.nl/library/2016/isi/amiri\_est.pdf

## Indoor 3D Model Reconstruction from Laser Point Clouds to Support Disaster Management in Public Buildings

#### Shayan Nikoohemat

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**My name is** Shayan Nikoohemat, from Iran. I am in the third year of my PhD in Faculty ITC. I am passionate about 3D space, smart buildings and how we can improve our experience during our everyday life inside the buildings.

My background is in Geomatics and land surveying. During my career and study always I was working with spatial data, geo-information, maps, coordinate systems and how to make them better. I hold a bachelor degree in Geomatics in Tehran, Iran and an MSc in Cartography from an Erasmus program among three universities: Technical University of Munich, Technical University of Vienna and Technical University of Dresden (2011-2014). My MSc thesis was about "Smart Campus Map and Conceptual Modeling" which I carried out and defended in TUM. After my study I worked in Munich for about a year and half in a startup company (NavVis GmbH) which was emerged from TUM. The expertise of the company was in indoor mapping with mobile laser scanners and indoor navigation. It was fun working

in a startup company because we were all young engineers and researchers. However, I had more thirst for learning new things and be creative, so I decided to continue my education in my favorite topic.

The research project that I am involved is about disaster management in large building. My research is part of the project so called SIMs3D (Smart Indoor 3D Models). In this project we are working with fire brigade of Netherlands (Brandweer Nederland) and TUDelft. Of course there are some other academic and industry partners involved. Public buildings such as hospitals, schools, concert halls and many more are important cases for fire fighters during the disaster management. Current problem is insufficient and sporadic CAD maps, 3D models and building information models (BIM) for the buildings. If such maps exist they are not well maintained during the building lifetime. Fire fighters are not provided with sufficient information when they enter a building.

Companies in SIMs3D project collect 3D information with Mobile Laser Scanner (MLS) devices from inside the buildings. Our responsibility is to reconstruct a precise 3D model from the data. The data collected with the devices is represented in the form of point clouds, millions of points with coordinates and sometimes RGB color. This data is noisy and cluttered because of the presence of people and furniture in the building. It is challenging to extract correct geometry and semantic from this data, put them together (because there is a lot of gap) and finally reconstruct



MSc Cartography, intake 2011, 14 students from 10 different nationalities

a 3D model. This kind of 3D data (point clouds and RGB-Depth) has a variety of applications and exploring them is the research problem in many fields such as computer vision, robotics, computational geometry and so forth. The novelty of our work in presented paper is that we exploit the trajectory of mobile laser scanners for scene understanding and interpretation of indoor environment. This involves detecting permanent structure such as walls, floors, ceilings, doors and windows. Detecting openings is specifically important for fire fighters during evacuation. The team in TUDelft is responsible to design precise and flexible navigation graphs

considering obstacles in our 3D model. In the image you can see from the noisy point clouds, we reconstruct the walls and openings (orange and cyan color) and with post processing we remove incorrect walls (black ovals in the second image). In the last right image you can see space partitions that is important for establishing the topology relation of indoor spaces. In addition to the permanent structure, we specify the navigable space and obstacles for navigation planning.

The SIMs3D project addresses the lack of up-to-date 3D indoor models for many large public building. This is a problem for many stakeholders, but in particular for organizations that deal with the safety management of public buildings, fire brigade and safety regions. The project aims at bridging research on 3D indoor reconstruction from point clouds, 3D indoor models (geometry, semantics and topology) and 3D indoor navigation for users with various profiles and tasks. For more information about this project: https://doi.org/10.1016/j.jag.2016.06.022 Shayan Nikoohemat

I am passionate about 3D space, smart buildings and how we can improve our experience during our everyday life inside the buildings



Figure 1: a) Input data disturbed by clutter (e.g. furniture), occlusions, reflections; b) detected walls (orange), openings (cyan), incorrect walls (dotted black) and openings (solid black); result after automatic cleaning

> If you like to know more about indoor 3D modeling and indoor navigation feel free to contact me s.nikoohemat@utwente.nl

## Improving the Accuracy of Individual Tree Detection

Anahita Khosravipour

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Forests are the most developed and widely distributed vegetation ecosystem on earth, covering approximately 30% (3869 million hectares) of the world's land area.

