SPECTRUM

THE OFFICIAL NEWSLETTER OF THE ISPRS STUDENT CONSORTIUM
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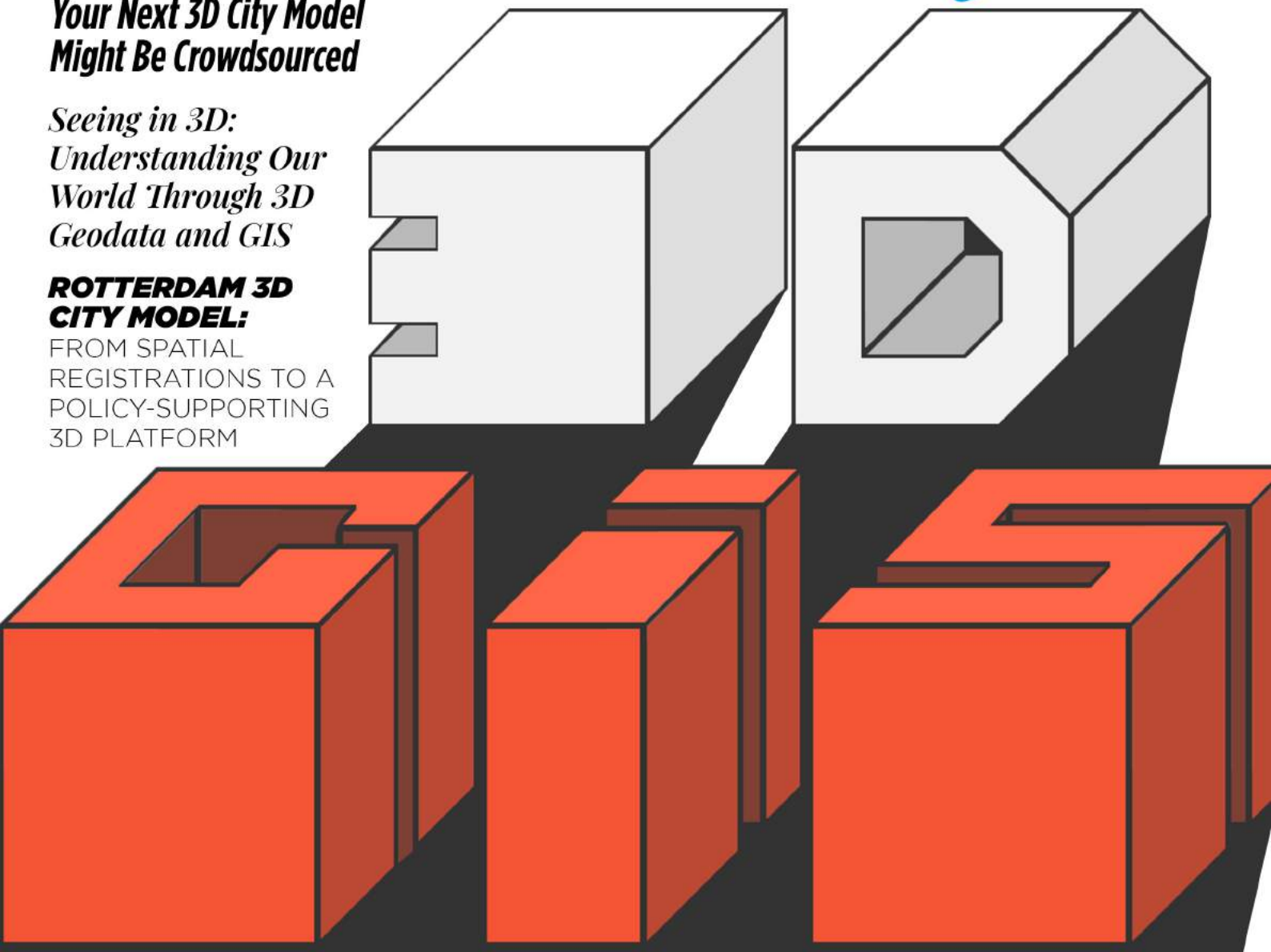
Your Next 3D City Model Might Be Crowdsourced

Seeing in 3D: Understanding Our World Through 3D Geodata and GIS

ROTTERDAM 3D CITY MODEL: FROM SPATIAL REGISTRATIONS TO A POLICY-SUPPORTING 3D PLATFORM



THE XXIV ISPRS CONGRESS VIRTUAL EVENT AND THE ISPRS STUDENT CONSORTIUM YOUTH FORUM

2020 IEEE GRSS & ISPRS YOUNG PROFESSIONALS & STUDENT CONSORTIUM SUMMER SCHOOL

IFOV: PROF. JANTIEN STOTER

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Dear ISPRS SC Newsletter readers,

Welcome to the 2nd issue of Spectrum (Volume 14), the official Newsletter of the ISPRS Student Consortium!

I am very pleased to present to you a Newsletter issue featuring articles on 3D GIS. In this issue, Assistant Professor Edgardo Macatulad from the University of the Philippines and Dr. Filip Biljecki from the National University of Singapore present to us the past and ongoing 3D GIS-related projects in their respective laboratories. Make sure to visit their websites for more information on their research groups and opportunities for the students and visiting researchers. We also look at a fantastic initiative, the Rotterdam 3D project in the Netherlands, working on the municipality's 3D representation. Finally, in the IFOV section, I am greatly privileged to have interviewed Dr. Jantien Stoter, a Professor of 3D Geoinformation at Delft University of Technology, who shared with us her professional experiences and passion for the field of 3D GIS. We are also delighted to feature the ISPRS – Working Group V/1. In this special feature, the group shared some of their activities and learning resources which aim to support and motivate capacity building in the fields of photogrammetry. Don't forget to visit the links they provided. Also, don't miss out on information on the upcoming activities and exciting opportunities for you in the Foresight, Into Horizon sections of this Newsletter.

On behalf of the ISPRS SC Board of Directors and the Newsletter Team, I would like to sincerely express my gratitude to all the contributors and readers of SpeCtrum. Once again, I apologize for the delay in the publication of SpeCtrum due to the difficulties brought by the pandemic. Our current situation is challenging - but we must keep moving forward. Little steps matter a lot.

We hope that this issue will be useful to those pursuing the research path of 3D GIS. All the best to your studies and research, and we hope to see you (virtually) in the upcoming events.

Charmaine Cruz
ISPRS SC BOARD MEMBER
SPECTRUM EDITOR-IN-CHIEF

THE XXIV ISPRS CONGRESS VIRTUAL EVENT AND THE ISPRS STUDENT CONSORTIUM YOUTH FORUM

by: **SHERYL ROSE REYES**, *ISPRS SC President*

The ISPRS Virtual Event was held from August 31 to September 2, 2020. Authors from all across the globe who submitted papers to the ISPRS Congress 2020 edition presented their research through live talks and pre-recorded videos as well as engaged with the audience through a live question and answer session.

