September 11th 2020 – 3DGeoInfo Day 3

Session 13 - 3D Data Creation - 8.30am – 10.00am

Paper # 27 Exploration of open data in Southeast Asia to generate 3D building models

Authors: Filip Biljecki, National University of Singapore, Singapore

This article investigates the current status of generating 3D building models across 11 countries in Southeast Asia from publicly available data, primarily volunteered geoinformation (OpenStreetMap). The following countries are analysed: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam. This cross-country study includes multiple spatial levels of analysis: country, town, and micro-level (smaller neighbourhood). The main finding is that authoritative data to generate 3D building models is almost non-existent while building completeness in OpenStreetMap is highly heterogeneous, yielding location-dependent conclusions. While in general just a fraction of mapped buildings has height information and none of the administrative areas provides sufficient information to generate 3D building models, on a micro-level some areas are fully complete, providing a high potential to generate 3D building models on a precinct scale, which may be useful for certain spatial analyses. Furthermore, some areas have high building completeness, requiring only half of the work necessary for the extrusion: the collection of building height attributes. As a part of this work, a semantic 3D building model of a selected set of buildings in Singapore has been generated and released as open data (CityJSON), and the developed code was open-sourced.

Paper # 40 Future 3D view of land and property information in Northern Ireland

Authors: Gareth Young, Ordnance Survey of Northern Ireland, United Kingdom; Ryan Hutchinson, Ordnance Survey of Northern Ireland, United Kingdom

Land & Property Services (LPS) was formed by the merger of four former agencies: Ordnance Survey of Northern Ireland (OSNI), Land Registry, Valuation Agency and Rates Collection Agency. The aim of the merger was to realise efficiencies in service delivery via a single land and property service organisation. LPS plays a vitally important role in supporting economic development in Northern Ireland including collecting approximately £1.3 billion of rates revenue helping fund vital public services. Due to the services provided, LPS has a wealth of data relating to both land and property within Northern Ireland. All of the data held by the organisation has a spatial component and can be related to Ordnance Survey mapping, either by being overlaid on the topographic map base or through a property address. However, OSNI's mapping products are currently collected and stored in 2D with buildings and land parcels being represented by their footprint with a single identifier associated with each real world feature. This makes it difficult to identify and visualise high rise and multi-functional buildings and the information associated with them as it does not allow for the representation of floors, divisions within a floor or representation across multiple floors. Also all this data is currently held within separate line of business legacy systems which has prevented it from being shared across the organisation. As a result, LPS has embarked on a digital transformation programme within the organisation to replace three of its large legacy systems (land registration, valuation and rating) over the next 5 years; with an aim to becoming more effective, efficient and to improve service delivery to clients and citizens. OSNI has a fundamental role to play in this transformation programme as their mapping and address data will be used as the framework for joining these disjointed datasets together and for visualising a single view of all the relevant land and property information. With this in mind,

OSNI initiated a project during 2019 to investigate 3D building modelling and to look at innovative ways of meeting the needs of LPS as an organisation into the future.

Click here for full abstract

Paper # 44 Photogrammetric 3D Information Systems for the Management of Models of Cultural Heritage

Authors: Luigi Corniello, Dipartimento di Architettura e Disegno Industriale, Università degli Studi della Campania "Luigi Vanvitelli", Italy

The research on 3D photogrammetric information systems, for the management of digital models of Cultural Heritage, addresses several objectives in the field of digitization and three-dimensional modeling of heritage. The study is conducted through detailed and accurate photographic and iconographic documentation, survey and digital documentation with accessible models. The present work, therefore, proposes to document and reconstruct graphically, the historical evolution of the Hvar Tvrdalj Fortress in Croatia through a series of digital drawings, but especially 3d photogrammetric modeling systems of outdoor spaces. Particular attention was paid to the digital modeling activities of the fishpond, located inside the fortified structure. The activity of representation of the Fortress of Hvar Tvrdalj was set up by providing, in an initial phase, the execution of a basic survey extended to the architectural organisms and the surrounding green space in order to define a first two-dimensional geometric model; then, in a second phase, were made the survey graphs and the consequent graphic restitution with the measurements of architectural details and the complete survey of the inner tank. The research, therefore, presents for the first time, a scientific study of photogrammetric digital survey developed through the creation of 3D digital models on a structure of great architectural and landscape interest, as well as a cornerstone of the island of Hvar for local tourism.

Session 14 – Keynote, NMCA/EuroSDR 1 - 10.30am – 11.15am

Paper # 21 A Multi-Perspective Approach to Interpreting Spatio-Semantic Changes of Large 3D City Models in CityGML using a Graph Database

Authors: Son H. Nguyen, Technical University of Munich, Germany; Thomas H. Kolbe, Technical University of Munich, Germany

In the age of virtualization, rapid urbanization and fierce competition, more and more "digital twins" of real cities are being created as a time, cost-efficient and especially user-oriented solution to many problems in urban planning and management. One prominent task is to efficiently detect progresses made by a city based on their virtual 3D city models recorded over the years, and then interpret them accordingly with respect to different groups of users and stakeholders involved in the process. The first half of the problem, namely automated change detection in city models, has been addressed in recent studies. The other half of the problem however, namely a user-oriented interpretation of detected changes, still remains. Thus, based on the current findings, this research extends the conceptual models and definition of different types of edit operations between city models using a graph database, where the graph representations of city models are also stored. New rules and conditions are then provided to further categorize these changes based on their semantic contents. Considering the different expectations and requirements of different groups of users and stakeholders, the research aims to provide a multi-perspective interpretation of such categorized changes.