Forests not only make significant contributions to the economy, but they also contribute to the mitigation of global warming by way of converting dioxide into oxygen. For example, between 2005 and 2010, about 870 million tonnes of CO2 were annually removed from the atmosphere through photosynthesis and forest biomass growth in European countries (State of Europe's forests, 2011). In order to estimate carbon sequestration, finding trees and accurately measuring the parameters of the trees are needed. In other words: for saving our earth we need to keep an account of trees!

The process of traditional field-based forest inventory is time-consuming and labourintensive. Remote sensing systems have opened new horizons in forest inventory, as Alps, the Bavarian National park in Gerthey are cost-effective and can be easily applied in remote areas with limited access. Among the available remote sensing techniques, the airborne laser scanner system has rapidly gained popularity in forest inventory, due to its capability to capture information regarding the shape, size, and position of trees. However, the current methods are inaccurate and noisy.

The aim of my research is to develop a new algorithm for improving the accuracy of individual tree detection across multiple forest types using airborne laser scanner systems. The algorithm is free of noise, more accurate, and more efficient than existing methods for detecting trees. The algorithm systematically prevents noise formation during the process and ignores any laser information that would result in noise. Our algorithm is easy to use. It uses raw laser data and does not need any preprocessing before use. The algorithm is freely available.

For testing the algorithm, we used three different aircraft that flew on average 300 metres above ground level in the French many, and Robson Creek area in Australia, for capturing trees. The algorithm improves tree detection in all areas and offers the possibility to improve the accuracy of a variety of applications (e.g. ecological, hydrological, and meteorological) that require tree information on a local and regional scale.



A tree captured by a laser scanner system



A top view of a tree captured by a laser scanner and processed using a conventional method (left) and our algorithm (right). The noise (small dark squares) within the crown of the tree is obviously visible in the tree that was processed using the conventional method

## **Elephants Living in Fear of Poachers**

Festus Ihwagi

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**For thousands of** years, elephants have been depicted as the ultimate icon of strength and endurance. Sadly, their numbers are plummeting on an almost irreversible scale across the African continent. Without elephants, the talk of mitigating climate change is a mirage. All the proponents of climate change agree that increasing forest cover and reducing the loss of other forms of life is vital, and this is where the elephants come in.

Elephants open up closed forest canopies with their perceived "destructive" manner of feeding, so that other plant species are given room to grow. Adult elephants eat close to 200 kilogrammes of vegetation per day. They roam widely on a daily basis and migrate far across landscapes, defecating every few hours. In so doing, they disperse the seeds of plants they have eaten far and wide. The seeds of some plants only germinate after they have passed through the stomachs of animals, and the elephants promote regeneration of such plants. Indeed, due to their poor digestion, their dung itself is food for many other smaller animals. Elephants are thus the chief architects and engineers of nature in the animal kingdom, a reason to keep them alive.

Sadly, their numbers are dwindling fast: no more than 350,000 elephants remain in the African grasslands today, compared to 1.3 million in 1969. The most significant immediate threat to the elephants is the hunt for ivory. The demand for ivory ornaments has risen beyond sustainable levels. At present, the demand cannot be met even if all living elephants were offered for the market. While concerted efforts by governments, non-governmental organisations (NGOs) as well as individuals are being made to reduce the demand for ivory, at the University of Twente, one study is seeking to unravel how elephants are coping with the risk of poaching.