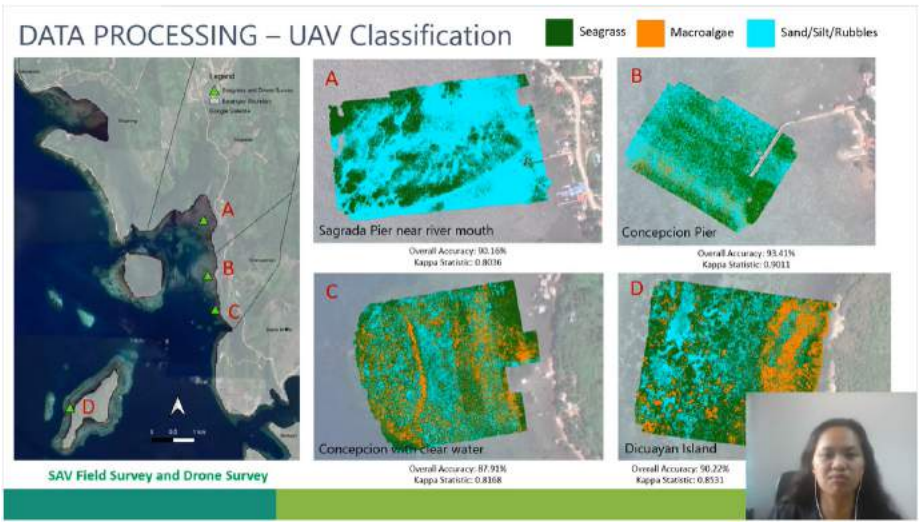

Figure 1. Investigating the effects of river discharges on submerged aquatic vegetation using UAV and GIS techniques - Tamondong, Ayin (Tokyo Institute of Technology, Japan) | Paper | Presentation |

Welcome messages were presented by Dr. Christian Heipke, President of ISPRS, and Dr. Nicolas Paparoditis, ISPRS Congress Director. A total of 309 presentations were available during the run of the Virtual Event, with the following breakdown for each Technical Commission (TC): 31 for TC I – Sensors and Systems, 110 for TC II – Photogrammetry, 93 for TC III – Remote Sensing, 55 for TC IV – Spatial Information Science and 20 for TC V – Education and Outreach, which also includes three presentations for the Youth Forum.

The ISPRS Student Consortium's Youth Forum was hosted as a joint session with the Technical Commission V – Education and Outreachon September 1. The Youth Forum sessions were moderated by Sheryl Rose Reyes, President of the ISPRS SC, and Dr. P. N. L. Raju of Technical Commission V.

Three presentations were delivered in the Youth Forum, including one live talk and two pre-recorded videos. Ms. Ayin Tamondong, a PhD student from Tokyo Institute of Technology in Japan, presented her research on investigating submerged aquatic vegetation using unmanned aerial vehicles and geographic information systems (GIS) techniques (Figure 1). Using state of the art remote sensing techniques, she identified seagrasses and macroalgae in the coasts of Busuanga, Palawan, Philippines.

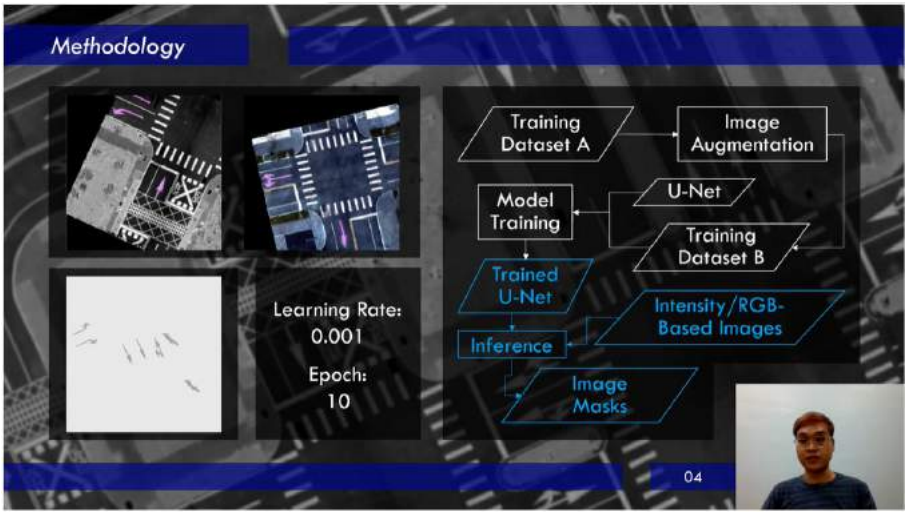

Figure 2. Using deep learning to digitize road arrow markings from LIDAR point cloud derived images. Lagahit, Miguel Luis (National Cheng Kung University, China Taipei) | Paper | Presentation |

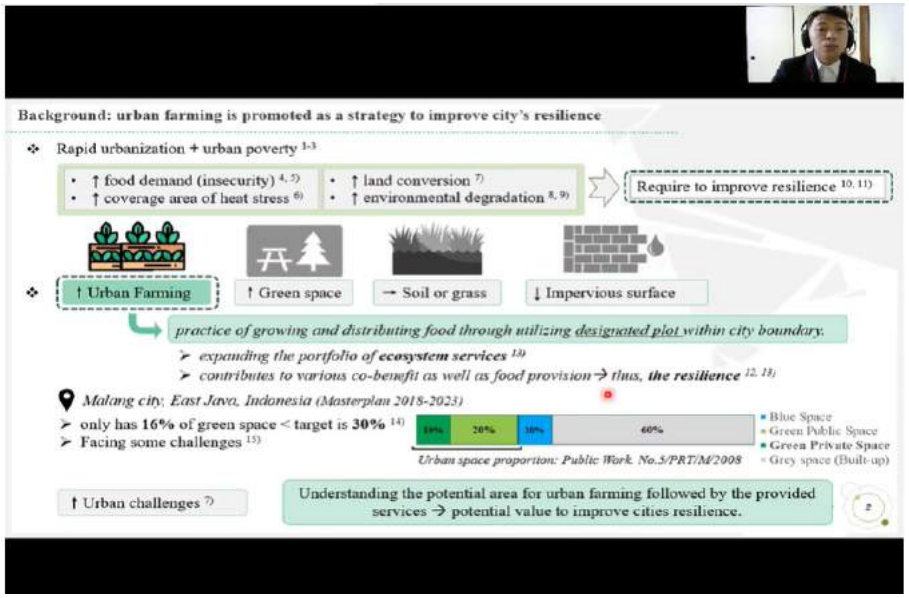

Figure 3. Geospatial valuation of urban farming in improving cities resilience: a case of Malang city, Indonesia. Atmaja, Tri (The University of Tokyo, Japan) | Paper | Presentation |

Mr. Miguel Luis Lagahit, a recent Master's degree graduate from National Cheng Kung University in China Taipei used LiDAR point cloud images and deep learning to digitize road arrow markings (Figure 2). These are important elements in generating HD maps for mobile mapping and an interesting application of neural networks.

Replays of the live talks as well as the pre-recorded videos are now available for viewing: http://isprs.stream-up.tv/

The Virtual Event of the ISPRS Congress for its 2020 edition was indeed very successful, with great engagement from the speakers and the audience. This event also provided an amazing opportunity for the youth to get connected to scientists and researchers from all over the world free of charge.

The ISPRS SC Board of Directors expresses their sincerest gratitude to all young authors who submitted to the Youth Forum. You all did a fantastic job and we look forward to meeting you all again in Nice, France for the ISPRS Congress 2021.

For the full proceedings of the ISPRS 2020 edition, please visit the following links:

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YOUR NEXT 3D CITY MODEL MIGHT BE *CROWDSOURCED*

by: **Dr. Filip Biljecki** | filip@nus.edu.sg

ABOUT THE AUTHOR

Dr Filip Biljecki obtained his MSc (Geomatics) and PhD (3D GIS) degrees from the Delft University of Technology in the Netherlands. He is currently an assistant professor at the National University of Singapore where he established the Urban Analytics Lab (https://ual.sg), a multidisciplinary research group focusing on geospatial technologies and urban informatics.

3D city models are gaining traction across multiple application domains, benefiting a large number of researchers and practitioners. They have enabled new spatial applications and have advanced existing analyses. For example, we can use 3D city models to estimate the level of sunlight on the street-level - an analysis impossible without 3D geoinformation. Among different applications, such an analysis helps to understand the thermal comfort of pedestrians.

As their use keeps increasing, it is not a surprise that many cities acquire 3D city models and utilise them for different purposes. Today, dozens of cities have a 3D city model. Many of these have been released as open data, benefiting researchers and the public. However, despite technological advances and increased awareness of the benefits of 3D geoinformation, the number of such instances remains limited.

