Abstracts

Mapping and Modelling:

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Presentation title: Utilizing a Discrete Global Grid System For Handling Point Clouds With Varying Location, Time, and Scale

Discrete Global Grid Systems (DGGS) have emerged in recent years as a new specification for working with global heterogenous datasets in a Digital Earth framework. This research aims to analyse the extent to which a DGGS can be used to handle point clouds having varying coordinate reference systems, acquired at different scales (densities), and at different times in the creation of the Open Point Cloud Map, the 'OpenStreetMap of point clouds'. The vision of the OPCM is to make point cloud data accessible to anyone, everywhere via an internet connection. This research aims to investigate the suitability of a DGGS for handling point clouds from varying origins in the creation of the OPCM.

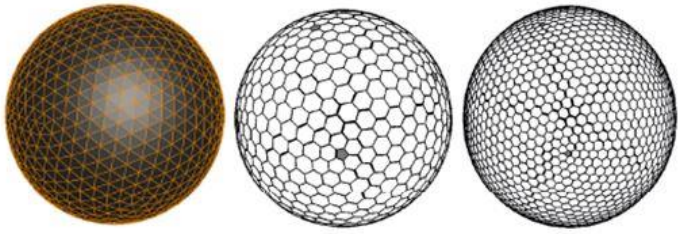

Figure 1: Triangular cells (left), and hexagonal cells at two levels of resolution (middle and right) in a DGGS (DGGS Abstract Specification, 2017)

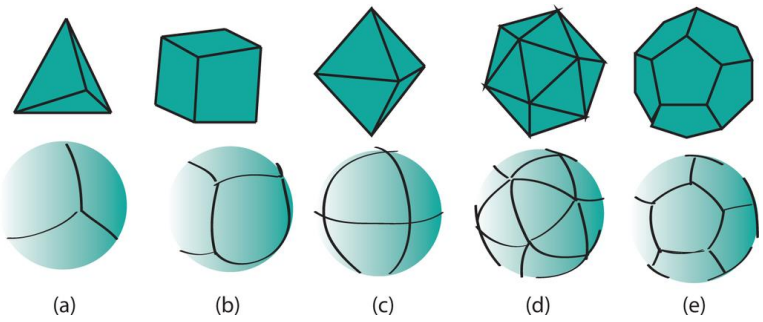

Figure 2: A base polyhedron (top) and its initial equal-area tessellation of the sphere (bottom). The initial equal-area tessellation represents Resolution 0 in the corresponding DGGS (DGGS Abstract Specification, 2017)

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Presentation title: **Visible cadastral boundaries extraction using very high resolution satellite images**

Cadasters together with land registry form a core ingredient of any land administration system. Cadastral maps comprise of the extent, ownership and value of land which are essential for recording and updating land records. Traditional methods for cadastral surveying and mapping often prove to be labour, cost and time intensive: alternative approaches are thus being researched for creating such maps. With the advent of very high resolution (VHR) imagery, satellite remote sensing offers a tremendous opportunity for (semi)-automation of cadastral boundaries detection. In this research, we explore the potential of object-based image analysis (OBIA) approach for this purpose by applying different segmentation methods to identify visible cadastral boundaries.

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Presentation title: **Adaptable dashboard for visualization of Origin-Destination data patterns**

In this research dashboard approach will be applied to represent and to provide insights for users in spatio-temporal patterns of Origin-Destination data. Despite the characteristics of a dashboard which are suitable for data representation, it has some limitations. For example, the layout of a dashboard is fixed and it is not meant for exploration purposes. Therefore, to allow users to access the sub-levels of the information and allow limited exploration possibilities, adaptability through storytelling and exploration approaches will be involved in the dashboard.
To 'illustrate' the approach of an adaptable dashboard two case studies will be involved (Figure 1).

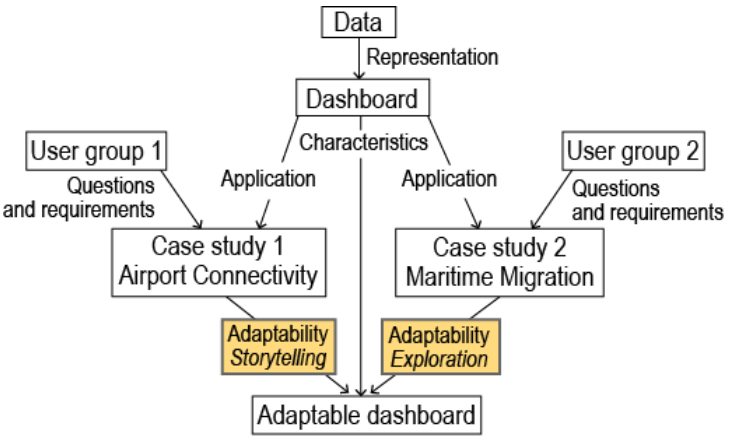

Figure 1: Adaptability involvement in a dashboard

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Presentation title: **Development of a data structure to model semantically rich 3D+LoD GIS data in 4D**

The main topic of this research is about storing different 3D models that represent Level of Details of the same real object, in one 4D model data structure, while maintaining the semantic information of the source models. The challenges of this work are related to the way the original 3D models are linked together, as well as how several different well-established GIS operations on the 2D space can be expanded for the 3D and 4D space.