At ITC, PhD candidate Festus Ihwagi from Kenya studies the role of land use on poaching levels, and the behavioural adaptations of elephants to avoid the poachers. Using GPS collars that are worn by elephants round their necks like bolo ties, the researcher collects hourly positions of hundreds of elephants in many African countries. For an animal that weighs over 3 tonnes, the hourly positions are sufficient to determine their fine-scale behaviour. While keeping tabs on the tracking project, Festus doubles as the site officer for Save the Elephants, responsible for leading a field-based body count and verification of the cause of death of every dead elephant reported in the vast semi-arid part of Northern Kenya which hosts an estimated 7,500 elephants. Save the Elephants works in collaboration with management staff of Kenya Wildlife Service, landowners, nature conservancy managers, and individual volunteers to search through the landscape for fresh elephant carcasses. A combination of near real-time monitoring of elephant movement behaviour and detailed records of the

causes of death forms a perfect natural laboratory. The research uses these to understand specific movements that can only be due to poaching. That combination of detailed individual poaching records and concurrent movement data is rare to find across the continent.

"Land use type is the strongest correlate of poaching rates at site level", Festus reported in his early findings. Besides poaching, the long-term threat to the survival of elephants, and relatedly of other forms of life, is a loss of habitat. As the human population grows and settlements expand, the elephant-human interaction increases. Elephant and human lives are lost as the two most dominant species on land crash in a competition for resources. Human activity over a 24-hour period is quite predictable: sleep at night and active during the day, and even then, the daily activities vary by the hour. The study reveals that elephants are switching their activity from daytime to the night where poaching levels are high. Poachers operate mainly on foot to be sure of undetected escape by blending in with the rest of the humans. A detailed assessment of the human factors, i.e. livestock abundance and distribution, locations of settlements, availability of food and water, terrain, and poaching levels shows that the near real-time adjustment of activity time by the elephants most strikingly corresponds to poaching. A life of fear implies a reduction of



Festus Ihwagi assessing and recording a carcass of an elephant. Photo: Shifra Goldenberg



A family of elephants In Samburu National Reserve Kenya. Photo: Frank af Petersens

feeding hours and less mating between females and males. While give us more insights into the elephant-poacher interaction. elephants are very protective of their calves, increased activity at night exposes these calves to lions and hyenas which are more active at night. The study continues to explore how elephants respond to the risk of poaching at other time scales and hopes to

Despite the hunting pressure having exceeded sustainable levels in the recent past, there is hope. Efforts by the international community to shut down markets are bearing fruits.



Festus Ihwagi explaining the major components of a GPS collar. Beside him is a skull of an elephant. Photo: Nicole Dangoor



## Winning the 'Afstudeerprijs 2017' for best MSc Research

#### Carolyne Danilla

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I was having a very slow Monday on 24 July when I received the email from Astrid, the head of communications at the University of Twente, about the award. I quickly sent her an email back to inquire whether I would have to fund my travel for the award ceremony myself. Astrid informed me that ITC would reimburse my costs for the trip as well as for accommodation while staying in Enschede! That's when I started informing my friends and family. I was going back to Enschede. I didn't know I had missed it this much. Everyone was very proud and excited. I was even more proud of the work I had done with the guidance of my supervisors Claudio and Valentyn, and John Ray.

Astrid was very helpful in putting together the necessary documents for a visa application. Because of the limited time before the day of the award ceremony, I had to seek help from the Dutch embassy in Uganda to process my visa in time. Everyone was quite helpful, and I got it within two weeks. I was later invited to see off the next group of students from Uganda travelling to the Netherlands for their master's programmes. The hardest task was perhaps explaining to everyone what my research was about. To most of them, I was speaking a strange scientific language. However, I did find a way to simplify everything to everyone's satisfaction.

The Journey from Uganda to Enschede was bittersweet. I arrived in the Netherlands on Wednesday 30 August. Everything reminded me of the place I once called home for 18 months. The rain from Schiphol to Enschede brought back memories of Dutch winters. I was excited to reconnect with some classmates and old friends. Enschede is a lot more exciting without the stress that comes with studying. I treated myself to a refresher tour of Enschede after the sun came out in the afternoon. I went to the Volkspark, met with Rosa to catch up, and ended the evening with Nicholus, my former classmates and friends.