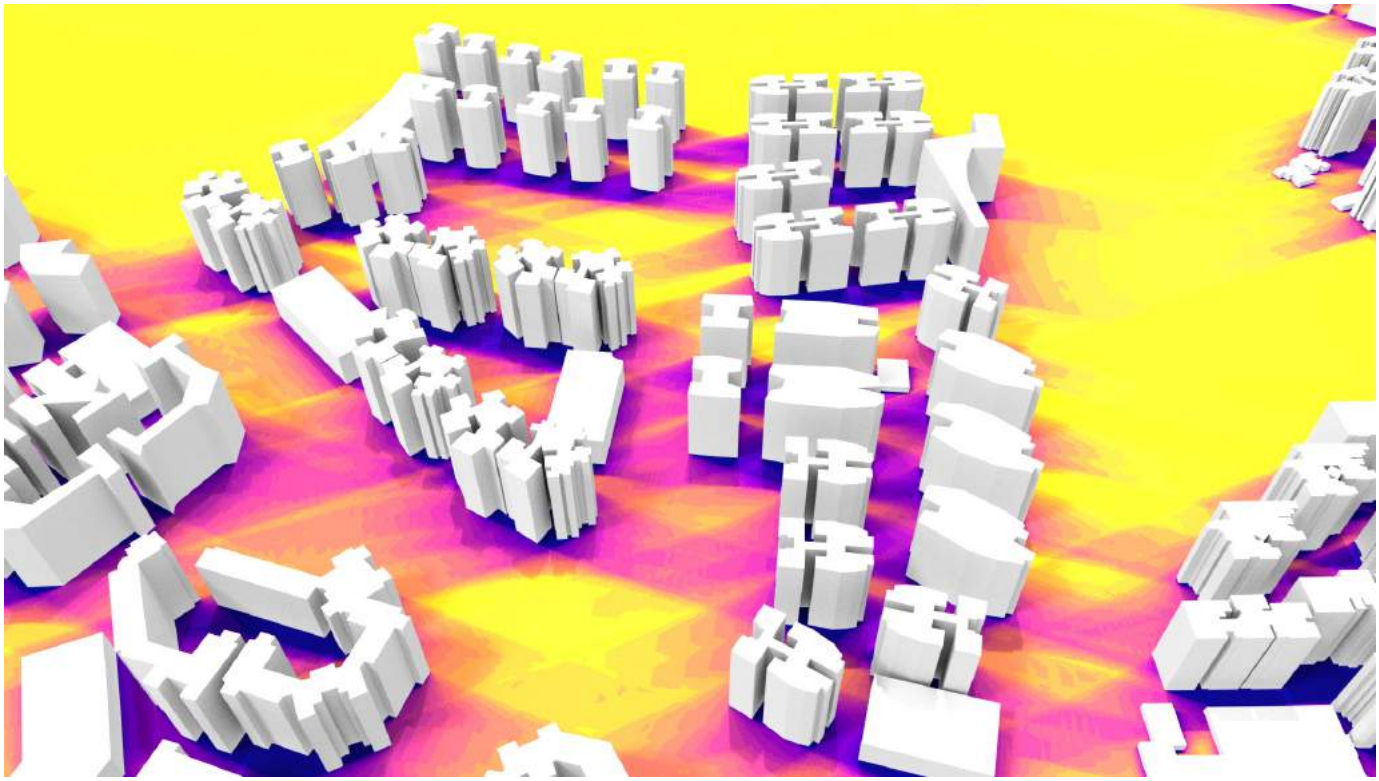

Figure 1. *A 3D city model of a residential town in Singapore, derived using building footprints from OSM, used for estimating shadow intensity on the street-level. Data: OSM, HDB.*

In parallel with local governments, another venue of 3D city models that has emerged is volunteered geoinformation, such as OpenStreetMap (OSM). The subject of 3D city models is not new to OSM; in fact, it has been around for more than a decade. However, it has been gaining momentum as OSM's building quality reached an impressive level in many places around the world.

There are different ways to obtain 3D city models from OSM. First, they can be generated by extruding the building footprint to the height of the building or its number of floors tagged by mappers. This is all done using OSM data. Second, it is possible to provide more detailed representations using specific tags, for example, the type of roof of a building, resulting in data with a higher level of detail. Third, in many places around the world, OSM provides a high level of

completeness of building footprints, which can be coupled with a point cloud to generate a 3D city model. While accurate, this method has a low potential for the lack of available open lidar datasets around the world.

Here at the Urban Analytics Lab at the National University of Singapore, we have been looking into the potential of OpenStreetMap for generating 3D city models around the world and seeking to develop methods to do so efficiently. As virtually all 3D open datasets are from Europe and North America, we believe that OSM presents a solid opportunity to generate 3D city models in other parts of the world, benefiting local researchers and practitioners.

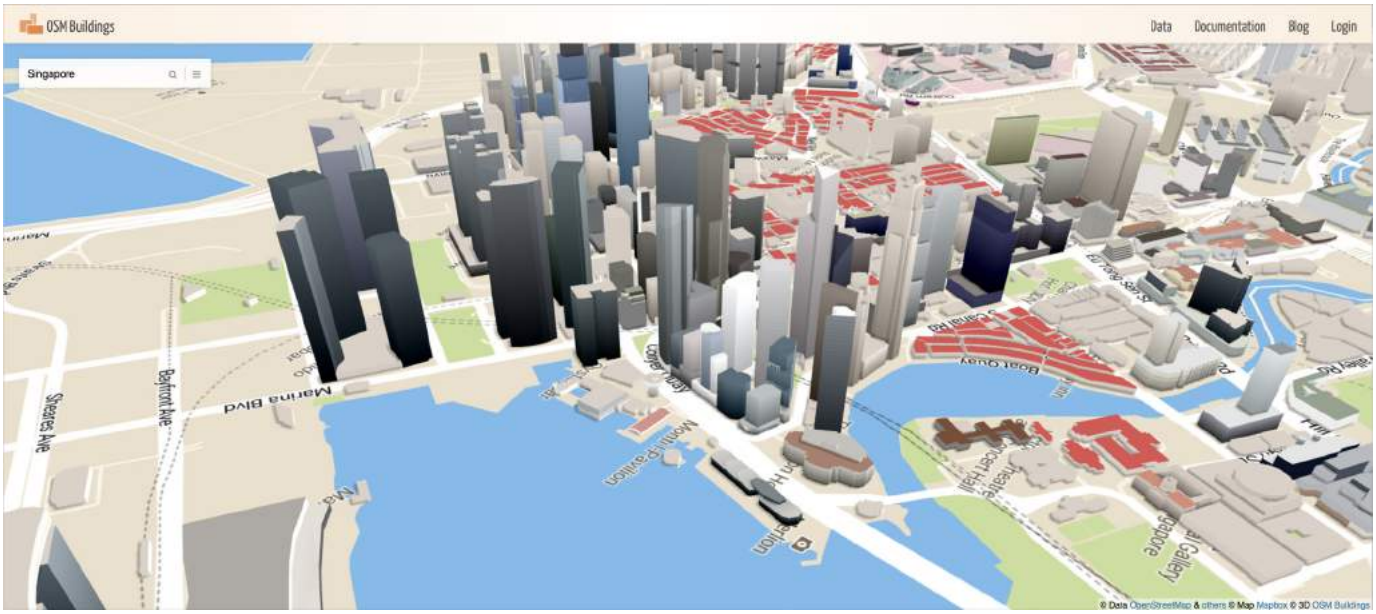

Figure 2. *A 3D city model of the central business district of Singapore generated solely from OSM data and visualised thanks to OSM Buildings.*

Our research is divided into multiple parts. The first and essential portion of our research is understanding the quality of existing building data. While preliminary results suggest that building completeness is very high in numerous cities around the world, data on building heights are scarce, with most of them having height information for less than 2-3% of buildings. Though such deficiency prevents generating 3D city models at a city-scale, we realise that many of these are clumped together, presenting a high potential to create 3D models at a precinct scale.