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Presentation title: **Towards an integrated standards based information model for 1D time series data within the water sector**

Sharing information in a more efficient way is becoming increasingly important. To make this possible in the water sector a platform is needed to facilitate the exchange of information. This platform allows for keeping data at the source, which can be accessed all over the world. The data exchange will become possible when the platform works according the right standards. An integrated model based on existing standards is one of the first steps in achieving better communication and interoperability. The research goal is to design a well defined information model based on standards that will be optimal for implementation in a information infrastructure within the water sector to make the 1D time series data exchange easier.
To create one Standard Based Information Model (SBIM) the international standards that are most recognised are selected and reviewed; ISO 19156 O&M, OGC Timeseries Profile of O&M and WaterML 2.0: Part 1- Timeseries. This is done to get a clear and complete SBIM that gives an accurate insight on both the positive and negative aspects of the existing standards, and will show in one information model the possible relation between them.
The Packet Plan with Packet A uses a totally different approach to the standards. It illustrates that there is no need to implement the total standard in all its richness at once to be able to share data, instead it presents a model with the concept of minimized packets. This is a time efficient process where the implementation of the standard will be in parts, leading to less information at once but divided over the packets. The user will only get the required information for the specific part the user needs at that time, resulting in an easier and more time efficient data exchange.

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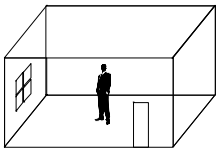
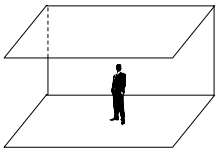
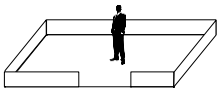
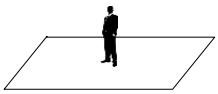
Presentation title: **A Generic Space Definition Assessment Framework for Pedestrian Navigation**

Walking on foot plays a vital role in our lives, because a main part of our lives we move as pedestrians. Compared with other locomotions, walking on foot gives great freedom, since we can move in indoor and outdoor seamlessly, except for the special controlled areas. A variety of services are needed to

optimally move as pedestrians, such as positioning, and navigation, etc. How people can move in spaces is an important aspect in navigation. However, until now the definitions of spaces in which pedestrians can move have not reached an agreement. With that in mind, we classify and define the spaces from the perspective of pedestrian navigation. Firstly, we conclude the definitions from different sources. Then we put forward an assessment framework based on top closure and side closure to define spaces as four types, indoor space, outdoor space, semi-indoor space, and semi-indoor space. Finally, some examples corroborate the feasibility and effectiveness of the definitions.

Environment	Indoor	Semi-indoor	Semi-outdoor	Outdoor
Definition	$T \geq \beta\% \ \& \ S \geq \delta\%$	$T \geq \alpha\% \ \& \ S \in [0,1]$ except $T \geq \beta\% \ \& \ S \geq \delta\%$	$T \leq \alpha\% \ \& \ S \geq \gamma\%$	$T \leq \alpha\% \ \& \ S \leq \gamma\%$
Example				
Scene				
Parameters	T = Top closure	S = Side closure	$0 \leq \alpha \leq \beta \leq 100$ & $0 \leq \gamma \leq \delta \leq 100$	

Proposed Generic Space Definition Assessment Framework for Pedestrian Navigation

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Presentation title: **Exploiting spatiotemporal data for smart city applications.**

Smart cities offer urban environments with large availability of data from sensor networks. However, a common question among city administrators, businessmen and citizens is: How to benefit from exploiting data and increase productivity, efficiency and quality of live? More specifically, how to add utility to data from sensors through the implementation of smart city applications? As part of our work, we looked into the role of spatiotemporal data to monitor dynamic geographic phenomena in smart cities. We characterized its main users, and applied complex event processing as a central component for data abstraction. We will present a system architecture for the development of responsive, event-driven applications, and describe how our approach adds utility to data generated by sensor networks.

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Presentation title: **Supporting indoor navigation using access rights to spaces based on Combined use IndoorGML and LADM model.**

Abstract: This research aims to investigate and design a combined use model of IndoorGML and LADM to define the accessibility of the indoor spaces based on the ownership or the functional right for use. The indoor spaces of each building have different usage functions and associated users. By defining the user types of the indoor spaces, LADM makes possible to establish a relationship between the indoor spaces and the users. LADM assigns rights, restrictions, and responsibilities to each indoor space which indicates the accessible spaces for each type of user. The 3D geometry of the building will be impacted by assigning such functional rights and will provide additional knowledge to path computation for an individual or a group of users. As result, the navigation process will be more appropriate and simpler because the navigation path will avoid all the non-accessible spaces based on the rights of the party.