On my second day in Enschede, I went to the University of Twente to shoot the award ceremony video, my very first official video shoot ever! I was nervous at first, but it all went well in the end, thanks to Astrid and her team that took care of everything. I spent the rest of the day enjoying the rare sunny weather which I may have brought along with me from my tropical country! The next day, I went to ITC to meet my supervisors. I had a rough start to my research: nothing was working out right until a few days before midterm. My supervisors encouraged and advised me, which made me more confident in my work. Throughout my

research, I knew I could count on them and John Ray for support. Getting to see them again and knowing we had done great work together was my favourite moment. And of course, I could not leave ITC without having lunch once more, thanks to Rosa!

I spent part of my weekend in Rotterdam catching up with my friends: Jiaxin, Tianyuan, Victor, and Ragha and the rest, shopping in Enschede, and preparing for the award ceremony on Monday. My guests to the ceremony were Rosa, Nicholus, and



Having lunch at the ITC restaurant like old times

Gideon, who did a great job in capturing all the great moments in photos. I was the only lady among the award winners, as well as the only one from my continent. It was a special honour, and a special evening to me. After the ceremony, I had to prepare for the journey back home - so soon!

I would like to take my research further; I am particularly interested in SAR image analysis for various applications using Machine learning. I am making plans for part-time research to further expand my topic as soon as I settle in at my new job with Esri Eastern Africa. Hopefully, my next adventure will be as great and rewarding as this one has been!

1.000,-

I wish to extend special thanks to my supervisors Claudio Persello and Valentyn Tolpekin, and to my adviser John Ray Bergado, for all their support and advice, to the team at Netherlands Earth Observation for providing the images and reference data, to the ITC faculty for funding my trip to Enschede, and finally to Rosa Aguilar and Nicholus for making my stay in Enschede a wonderful one.

> Hopefully, my next adventure will be as great and rewarding as this one has been!



Carolyne and her guests after the award ceremony

Receiving the 'afstudeerprijs' award for best MSc research of Faculty ITC





### 3D Geodata in Slovenia

**Communication Department** 

news-magazine@utwente.nl

The ITC Faculty of Geo-Information Science and Earth Observation of the University of Twente is one of the partners in a European collaboration project to establish a Slovenian Centre of Excellence for 3D geodata. SLICE3D (Slovenian Centre of Excellence on 3D Geodata) is a one-year project, financed within the framework of the Widening Actions under the Spreading Excellence and Widening Participation part of Horizon 2020, dedicated to the preparation of a scientific and innovative strategy as well as a business plan for the setting up of the Centre of Excellence.

Strengthen research and innovation capacity The main idea of the centre is to strengthen the research and innovation capacity of Slovenia in the fields of geodata acquisition and 3D/4D geodata modelling, and consequently in other fields related to geodata and spatial decisions. The consortium, coordinated by the University of Ljubljana, includes a governmental institution (Surveying and Mapping Authority of the Republic of Slovenia) an SME (XLAB d. o. o.) from Slovenia, and partners with longstanding experience in the fields of geospatial technologies, 3D mapping, and business planning (Fondazione Bruno Kessler from Italy, KU Leuven from Belgium, University of Twente and Valorisation from the Netherlands, Swisstopo from

Switzerland). Within the granted first-phase research and innovation (R&I) projects project of one year, a formal and strong cooperation will be developed between the involved partners to provide the platform for knowledge transfer and strengthening of the research and innovation capacities in Prof. George Vosselman, Head of the ITC both the country (Slovenia), where research and innovation (R&I) performance is still below EU thresholds, and in the wider region.

#### Cutting-edge geospatial technologies

The ambition is to create a Centre of Excellence that will establish a strong mediumand long-term scientific presence at European and at a wider international level. The focus of SLICE3D will be to achieve excellence through education programmes and



Representatives of SLICE3D project partners at the meeting in Enschede, the Netherlands

using cutting-edge geospatial technologies, resulting in tangible results which can be supplied to market players.

department of Earth Observation Sciences: "Our department is proud to join one of the only two EU-wide phase-1 team projects that have been granted to The Netherlands for 2017. For the Slovenian universities, SLICE3D is a very important capacity-building EU- funded project, and we envisage that our contribution will be key to the continuity of the project in phase 2. During the first phase, strategic scientific and business plans will be developed for the establishment of a Slovenian Centre of Excellence. In phase 2, which will last for another 5-7 years, we hope to actually establish this Centre."