The second part focuses on predicting the heights of buildings that do not have such information in OSM using machine learning techniques, solely from existing OSM data. Preliminary results indicate a level of accuracy that might be sufficient for several applications, leading us to the third part of the research, in which we seek to explore the usability of such large-scale 3D city models derived from OSM.

This on-going project is at the outset, and we hope that the 3D datasets we intend to generate will be found useful by other researchers and practitioners in their activities. We plan to make these datasets available as open data. Finally, I want to use this opportunity to mention that in our research group we welcome visiting researchers to explore new applications of 3D city models and other topics at the intersection of GIS, 3D city modelling, and urban analytics.

FOR FURTHER READING

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SEEING 3D:

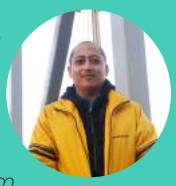
Understanding our world through 3D geodata and GIS

By: **EDGARDO MACATULAD** | egmacatulad@up.edu.ph

In the Spatial Visualization course I teach, I always mention *Magic Eye* - a series of books featuring what are called autostereograms [1][2]. An autostereogram is a single-image stereogram designed to allow people see a visual illusion of a 3D scene or object by focusing on 2D patterns in the image [3]. It made for a fun and interesting class activity on 3D visualization, albeit only an illusion.

Much can be said now about 3D data, models and platforms. Not just for illusion, but as virtual representations of the actual 3D world. With current technologies capable of acquiring, managing, displaying and utilizing 3D data, capabilities and opportunities for understanding the world we live in are now available in the context of the so-called "third dimension". Among these technologies is 3DGIS which is, in its simplest sense, our reliable Geographic Information Systems (GIS) extended to the third dimension, allowing 3D spatial analyses of geographic data for better visualization and modeling that is "closer to reality".

ABOUT THE AUTHOR



Edgardo G. Macatulad is an Assistant Professor at the Dept. of Geodetic Engg. in the Univ. of the Philippines (Diliman) and holds a degree of MSc. in Geomatics Engineering (Geoinformatics) from the same university. He is a member of the Environmental Systems Application of Geomatics Engineering (EnviSAGE) research laboratory in their department. His current field of interest is towards Geomatics for Built Environment Analysis, Modeling and Simulation, including 3D and indoor GIS, Geo-visualization, Geo-simulation and Urban Environment modeling.

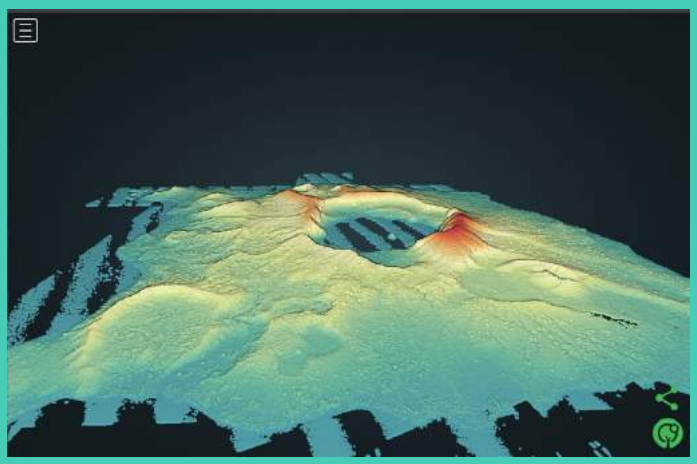


Figure 1. *3D visualization of Taal Volcano, Batangas, Philippines from LiDAR points, rendered using potree (https://potree.entwine.io/data/view.html?r=%22https://phil-lidar-taal-entwine-s3.s3.us-east-2.amazonaws.com/Taal_Volcano_Island/%22)*

Figure 2. *Snapshot of a flood simulation from animation, blue areas showing the possible extent of flood inundation (from https://dream.upd.edu.ph/products/flood-hazard-maps/)*

Acquiring 3D geodata is a challenge but, fortunately, there are already sensors and methods for creating 3D geodata, including stereo-images from UAS, terrestrial and airborne LiDAR, mobile scanners, and even indoor laser scanning. In our Training Center for Applied Geodesy and Photogrammetry (UP-TCAGP), we made use of the Light Detection and Ranging (LiDAR) technology under the Disaster Risk and Exposure Assessment for Mitigation (UP-DREAM) Program to generate updated and top-quality flood maps and models from LiDAR data [4]. LiDAR uses laser pulses which hit and reflect off of the ground and things like buildings and tree branches [5] to produce millions of 3D points, creating a "3D map" of the Earth's surface. These points can then be used for high-resolution visualization of terrain (Figure 1) and for better understanding of processes, such as flood simulations (Figure 2).

The availability of these 3D data was essential to the production of detailed resource maps and GIS vulnerability assessment of agricultural resources, coastal resources, and forest resources detailed maps and database of hydrologic datasets, and resource assessment of renewable energy sources under our Nationwide Detailed Resources Assessment using LiDAR (Phil-LiDAR 2) Program [6][7].

In one of our research laboratories, Environmental Systems Application of Geomatics Engineering (EnviSAGE) [8], 3DGIS and 3D visualization have been used to incorporate the "3D space" in environmental models and to present a 3D view to better communicate results of analyses, such as integrating the sky view in urban development (Figure 3) [9], visualizing future scenarios in coastal land use planning (Figure 4) [10], and incorporating 3D landscape in air quality modeling (Figure 5) [11].

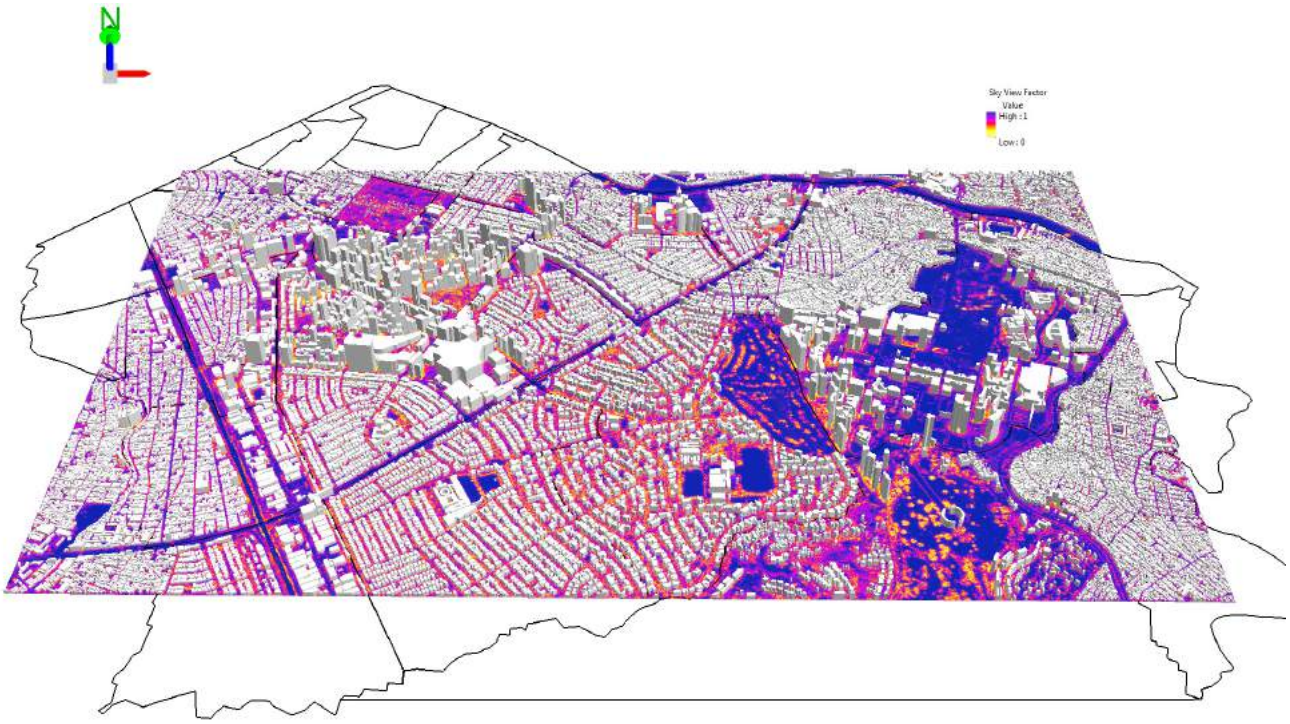


Figure 3. *Incorporating 3D analysis of Sky View Factor in urban redevelopment plans [9]*