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Presentation title: **Open Point Clouds: explorative LOD**

In current processes, the steps to be taken and the throughput time of data acquisition, processing, modelling, analysis and visualisation are driven by the information (LOD) model and the user requirements and expectations. Among other issues, at the final stage of this process some of the inherent available information from the acquired data is not taken into account or lost. We use the term “explorative” to indicate the unrevealed possibilities of direct use of point clouds in this geo-processing chain. These point clouds (massive sets of X,Y,Z coordinates and attribute values) are the connecting elements between data acquisition and information retrieval. Thus, the acquired point clouds themselves have to processed, analysed and visualised as much and direct as possible to expose information to all kinds of users.

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Presentation title: Expanding metadata specifications to account for 3D geoinformation

3D datasets have unique metadata needs but current metadata standards do not account for 3D data explicitly. It is missing from INSPIRE and the ISO 19115 metadata standard core. Some elements can be easily accounted for by enhancing existing metadata elements e.g. extending the bounding box to be a 3D bounding box. Other elements need to be introduced, such as the level of detail of a 3D dataset. Additionally, given that 3D data can also be generated in a multitude of ways, e.g. 3D city models have different approaches to modelling roofs, roof type, source of footprint, etc., it is therefore important that these generation methods are catalogued in the metadata.

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Presentation title: **Towards Innovative Geospatial Tools For Fit-For-Purpose Land Rights Mapping**

In large parts of sub Saharan Africa it remains an ongoing challenging to map millions of unrecognized land rights. Existing approaches have proven inappropriate in many cases. Therefore, the main goal of its4land, an European Commission Horizon 2020 project that aims to develop innovative tools inspired by the continuum of land rights, fit-for-purpose land administration, and cadastral intelligence. The innovation process incorporates a broad range of stakeholders and emergent geospatial technologies, including smart sketchmaps, UAVs, automated feature extraction, as well as geocloud services. The aim is to capture the specific needs, market opportunities and readiness of end-users in the domain of land tenure information recording in Eastern Africa.

Figure 1: Prototype user interface for exploring possible alignments of a sketch map with a vector-raster overlay (http://chipofya.staff.ifgi.de/tech4land/alignment_demo.html)

Figure 2: Processing pipeline of simple linear iterative clustering (SLIC) resulting in agglomerated groups of pixels, i.e., superpixels, whose boundaries outline objects within the image

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Presentation title: **Maps and meanings: pealing the cartographic onion of Rebuild by Design**

A wide range of visual representations, e.g. GIS maps, diagrams, photomontages, and 3D models, are used to facilitate communication in participatory landscape planning and design processes. I propose a critical semiotic perspective on design image material, its production, and its reception by different stakeholders, to better understand how different forms of knowledge, intentions, visuals and media influence participatory landscape planning and design processes. This perspective is illustrated using cartographic examples from Rebuild by Design, a participatory design competition organized in New York, USA after hurricane Sandy in 2012.

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Presentation title: **Modelling urban noise in CITYGML ADE: Case of the Netherlands**

The 2002/49/EC Environmental Noise Directive aims to determine the exposure of an individual to environmental noise through noise mapping. One of the most important steps in noise mapping is the creation of input data for simulation. At present, it is done semi-automatically (and sometimes even manually) by different companies in different ways and is very time consuming and error-prone. Here, we present our approach for automatically creating input data for noise simulations. Secondly, we focus on using 3D city models for presenting the results of noise simulations. We implemented a few noise modelling standards for industrial and road traffic noise in CityGML by extending the existing Noise ADE with new objects and attributes. This research is a stepping stone in the direction of standardizing the input and output data for noise studies and for reconstructing the 3D data accordingly.

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Presentation title: **Modelling and mapping tick dynamics using volunteered observations**

Tick populations and tick-borne infections have steadily increased since the mid-1990s posing an ever-increasing risk to public health. Yet, modelling tick dynamics remains challenging because of the lack of data and knowledge on this complex phenomenon. Here we present an approach to model and map active questing ticks (AQT). This approach is illustrated with 9 years of data collected by a group of trained volunteers who sampled AQT on a monthly basis and for 15 locations in the Netherlands. We enriched this unique dataset with a wide array of biotic and abiotic environmental variables before modelling AQT using a time-aware Random Forest regression method. This modelling exercise indicates that water levels in the atmosphere are key to model AQT, and allows mapping daily tick dynamics. This study paves the way towards the design of new applications in the fields of environmental research, nature management and public health.

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Presentation title: **Integration of Open Data Principles and Spatial Information Infrastructure for Participatory Urban Planning Monitoring in Indonesian Cities**

This presentation describes the improvement of spatial information sharing to support participatory urban planning monitoring. The purpose of this research is to design open data governance by integrating open data principles and Spatial Information Infrastructure at the local government (city) level, which can be accessed and updated by the government, business and citizens. The presentation provides the user requirement and user-centered design of open spatial information infrastructure

and participatory urban planning monitoring for Indonesian cities. It shows how the policy is open for spatial information-mediated updates to support participatory urban planning monitoring and to improve citizen participation in the process.