The Centre will thus be an important bridge for the industrial use of research results. Besides the scientific goals, the social and economic contributions are emphasized. For this purpose, in synergy with the scientific agenda, a clear innovation path is foreseen. This will ensure scientific excellence and a strong positioning of Slovenia within the relevant domains.

For more information, visit the project website via www.slice3d.si

## **Dutch Climate Experts Join Forces**

#### **Communication Department**

#### news-magazine@utwente.nl

**Fourteen Dutch knowledge** organizations have joined forces to provide government bodies and companies in the Netherlands and abroad with better policy advice on adapting to the enormous challenges posed by climate change.

Today, they signed agreements to establish the Netherlands Consortium on Climate Change Adaptation (CCCA). The consortium will integrate knowledge and expertise from various sectors and disciplines. This will allow them to respond more effectively to the complex policy questions raised by rapid warming and in the context of global sustainable development goals.

#### Direct and indirect impact of climate change

According to the 2015 Paris climate agreement, the world will need to adjust to serious consequences of global warming: rising sea levels, extreme heat, droughts, hurricanes, and extreme rainfall. Indirect consequences will affect all sectors of society: from spatial planning and infrastructure to banks and insurance companies, from agriculture and food security to safety and public health, from economic development and tourism to global migration.

All these indirect consequences, like possible adaptation measures, will influence each other as well. Adaptation measures tailored to one sector (such as water management) may work out less favourably in other sectors (such as agriculture or public health). Adaptations on a national scale, such as major water infrastructure projects, may cause problems on a local scale.

For this reason, there is a great need for policy advice that combines and integrates knowledge from different fields, sectors, and government levels. Smarter advice could result in measures that reinforce rather than weaken each other, and tie in more closely with the needs of governments and companies in the Netherlands and Europe, as well as those in Asian, African and American countries that will be greatly affected by global warming on account of their having much fewer resources.

Over the coming decades, global investments in well-substantiated adaptation projects will involve many hundreds of billions of euros.

#### CCCA: a broad coalition of experts

The CCCA brings together a wide spectrum of experts and disciplines. The growing list of consortium members and partners includes leading Dutch universities, institutes, and companies that focus on climate change. All these members and partners collaborate with colleagues abroad, which extends the knowledge consortium's reach even more. Later this year, the United Nations Centre of Excellence on Climate Adaptation will be established in the Netherlands. Many parties and consortia are interested in hosting this Centre, and ITC has been approached by several of those consortia to participate and offer its expertise. The following is a press release of one of these consortia, led by the University of Utrecht.

The consortium will found its work on eight themes and crosscutting issues, which vary from water management, infrastructure, and urban planning to public health, finances, law, and governance.

At its launch, the consortium consists of fourteen organizations, a number that will grow in coming years. Seven of them will formally shape the consortium by means of a 'field office' that will create joint projects. Within these projects, the field office will ensure that knowledge and practical experience of the various partners, sectors, and disciplines will be combined, integrated, and tailored to the needs of local and national governments, companies, and NGOs, in both the Netherlands and the rest of the world.

#### The following organizations have joined the consortium as members:

- Climate-KIC Benelux (part of the European Institute of Innovation and Technology)
- KNMI (Royal Netherlands Meteorological Institute)
- KWR Watercycle Research Institute
- NIOZ (Royal Netherlands Institute for Sea Research)
- RIVM (National Institute for Public Health and the Environment)
- University of Twente (Faculty of Geo-Information Science and Earth Observation)
- Utrecht University (consortium coordinator)

#### The following organizations have signed on as associated partners:

- Climate Adaptation Services (CAS)
- FutureWater
- HydroLogic
- Raboban
- Sweco Nederland
- TNO
- Weather Impact



## First GEO Human Planet Forum held at ITC

**Richard Sliuzas** 

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**The Group on** Earth Observations (GEO) created the Human Planet Initiative (HPI) in 2017 to support the evidence-based assessment of human presence on the Earth by leveraging advances in Earth Observation technologies and geospatial data analytics to improve the global awareness of the spatial patterns and processes of the today's urbanizing world.