Figure 4. *Visualizing coastal landuse planning scenarios using 3DGIS [10]*

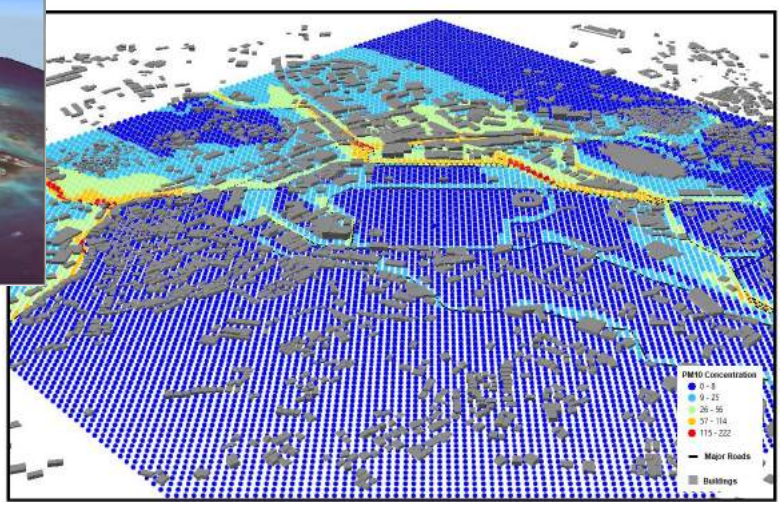


Figure 5. *Sample 3D visualization of PM10 concentration from geostatistics [11]*

The further advancement of software and hardware and data standards for 3D applications leads us towards modeling and representing 3D space [12] and corresponding real world processes [13] that allow us to look deeper, figuratively and literally, inside 3D indoor spaces, such as in buildings (Figure 6). In such indoor spaces, we can use 3DGIS to model and analyze movement of people, such as building evacuation through 3DGIS-based simulations that consider the multi-level connectivity of indoor paths [13].

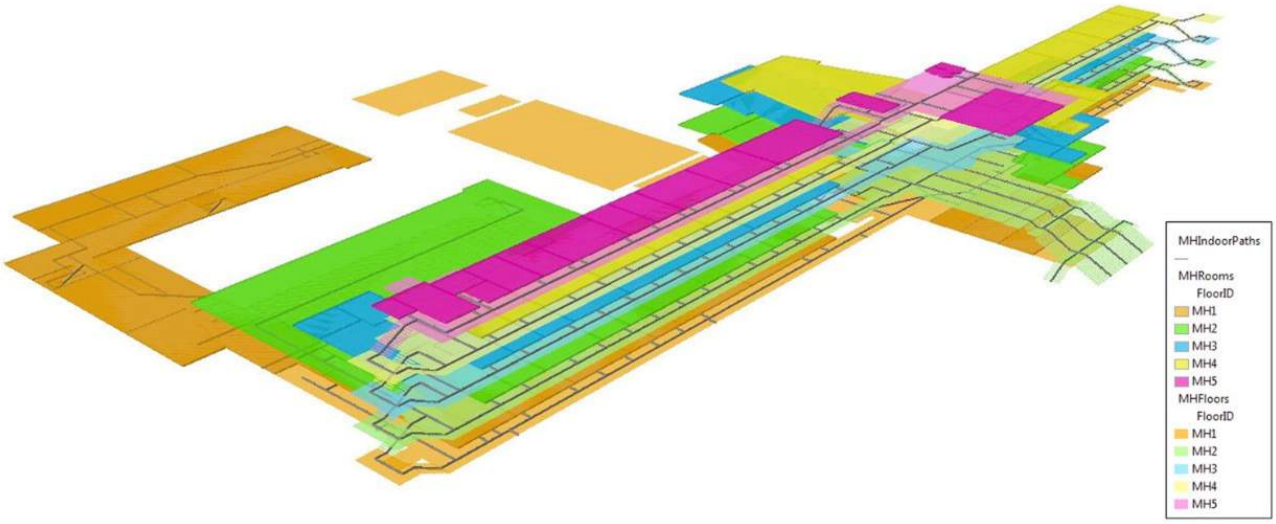


Figure 6. *Indoor building space visualization using 3DGIS [13]*

In continuously changing landscapes and urbanizing cities, especially in the Philippines, making use of 3D geodata and 3DGIS can be beneficial. Beyond visualization and beyond models, I think what truly is the relevance of a 3DGIS is to help us be aware of the 3D space we live in and to provide us with a platform for representation and analysis towards better understanding of our 3D world. Like how we try to refocus our eyes to see the "3D image" in autostereograms, we can refocus our ideas, efforts and researches towards—as how *Magic Eye* aptly puts it—"a new way of looking at the world" [2].

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THE ROTTERDAM 3D CITY MODEL:

From Spatial Registrations to a Policy-supporting 3D-platform

BY ERIK JANSEN

Ever since 2009, the municipality of Rotterdam has been experimenting with 3D-GIS. It started with the bold motivation: why not? It's possible to visualize our legal registrations in 3D, so why not just do it? The mentality of 'Don't talk, just do it' is characteristic for Rotterdam, an industrial city with the biggest port in Europe. But along the way, the transition to 3D-GIS greatly supported various policy goals and the bigger national transition to 3D spatial legal registrations.

This article will show how it's done. We show briefly how spatial registrations are used to create the 3D-model. Furthermore, the advantage of a 3D-model in supporting sustainability goals will be discussed. In the last part the importance of open standards in the development of 3D geo-information will be emphasized.

CREATING THE 3D-MODEL OUT OF SPATIAL REGISTRATIONS

The Rotterdam 3D-model is created processing 2D spatial data into a 3D model. In the Netherlands, local governments collect and store lots of spatial data since we are required to administer these data into mandatory registrations. There are several spatial registrations in the public domain that describe the geometry of a building. The most important are 'the BAG' (Basic Registration of Addresses and Buildings), and 'the BGT' (Basic Registration of Large-Scale Topography). These registrations describe building geometry in different manners but, brought together, both led to the 3D-model of Rotterdam.