Paper # 52 Generating, storing and disseminating a countrywide 3D model

Authors: Balázs Dukai, Delft University of Technology, Netherlands; Ravi Peters, Delft University of Technology, Netherlands; Tom Commandeur, Delft University of Technology, Netherlands; Teng Wu, Delft University of Technology, Netherlands; Hugo Ledoux, Delft University of Technology, Netherlands; Tony Baving, Kadaster, Netherlands; Marc Post, Kadaster, Netherlands; Vincent van Altena, Kadaster, Netherlands; Willem van Hinsbergh, Kadaster, Netherlands; Jantien Stoter, Delft University of Technology, Netherlands

As in many countries, in The Netherlands governmental organisations are acquiring 3D city models to support their public tasks. However, this is still being done within individual organisation, resulting in differences in 3D city models within one country and sometimes covering the same area: i.e. differences in data structure, height references used, update cycle, data quality, use of the 3D data etc. In addition, often only large governmental organisations can afford investing in 3D city models (and the required knowledge) and not small organisations, like small municipalities. To address this problem, the Dutch Kadaster is collaborating with the 3D Geoinformation research group at TU Delft to generate and disseminate a 3D city model covering the whole of the Netherlands and to do this in a sustainable manner, i.e. with an implementation that ensures periodical updates and that aligns with the 3D city models of other governmental organisations, such as large cities. This article describes the workflow that has been developed and implemented.

Session 15 - NMCA/EuroSDR 2, Closing - 1pm – 2.30pm

Paper # 31 National 3D City Model Production

Authors: Joonas Jokela, National Land Survey of Finland, Finland; Nils Mesterton, National Land Survey of Finland, Finland

The National Land Survey of Finland (NLS) is currently working on a new National Topographic Database (NTDB). The NTDB digitalizes and unifies the core spatial data themes into one centralized database. As a completely new data type, 3D buildings have been added to the data model. This uniform 3D data will create the basis for the national 3D city model in Finland. The production of 3D buildings is based on a national recommendation for geospatial building and structure data. The goal of the recommendation is to promote interoperability and to increase the harmonization of the geospatial data produced by different actors. This recommendation is aimed to be a common specification among the data producers. The recommendation defines how specific features should be modelled but does not specify which format or standard should be used to model the features. The 3D building data produced by the NLS will be modelled in accordance with CityGML v2 LoD2. As the 3D production will be on a country-wide scale, the process is expected to be as automatic as possible. The NLS tested two different approaches for the 3D production system, a model-based approach and a data-based approach.

Click here for full abstract

Paper # 70 Semantic Representation of 3D City Models: Connecting CityGML/CityJSON to Linked Data

(Abstract to be provided)

Paper # 76 Transforming Authoritative 2D data to a 3D world

Authors: Philip Ridley, 1Spatial, United Kingdom; Seb Lessware, 1Spatial, United Kingdom; Daniel Warner, 1Spatial, United Kingdom

Authoritative data is data that has a mandated use, where it is considered the single source of truth for cases such as legal decisions. This mandated use requires the data to be of high quality, as transparency is key during vigorous investigations on decisions made using the data. As a result, government organisations, primarily National Mapping Agencies have used a variety of methods to ensure that the data is of a sufficient quality. From manual quality assurance checks through to rules-based data management processes. As web-mapping tools on mobiles and platforms such as Google Maps became more popular and easier to access there was a shift in culture where the public expect to be able to access geospatial data instantly, and more importantly for free. Although this data could be argued as not authoritative, government organisations providing authoritative data had to make changes to how they provide authoritative data to meet this change in culture. This work has been done using 2D data, however there is a move towards 3D data. Advances in data capture methods, such as LiDAR, has reduced the cost of capture whilst increasing the accuracy and speed at which 3D data can be captured. The 3D data being captured however is separate to the existing authoritative 2D data which has been captured over many years. While the 2D data has typically high consistency or quality, the 3D data can have better positional accuracy because of automated capture techniques. This mismatch between 2D and 3D data continues to be a problem and validating and aligning the two is important to produce authoritative 3D data. With such an influx of 3D data and an expectation to

be able to use 3D data in an authoritative manner creates a potential problem for authoritative data suppliers. The question is how can organisations move from providing 2D authoritative data with variable positional accuracy to 2D and 3D coherent authoritative data? During this presentation 1Spatial shall share techniques on how government organisations can unify their newly captured 3D data and their authoritative 2D data to create an authoritative high-quality 3D dataset. This approach can use 3D, 2.5D or 2D data to produce an improved and possibly consolidated version of each. Examples might include using 2D building footprints to divide up a multi-single occupancy 3D building into Individual apartments.

Click here for full abstract.

Paper # 78 The Economics of 3D Geospatial Information

Authors: Andrew Coote, Mr, United Kingdom

The use of 3D geo-information has rapidly developed in recent years. Technological advances have driven this evolution and reduced the costs involved in acquisition and processing. Consequently, National Mapping Agencies (NMA's), other public bodies and private entities are all actively seeking to transform their data operations and processes to produce such enhanced products. However, budgetary constraints necessitate a rigorous assessment of costs and benefits before opportunities can be developed. This presentation will cover work undertaken to establish a generally applicable approach for business case analysis to support investment in 3D Geospatial Information. It will explain a 3-stage approach which involves: i) Alignment to Organisational Policy Drivers – why is this important, are we solving the right problem? ii) Value chain analysis – what added socio-economic value will changes to the supply chain deliver? iii) Cost-benefit Analysis – how can we present this value in a form that allows decision makers to objectively compare 3D Geo-information to other investments.

Click here for full abstract.