Together with the European Commission's Joint Research Centre (JRC) and other partners, the ITC Faculty of the University of Twente organized and hosted the first formal meeting of this initiative, the Human Planet Forum, from 12 to 15 September 2017. The Forum built upon two earlier workshops held at JRC in 2014 and 2015 and a series of related events such as UNISDR's Global Platform for Disaster Risk Reduction in Cancun, Mexico, and the Habitat III conference in Quito, Ecuador, in 2016.

#### Forum activities and outcomes:

Two training events related to JRC's Global Human Settlement Layer (GHSL) products were held before the main sessions. A one-day workshop on the Massive Automatic Spatial Data Analytics (MASADA) tool provided an introduction on how to process large image sets using symbolic machine learning to extract a binary human settlement layer and several other intermediate products. The tool is downloadable and can be used in its standard settings or tuned to specific contexts to work with user-defined data (e.g. VHR imagery) and parameter settings to improve mapping accuracy. A half-day workshop on the Degree of Urbanization (DUG) tool was also staged. This workshop focused on the

definitions of human settlements and recent work by the European Commission to standardize definitions for the purpose of global comparative analysis. This work, led by Lewis Dijkstra, is the basis for one of the expert groups established at the forum.

Seventy-five participants from sixteen countries around the globe attended the forum. During the opening, a live video link was established to Italy to enable Dr Charlina Vitcheva, Deputy Director General of the European Commission, Joint Research Centre and Dr Joan Clos, Executive Director of UN-HABITAT, to address the participants. The keynote speaker, Dr Robert Ndugwa, Head of UN-HABITAT's Global Urban Observatory Unit, then gave his presentation entitled "The need for city/urban data and monitoring systems for SDGs, New Urban Agenda, and other global urban-related frameworks" to kick-start the discussion. The next one and half days, a series of presentations followed, covering state-of-the-art Earth Observation methods for global urban mapping and monitoring, as well as applications of the derived products for issues such as population estimation and modelling, for studying urban metabolism, for slum mapping, and for urban climate modelling. Following a series of mini-pitches by



A workshop on the Massive Automatic Spatial Data Analytics (MASADA) tool



Dr Richard Sliuzas

potential working group leaders, a World Café activity allowed participants to discuss initial ideas that will be the focus areas for future HPI developments .

Ultimately, eleven expert groups were formed at the forum (Global harmonised definition of cities and settlements; Global Settlements in Disaster Risk Reduction; Global Urban Climate and Mitigation Planning; Global updated and historical baseline data on population and built-up areas; Global high-resolution agestructured population maps 2000-2020; Global Settlements, Infrastructure, and Population Data Intercomparison; Accuracy assessment of global settlement layers; Global future population grids including demography and migration; Global urban metabolism; Urbanization dynamics in China and the Belt and Road; Capacity building and traineeships; Urban poverty mapping). These groups will function as the implementation bodies of the HPI. ITC has the lead in the group on Capacity building and traineeships, but is likely to be active in several other groups as well. For example, ITC's expertise in slum mapping will be part of

the Urban poverty mapping group, and in the light of our participation in the Integrated Research on Disaster Risk network, we will also contribute to the group on Disaster risk reduction. Other contributions are also possible, and we will certainly be following and contributing to the work and outcomes of other expert groups where possible. A call for papers for a special issue of the International Journal of Digital Earth on patterns and processes of Global Human Settlements is now in preparation. The next Global Human Settlements Atlas will be launched in 2018, and the next Human Planet Forum will be held in 2019.