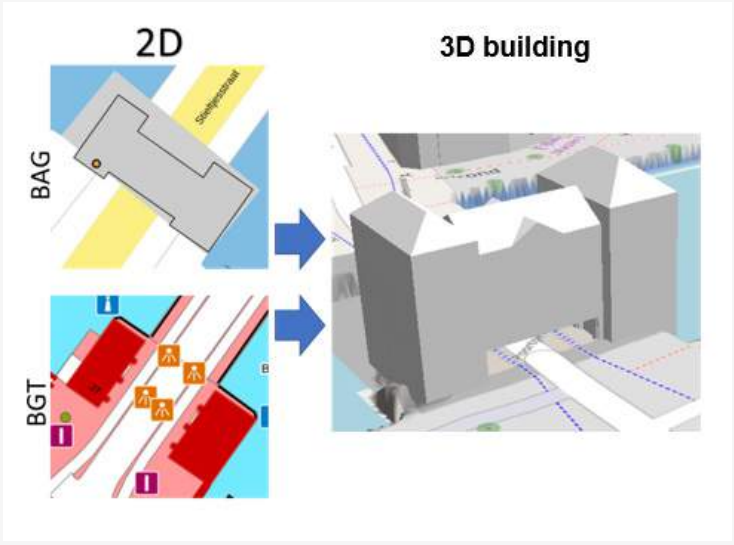

Figure 1. *Combining registrations BAG and BGT into a building with overhang section*

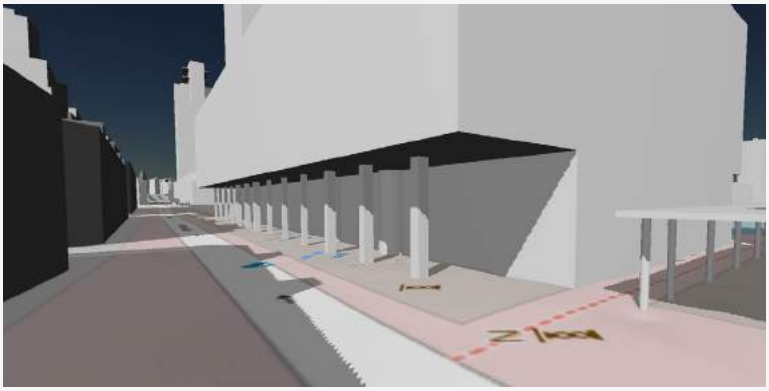

Figure 2. *Another example of how overhanging sections look in the Rotterdam 3D model*

The BAG and the BGT complement each other in creating the model. The situation of an underpass underneath a building is a good example to show this (see Figures 1 and 2). In creating this part of the model, the BAG displays the footprint of the entire building including the overhanging sections. By projecting a LiDAR point cloud over the registration, a building model with all walls connected to ground level can be automatically generated. In the BGT, a building is defined as only the part existing at ground level. Overhanging sections and columns are described separately. So, by adding the BGT, the software knows at which part at ground level the underpass is located.

MAKING REGISTRATION INTO A 3D-MODEL? WHAT'S THE ADVANTAGE?

There are multiple advantages with 3D-spatial data - supporting Rotterdam's sustainability goals is one of them. The model provides a detailed insight into the rooftop landscape of Rotterdam. The various shapes, slopes, and orientations of roof surfaces are very useful for determining promising locations for installing green roofs or solar panels.

In addition to a source of information, the 3D model also functions as a worthy communication tool. The results of analysis can be easily linked to the model and a visually appealing illustration can be created. On top of that, the user can navigate freely through this image.

Sustainability is not limited to rooftops. Recently, more questions have been raised about the building surfaces. For example, people want to have insights about the mirror/wall ratio or which surface of a building catches most sun hours. Momentarily, our model is not equipped to answer these questions. However this is a chance for further development.

Figure 3. *The visualization of energy labels in the city center of Rotterdam*

THE USE OF OPEN STANDARDS

To close this article, we would like to address the value of open standards. We believe in the value of widely adopted open standards for both information models as well as technical standards for data formats. These enable a heterogeneous setup combining technology from different vendors and avoiding long-term vendor lock-in.

This means we can connect every source to our platform independent of the supplier or (data)format of our 3D storage platform. From there, we can supply data to whatever application we need to use. Besides avoiding a lock-in, there is not one party who offers the total package from source to use. The use of open standards makes possible that different suppliers can be combined to further develop the 3D platform (see Figure 4).

For municipalities we see a role here in actively communicating our needs, interests and use cases to all parties involved in the development of standards in order to nudge them in the right direction. In the selection process of new software the support of relevant open standards should be high on the list of selection criteria.

Figure 3. *To avoid vendor lock-in every column in the production chain has its own suppliers*

ROTTERDAM 3D (3DROTTERDAM.NL)

Rotterdam 3D is a 3D-model based on several basic registrations, elevation data, city maintenance data and aerial imagery. Beside a good-looking visualization, it is a model that copies real-life geometry. The model contains buildings, trees, lamp posts and cables and pipes underneath ground surface. All these objects are based on the actual location and are clickable. Be clicking on the objects, city maintenance data will be presented.

The municipality of Rotterdam is willing to share the Rotterdam 3D model with whoever wants to work with it. In this way, the Department of Basic Administrations stimulates the use of this unique data set.

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Email Address: 3d@rotterdam.nl

A city of distinctive character, Rotterdam is energetic and constantly changing. Rotterdam and its inhabitants never shy away from experimentation. In fact, they would rather seek it out. Rotterdam has many faces. Like the Nieuwe Maas, a waterway that represents a powerful symbol for the city's constant motion. Rotterdam is a city where the Make it Happen mentality can be seen and felt. With people and organizations that make a clear choice for Rotterdam and add their own take on that Rotterdam mentality and 'can do' spirit. Whether they live here, are just visiting, or are running your own business, or studying here.
Within this city, the municipalities department of Basic Administration is responsible for collecting spatial data and storing it in various basic registrations. With these data sets, Team GIS and Advice use GIS tools and analyses to solve problems and challenges of colleagues in a clever way.

2020 IEEE GRSS & ISPRS

YOUNG PROFESSIONALS & STUDENT CONSORTIUM SUMMER SCHOOL

OCTOBER 16 - DECEMBER 10

The IEEE GRSS Young Professionals (YP) & ISPRS Student Consortium Summer School is an event jointly organized in Brazil and supported by the two main international organizations in the field of remote sensing:

IEEE Geoscience and Remote Sensing Society is a non-profit society and its area of interest is the theory, concepts, and scientific and engineering techniques applied to remote sensing of the Earth, ocean, atmosphere, and space. Also, it is interested in the processing, interpretation and dissemination of this spatial information.

International Society for Photogrammetry and Remote Sensing is a non-governmental organization that aims to develop international cooperation for the advancement of photogrammetry and remote sensing and its applications.

The IEEE GRSS-YP and the ISPRS SC summer school traditionally occur abroad every year and mainly features the integration of students and researchers in remote sensing at the regional level. In other words, the regional sections and chapters of the IEEE / GRSS and ISPRS are responsible for organizing the events in their respective countries independently.

In Brazil, the joint event has been organized since 2015 on a yearly basis at the Federal University of Paraná (UFPR) in the city of Curitiba (Paraná). The event shifted to Presidente Prudente in 2016 (Sao Paulo), Lages in 2017 (Santa Catarina), Campo Grande in 2018 (Mato Grosso do Sul) and Sorocaba in 2019 (Sao Paulo).

This year's event was first planned to be hosted in Belo Horizonte in 2020, and due to the current pandemic situation (COVID19), we will have the sixth edition of the event hosted in a virtual way with the theme, "Emerging Trends in Remote Sensing Science and Applied Machine Learning".

The event is organized in several talks every week, starting from October 16 to December 11, with one to two weekly talks. It aims to guide the career of young professionals as well as higher education professionals, students of courses related to the area, and graduate students who make use of Remote Sensing data and images. It consists of lectures and interactive sections given and moderated by prominent professionals who work in companies, teaching/research institutions and in academia.

REGISTRATION IS FREE!

For more details, please visit the official website: http://grss-isprs.dcc.ufmg.br/

Prof. Jantien Stoter

IFOV

IMPORTANT
FOCUSED
OUTSTANDING
VALUABLE

Email Address: j.e.stoter@tudelft.nl | Jantien.stoter@kadaster.nl
Current Position: Professor of 3D Geoinformation at Delft University of Technology and Innovation and consultant at the Dutch Kadaster
Affiliation: 3D Geoinformation Group, Department of Urbanism, Faculty of the Built Environment, Delft University of Technology, Kadaster, Hofstraat 110, 7311 KZ Apeldoorn, the Netherlands
Research Interests and Expertise: 3D modeling, realizing geoinformation innovations in practice

Prof. Jantien Stoter is a full professor, at the Faculty of Architecture and The Built Environment where she leads the 3D GeoInformation group at the Department of Urbanism. She obtained her Ph.D. degree (3D Cadastre) in 2004. For this work, she received the Tienstra award of the Dutch Royal Academy of Science.

She combines her professorship with jobs as a researcher at both the Kadaster and Geonovum. She is chair of the EuroSDR 3D Special Interest Group EuroSDR 3D SIG. She is a member of the Board of Directors of the Open Geospatial Consortium. In December 2016, she became a Principal Investigator at the Amsterdam Institute of Advanced Metropolitan Solutions. Her research interests are 3D, automated generalization and information modelling.

For her research on 5D data modeling she received the prestigious Vidi award of the Netherlands Scientific Foundation (NWO). In addition, she received a Starting Grant from the European Research Council for her project Urban Modelling in higher dimensions (ERC). She is a member of the editorial boards of several journals.

Can you tell us how you started working on 3D geoinformation? What sparked your interest in your current field of study?

That was in 1999 when I started my Ph.D. research on 3D cadastre. At that time, 3D geoinformation was limited to mainly visualization applications. My interest was in the potentials of 3D data beyond visualizations, i.e. in the 3D representations of objects in order to apply the data in 3D GIS applications, and specifically to reflect multi-level property situations in cadastral registrations (the topic of my Ph.D. research). But 3D geoinformation beyond visualization was still in its infancies and interest in 3D applications was limited to academic interests. It has only been a decade since this changed and 3D applications have become common practice.

Can you briefly introduce what 3D GIS is? What do you think is the contribution of 3D GIS in shaping smart city-related developments and in addressing important issues in the society and environment?

3D GIS is the representation of reality in 3D city models containing models of buildings, trees, roads, etc to apply the data in spatial analysis. These 3D models contain both the geometry and semantics of those objects.

3D city models can be used in urban applications, such as urban wind and dispersion simulations, energy studies, noise studies, and various types of analysis that require a planned architectural design to be placed in its context (e.g. line of sight and shadow analysis, clash detection with cables and pipelines underground, impact of wind circulation).

3D city models can offer solutions to urban problems since they provide up-to-date 3D virtual representations of reality that can be used to study the impact of different planning and intervention scenarios in order to make the best decisions for the city. As such, 3D city models have the potential to play a supporting role in shaping the future. The added value of 3D over 2D is evident: Our reality is 3D. Consequently, 3D city models are more capable of capturing the complexity of reality to address important issues in our society and environment.

> *“Our reality is 3D. Consequently, 3D city models are more capable of capturing the complexity of reality to address important issues in our society and environment.”*

Can you share with us one of your projects carried out with 3D GIS that you find most interesting? (Please briefly share the project's overall goal, the geospatial data used, approach, results/ achieved outcome. You may also share the link to your papers).

In general, I find it most interesting to develop and implement technical solutions for real-world applications such as 3D data for noise simulation[1] and BIM-Geo integration for building permit issuing[2]; or to make research results that work on test areas work on countrywide areas (paper accepted for 3D Geoinfo conference, London, September 2020).

Technical innovations regarding 3D data usage that look promising in prototypes and pilots may encounter problems in practice. The problems may be technical (solutions in practice should cover all situations also the exceptions, and performance should still be reasonable), but also organizational and institutional (Who is responsible for the data? How are updates organized? Who finances the solutions? How to equip organizations with the needed (often new) knowledge?).

> *"The challenge is to understand these problems and develop solutions to these in close collaboration with practitioners so that 3D Geoinformation innovations find their way to practice"*

We are now in the era of big data. The remote sensing technologies (space-borne, aerial, ground/ marine-based) have been advancing so much in recent years that they provide us a massive amount of data and information. How do you see this big data impact the future of the 3D GIS domain?

Recent developments have allowed practitioners to easily reconstruct 3D models. 3D data is generated by many organizations, many projects, and a wide variety of applications. Therefore, the main challenges are aligning different 3D city models so that, once collected, 3D data can be reused and, even more importantly, that 3D data about the same area is consistent. This will add significant value to the huge amount of 3D data already being collected and available.

What are the current challenges in the field of 3D geoinformation technology? What are the latest developments when it comes to n-dimensions of spatial data? As part of the Open Geospatial Consortium (OGC), can you tell us how significant is the development of open geospatial standards in the advancement of 3D geoinformation?

Open standards are crucial in the alignment and reuse of 3D data. Several 3D standards have been developed over the years, but implementation is not always straightforward since current standards allow many ways to model a specific situation. Attention for implementation during standardization development, starting from the needs of practitioners and users is crucial to overcome such problems. This will also help to identify the complexity of standards which may make it difficult to support early in the standardization process.

The strength of 3D is the data integration of heterogeneous data: data above and below the surface; data from different domains with different contents and data structures; Geo and BIM data etc. Such data integration is solved within individual software systems, but standardization is important to make this data integration possible beyond individual software systems and applications.

What is your encouragement for the students and young researchers pursuing the research path of 3D geoinformation? Are there any particular skills they would need to develop? What do you think is the role of student organizations in the development of 3D geoinformation?

Specifically for 3D Geoinformation, skills are required that help understanding the 3D data needs from practitioners in order to develop solutions accordingly.

> *"3D Geoinformation is a serving discipline so the willingness and interest to understand real-world contexts and to link to other domains is crucial."*

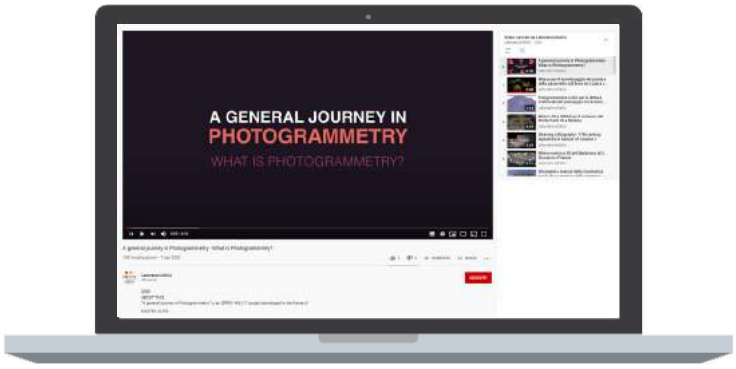
In addition, as in many domains, coding skills have become important to develop solutions with currently available technologies. You cannot start early enough to develop such skills.

[1] Automated reconstruction of 3D input data for noise simulation. Jantien Stoter, Ravi Peters, Tom Commandeur, Balázs Dukai, Kavisha Kumar and Hugo Ledoux. Computers, Environment and Urban Systems 80, 2020, pp. 101424.

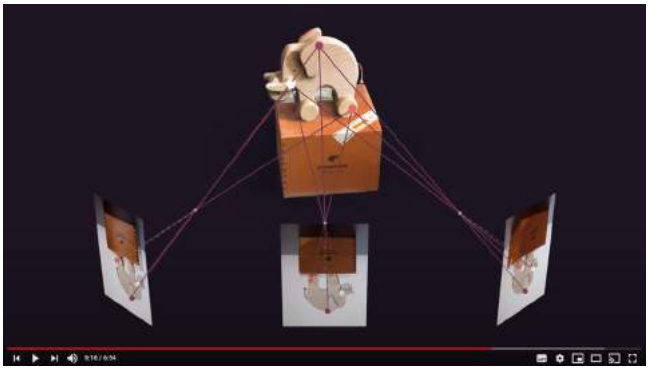
[2] Opportunities and Challenges for GeoBIM in Europe: developing a building permits use-case to raise awareness and examine technical interoperability challenges. F. Noardo, C. Ellul, L. Harrie, I. Overland, M. Shariat, K. Arroyo Ohori and J. Stoter. Journal of Spatial Science, 2019.