For those alumni and readers who are interested in global urban mapping and monitoring, more information including videos and PDFs of all presentations are available on the Forum website www.utwente.nl/en/itc/hpi-forum/. If you wish to be involved in the work of the expert groups, please contact any of the expert group leaders whose names and affiliations are available here: http://ghsl.jrc.ec.europa.eu/HPl.php.



World cafe discussion

#### **KEY LINKS FOR INFORMATION RELATED TO THIS TOPIC ARE:**

- Human Planet Forum: www.utwente.nl/en/itc/hpi-forum/
- JRC Global Human Settlement Layer http://ghsl.jrc.ec.europa.eu/
- JRC Human Planet Initiative: http://ghsl.jrc.ec.europa.eu/HPI.php
- GEO www.earthobservations.org/activity.php?id=119
- ESA Thematic Exploitation Platform TEP-Urban https://urban-tep.eo.esa.int/#!

Human Planet Forum Local Organizing Committee: Richard Sliuzas, Luc Boerboom, Monika Kuffer, Alfred Stein, Saskia Tempelman.

For more information about this topic please contact r.sliuzas@utwente.nl

### LANDac 2017: International Conference on Land Governance

#### Dimo Todorovski

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**The motto of** this year's LANDac International Conference on Land Governance was "Leave No One Behind: Setting the Land Agenda to 2030".

Like each year, the event took place in the historic Muntgebouw (the former Royal Dutch coins works), Utrecht, the Netherlands, on 29 and 30 June 2017.

ITC was present at LANDac 2017 Annual International Conference with one professor, six staff members, six PhD candidates, and nineteen participants in ITC's specialization in Land Administration from four continents. LANDac, the Dutch Land Academy, is a partnership between Dutch organizations and their Southern partners working on land governance for equitable and sustainable development. LANDac was formed in 2010 as one of the IS Academies, a series of five-year programmes designed by the Dutch Ministry of Foreign Affairs to strengthen the role of knowledge and research in sustainable development, poverty alleviation, and international cooperation.

**Faculty ITC**, University of Twente is one of the twelve LANDac partners. For more information about us, visit: www.landgovernance.org

## Two awards for ITC EOS PhD candidate Shayan Nikoohemat

NOUNCEMENTS

#### **Communication Department**

#### news-magazine@utwente.nl

**During the ISPRS** Geospatial Week 2017 which took place in Wuhan, China, PhD candidate Shayan Nikoohemat received the "Best youth oral paper award" as well as the overall "Best paper award".

The paper entitled "Exploiting Indoor Mobile Laser Scanner Trajectory for Semantic Interpretation of Point Clouds" was given the "Best youth oral paper award" by the chairs of the Indoor3D workshop based on the results of the peer review process. Besides Shayan, the co-authors are Dr Michael Peter, Dr Sander Oude Elberink, and Professor George Vosselman. Among the award winners of all workshops of the Geospatial Week 2017, the paper was additionally elected "Best paper" by the organizing committee of the event.

The paper describes several algorithms for the extraction of semantic information from point clouds captured in indoor environments using mobile mapping systems. In addition to the point clouds, it especially concentrates on the use of the system's trajectory as a valuable information source. Methods for the robust labelling of points as belonging to walls, floors, or ceilings, but also for the detection of openings, i.e. doors and windows, and the labelling of space as navigable are presented. The research was carried out in the context of the NWO-TTW Maps4Society SIMs3D project in which methods for the reconstruction of as-built indoor models for use in emergencies are developed.

#### Mobile Laser Scanner Trajectory for Semantic Interpretation of Point Clouds" was given the "Best youth oral paper award" by the chairs of the Indoor3D workshop based on the results of the necessaria



Award ceremony during ISPRS GeoSpatial Week

On page 11 you will find a short article about Shayans research. Link to the full paper: https://doi.org/10.5194/isprs-annals-IV-2-W4-355-2017



## Be Smart with Public Land

Paul van der Molen

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In every country, the state owns land. Kevin Cahill ('Who Owns The World', 2010) claims that Queen Elizabeth II is the largest land owner on Earth, as she possesses the UK, Canada, Australia, New Zealand, and much more, amounting to one sixth of the Earth's surface. In his latest column, Paul van der Molen discusses various historical examples to show that state-owned land is often just land stolen from the citizens.