NEW EDUCATIONAL VIDEOS *to introduce* PHOTOGRAMMETRY

BY GRAZIA TUCCI



The videos are available on YouTube
(and on the ISPRS website, Education section)



Visual representation support, in the first video of the series, the presentation of the geometrical principles of photogrammetry

TEAM PROJECT:
Grazia Tucci (University of Florence, Italy),
Anjana Vyas (CEPT University Ahmedabad, India),
Vikram Sorathia (Kensemble Tech Labs, India),
Satwant Rihal (California Polytechnic State University, USA) - ISPRS Technical Commission V - Education and Outreach

VIDEO PRODUCER:
GeCo Lab University of Florence (Grazia Tucci, Valentina Bonora, Lidia Fiorini, Erica I. Parisi);

EXECUTIVE PRODUCER: La Jetée

In a world where a variety of apps and software allows us to reconstruct 3D objects and spaces, it seems that "photogrammetry" is a word becoming less and less charming. Everybody can play with a digital camera, or with a smartphone as well, and enjoy, publicize, and share amazing 3D models. For sure, a broader target audience is useful to support research and development in the field; albeit some awareness about "how it works" is needed to ensure high-quality results, as is required in professional activities. The project "Education and training resources on digital photogrammetry" (developed within the 2018 ISPRS Capacity Building Initiatives) aims to produce new educational resources for teaching the latest advances in digital photogrammetry with smart approaches.

The combination of updated learning material and smart teaching approaches has also been tested in the field in different case studies. In fact, another objective of the project has been organizing the TCV pre-symposium tutorial "Ground-based 3D modeling (Close range photogrammetry & TLS)" during the ISPRS TCV Mid-Term Symposium in Dehradun (India, November 2018 - www.isprstc5india2018.org), as a test to apply the above-mentioned teaching methodologies and to draft the new educational resources.

"A general journey in photogrammetry" is a short series of videos that is going to be made available online. The first video "What is photogrammetry" introduces photogrammetry, shows how it supports the production of reality-based 3D models, and simply explains its geometrical principles. The second video "How to take photos", (coming soon) gives some suggestions on how to correctly take photos for digitizing a small object or a building as well, preparing a good setup for indoor scenes or working outdoors. It also focuses on "metric" models and their accuracy. The last video (work in progress) sums up some tips for taking photos with good image quality, even with low-cost equipment.

The project is a long-term contribution to the ISPRS WG V/1 mission, and its outcomes are going to be shared with the ISPRS community as a starting point to increase and update the Educational section of the ISPRS web site, hopefully boosting some other new contributions to cover different topics. A paper describing it was recently presented at the XXIV ISPRS Congress (*https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLIII-B5-2020/257/2020/isprs-archives-XLIII-B5-2020-257-2020.pdf*).

ABOUT THE AUTHOR

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Grazia Tucci is an Associate Professor of Topography and Cartography at the University of Florence. Her teaching activities include courses on Topography, GIS, Remote Sensing, and Geomatics for Built Heritage and Environment.

Member of the CIPA-HD Executive Bureau and ICOMOS. Since 2016 she is Co-Chair of the ISPRS's WG V/1 "Framework for Multi-level Education & Training – Curriculum Development and Methodology". Director of GECO - Geomatics for Environment and Conservation of Cultural Heritage Laboratory. Chair of the GEORES Conference, whose aim is to bring together researchers in Geomatics and Restoration. Author of more than 200 papers both in national and international journal and conference proceedings.

PHD
Scholarships & Fellowships

(2) PhD Positions - Remote Sensing for Precision Agriculture and Plant Phenotyping
Technical University of Munich
Location: Germany
Deadline: 15 September 2020
Link: https://is.gd/q5vl6t

PhD Position Fully-focussed SAR Altimetry Processing - Application to the Rhine ROFI
Delft University of Technology (TU Delft)
Location: Delft, Netherlands
Deadline: 16 November 2020
Link: https://is.gd/9r1MTS

PhD student in Close Range Remote Sensing
Swiss Federal Institute for Forest, Snow and Landscape Research WSL
Location: Birmensdorf, Switzerland
Deadline: 02 October 2020
Link: https://is.gd/jAeBFx

PhD in Multistatic SAR Remote Sensing
Cranfield University
Location: UK
Deadline: Ongoing
Link: https://is.gd/IQ71AY

PhD Student in Space Physics
University of Oulo
Location: Finland
Deadline: 15 November 2020
Link: https://rekry.saima.fi/certiahome/open_job_view.html?did=5600&lang=en&id=00009697&jc=1

POSTDOCTORAL
Positions & Jobs

Post-Doctoral Fellowship in Remote Sensing
FAPESP - São Paulo Research Foundation
Location: São Paulo, Brazil
Deadline: 15 September 2020
Link: https://is.gd/tixNGE

Student Research Assistant/HIWI (m/f/x)
Helmholtz-Zentrum für Umweltforschung
Location: Leipzig, Germany
Deadline: 20 September 2020
Link: https://is.gd/kyUrT2

Project assistant in microwave remote sensing, TU Wien
Location: Wien, Austria
Deadline: 24 September 2020
Link: https://is.gd/EZ2F8O

Postdoctoral Investigator (m/f/d) In the area of Ocean Colour Remote Sensing
Helmholtz-Zentrum Geesthacht
Location: Geesthacht, Germany
Deadline: : 30 September 2020
Link: https://is.gd/gphyAp

Postdoctoral Research Associate in Modelling ocean wave–sea ice interactions
University of Adelaide
Location: Australia
Deadline: 11th October 2020
Link: https://careers.adelaide.edu.au/cw/en/job/504570/arc-grantfunded-researcher-modelling-wavesea-ice-interactions

Two postdoc positions at the Netherlands Institute for Space Research, Utrecht
Location: The Netherlands
Deadline: 15 October 2020
Link: https://www.sron.nl/plugins/content/moskt/Browse.php?fDocumentId=133585

Two postdoctoral positions
National University of Singapore
Location: Singapore
Deadline: 15 December 2020
Link: https://ual.sg/openings/

Data Scientist
British Antarctic Survey (BAS)
Location: United Kingdom
Deadline: 20 September2020
Link: https://www.bas.ac.uk/jobs/vacancy/data-scientist-2/

07-09 OCT

THE 5TH INTERNATIONAL CONFERENCE ON SMART CITY APPLICATIONS
SAFRANBOLU, TURKEY
Website: *http://www.medi-ast.org/SCA20/*

31 OCT *to* 02 NOV

UASG-2020
SECOND INTERNATIONAL CONFERENCE ON UNMANNED AERIAL SYSTEMS-2020
GREATER NOIDA, INDIA
Website: *https://www.iitr.ac.in/uasg2020/*

05-06 NOV

23RD ICA WORKSHOP ON MAP GENERALISATION AND MULTIPLE REPRESENTATION
DELFT, THE NETHERLANDS
Website: *http://varioscale.bk.tudelft.nl/events/icagen2020/*

26-27 NOV

5TH WORLD CONGRESS ON DISASTER MANAGEMENT
NEW DELHI, INDIA
Website: *http://www.wcdm.co.in/ gae2020/*

30 NOV *to* 04 DEC

CLIMATE CHANGE AND DISASTER MANAGEMENT: TECHNOLOGY AND RESILIENCE IN A TROUBLED WORLD
SYDNEY, AUSTRALIA
Website: *http://www.gi4dm.net/2020/*

UPCOMING EVENTS
OCT NOV DEC 2020

Acknowledgement

On behalf of the ISPRS SC Board of Directors, the Newsletter team would like to thank all the contributors and coordinators who generously gave their time and shared their knowledge and experiences in the field of 3D GIS. We would also like to acknowledge all the young authors who presented their papers in the Youth Forum during the ISPRS Congress Virtual Event.

Let us continue to support and care for each other during the COVID-19 pandemic. Stay safe, everyone!

Please visit our ISPRS 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.

ISPRS STUDENT CONSORTIUM

isprs
information from imagery

SPECTRUM

SEPTEMBER 2020