When Captain Cook landed at Botany Bay in Australia in 1770, he clause' or 'land vested in the president,' in all cases it relates to proclaimed the Declaration of Possession, based on the doctrine of 'terra nullius', bringing all land into the possession of the Crown. After the well-known Mabo case, the 'terra nullius' doctrine was overturned and the government had to create a 'native title' - to which, of course, the original people were entitled long before Captain Cook's declaration.

The federal government of the USA owns about 28% of the total US land area, from 5% in Wisconsin to 80% in Nevada. Following the War of Independence, starting in 1775, the USA expanded to the west through annexation (Texas), war (Mexico), negotiations (Oregon), and purchase (Louisiana purchase). At first, the federal government considered all the acquired lands to be under temporary ownership, but later it asserted its power. In Africa, in precolonial times, people had their own legal systems, based on their customs and practices. In the 19th century, European states were keen to acquire political interests in Africa. In 1884, the Berlin Conference even regulated the 'scramble for Africa'. Under British colonial rule, the 'reception clause' (the formal decision that British common law should apply in the British colonies, thus replacing the existing laws) declared all land to be Crown land. As the famous Kenyan professor Okoth-Ogendo once said: "We were owners of our land, but suddenly we became tenants of the Crown." After the independence of Kenya in 1963, the new Constitution stipulated that Crown Land should become Government Land, held in trust by the President.

After the revolution in Russia in October 1917, all private land was nationalized, even though in 1848 the Communist Manifesto had sought to nationalize bourgeois property but not "the hard-won, self-acquired and self-earned property of the small peasant or petty artisan." Article 2 of the 1918 Constitution reads: "For the purpose of attaining the socialization of land, all private property in land is abolished." The examples mentioned here are just a few of the many cases, showing that state land is often just land stolen from the people. Whether it is 'terra nullius' or a 'reception

land that was formerly owned by individuals and communities. It is painful to observe how governments take their state land for granted, as if it were their own property. Apart from the social and legal injustice, state land is often weakly managed. Governments do not know how much land they 'own', where it is located, how it is used and by whom, and many corruption issues are related to state land: land grabbing, land swaps, eviction, and the granting of state land to political friends. This cannot go on. I would advise governments to be smart with state land and to develop a sound policy; keep what is necessary for the public good, but alienate the remainder or give it back, so that land can be put to good and fruitful use.



Paul van der Molen is an emeritus professor in Cadastre and Land Administration at Faculty ITC, University of Twente (The Netherlands) and a former director of Kadaster International in Apeldoorn. He is an honorary member of the International Federation of Surveyors (FIG). This article was published in GIM International:

www.gim-international.com/content/article/be-smart-with-public-land

## Alumni Meet at Dar es Salaam - ESRI Eastern Africa

#### Lyande Eelderink

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A delegation from ITC attended the Esri Eastern Africa User Conference. Now in its 12th year, the Conference was held in Dar es Salaam, Tanzania, from 4 to 6 October 2017. This Conference provided an outstanding platform to meet with ITC's Eastern African clients, relations, and alumni. ITC was present at the exhibition with a booth which attracted a lot of attention from prospective students.

As you can see from the pictures, the Esri Eastern Africa User Conference is the region's major GIS industry networking event.

On Thursday evening, an ITC alumni reception was organized. Some 25 alumni attended this reception. The former students were welcomed by Jeroen Verplanke, who updated the alumni on recent developments in the ITC curricula. It was a pleasant evening for reminiscing about Enschede together and learning how the alumni are fulfilling their geospatial aspirations.







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- Dynamic Mapping
- Earth Observation
- Emergency Services ENC Electronic
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