6th INTERNATIONAL DOCTORAL SEMINAR ON GEODESY GEOINFORMATICS AND GEOSPACE 2022.

List of Abstracts

Author:	Paper title:
Antonio Tupek	GNSS Antenna Absolute Field Calibration System – Development and Initial Testing
Samanta Bačić	The Role of Green Infrastructure in Land Management
Josip Križanović	Modeling land administration system data dissemination processes
Grgo Dželalija	Utility registration implementation model based on LADM
Edivando Vitordo Couto	Agribusiness intensification jeopardizes Amazon Tropical Wetlands

GNSS Antenna Absolute Field Calibration System – Development and Initial Testing

Tupek, Antonio [1]

[1] University of Zagreb, Faculty of Geodesy, Croatia.
E-Mail: antonio.tupek@geof.unizg.hr

Abstract

For high-precision Global Navigation Satellite Systems (GNSS) positioning based on carrier-phase observations, knowledge of the GNSS receiver antenna electrical phase center is crucial. Numerous studies have led to the understanding of the influence of GNSS antenna phase center on GNSS positioning accuracy. With the goal of determining the phase center correction model of GNSS antennas, several GNSS antenna calibration systems are in operation or under development worldwide. The International GNSS Service (IGS) publishes type-mean phase center correction models for almost all geodetic-grade GNSS antennas. However, the type-mean models are not perfect and do not fully reflect the reception characteristics of GNSS antennas. Published scientific research results have shown that depending on the application of individual or type-mean phase center correction models, the results may differ significantly, i.e., the application of individual phase center correction models significantly improves the accuracy of GNSS positioning. The objective of this PhD research is to develop an automated absolute GNSS antenna field calibration system based on a 6-axis industrial robot. Within this presentation, the developed calibration method and initial testing results are elaborated and presented.

Key words: *GNSS, receiver antennas, phase center corrections, industrial robot, absolute antenna calibration.*

The Role of Green Infrastructure in Land Management

Samanta Bačić

Abstract:

The majority of the world's population lives in urban areas, and that number is increasing every day, and due to this accelerated urbanization, there is a decrease in green spaces. As a result, there is air and environmental pollution, increasing climate change, increased consumption of energy and natural resources, and various other environmental problems. One of the ways to solve these problems is the planning of green infrastructure. Green infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services in both rural and urban settings. Green infrastructure sustains clean air and water, and provides many benefits to people and wildlife. Therefore, it is necessary to develop green infrastructure in a planned manner. This represents a great challenge, but it is crucial because green infrastructure supports natural and ecological processes that bring benefits to both rural and urban environments, and as such is necessary for the healthy development of humans and society as a whole. The importance of green infrastructure is recognized at the world level, and numerous legal regulations have been adopted emphasizing that it is necessary to develop green infrastructure in a planned manner. For the implementation of any policies related to urban spaces and the environment, such as the development and implementation of green infrastructure in space, land management measures aimed at sustainable land use are used. Land management is carried out using a land administration system that enables effective land use and conservation, obtaining income from the land and resolving land disputes. Land management includes processes of determining, registering, and disseminating information about the rights, value, and use of land. The development of green infrastructure brings several benefits. In this research, the emphasis is placed on the economic benefits, especially on the increase in the value of land and real estate in well-planned urban areas.

Keywords: green infrastructure, land management, economic benefits, value of land

Modeling land administration system data dissemination processes

Josip Križanović

University of Zagreb, Faculty of Geodesy

e-mail: [*jkrizanov@geof.hr*](mailto:jkrizanov@geof.hr)

Abstract:

Cadastre and other land information registers, or taken together the land administration system (LAS), are public registers founded on the principle of publicity and are obliged to grant access to registered land information to a wide range of users. For LAS to be effective it is required to have well defined static and dynamic components of the system. Static and part of dynamic components of the LAS are defined by ISO 19152, the Land Administration Domain Model (LADM) standard, but for system to be effective and functional, the process optimization is required. Generally, the processes in LAS can be split between registration and dissemination of the data. The aim of this research is to develop model and methodology for modeling land administration (LA) data dissemination processes in compliance with LADM.

LA data dissemination processes are considered to be outdated, as in most cases the digitization of LA data was conducted to match the paper-based system. Additionally, in most LASs the so-called siloed data management is present, meaning that the data is spread across multiple authorities which have their own views of data importance, terminology and processes. These differences could be overcome by employing standards such as LADM.

LADM did not model the processes in its first edition as they were considered to be country-specific. The first edition focused on people-to-land relationships using common vocabulary and concepts. As the scope of LADM is becoming wider, the processes are identified as important and are expected to be included in future editions.

The research which will contribute to the development of this doctoral thesis includes detailed literature review concerning LASs, LA processes and process management methodologies and architectures. Currently, there are no standard process models or methodologies to describe LA processes. Therefore, the goal of this research is expected to contribute to the development of a generic methodology for process modeling and process models for the LA data dissemination processes.

Furthermore, the LA data dissemination processes in Croatia will serve as a starting point when modeling and reengineering the processes. From the developed process models, it will be possible to determine process elements, i.e., actors, activities and input/output data. Process break down will aid in determining process phases and basic activities as well. Additionally, the developed and optimized LA data dissemination processes in Croatia might be compared to process models of other LASs. Finally, the modeling of the processes in Croatia might as well contribute to future developments of Croatian LADM profile.

Key words: LADM, processes, dissemination, modeling

Utility registration implementation model based on LADM

Grgo Dželalija, mag. ing. geod. et geoinf.

Ericsson Nikola Tesla d.d.

e-mail: grgo.dzelalija@ericsson.com, gdzelalij@geof.hr

Abstract

With industrialization and urbanization, the management of data on public utility infrastructure is becoming increasingly important. For example, unsatisfactory data about locations of underground utility cables and pipes could lead to damages during excavations and consequently to accidents and financial losses. Pipeline and Hazardous Materials Safety Administration of United States has reported eight lives lost, 27 injuries and total loss of about 160 million US dollars due to damages to the pipelines during excavation in the period from 2017. to 2019. Different jurisdictions will have different approaches to managing utility infrastructure data, as well as different levels of connection between this data and the data of cadastral parcels and interests on them. Two main types of approaches can be distinguished, national utility cadastres established by regulations and liberal approaches with call centers or other platforms connecting and sharing utility infrastructure data being managed and recorded by utility owners.

ISO standard 19152 Land Administration Domain Model (LADM) is a conceptual scheme that describes land administration systems. LADM models administration of data on the legal properties of infrastructure, while technical properties are left for external registers. Nonetheless, since some jurisdictions consider data about physical features of utility infrastructure valuable and view them as properties that can be owned or leased, they include them in their national profiles. Such applications show that LADM is flexible and can be effective for linking cadastral data with other relevant registers, such as utility cadastre.

This research will develop and propose a concept of implementation of LADM for utility infrastructure that would include classes and attributes to describe data of both legal and physical properties of utility infrastructure. The proposed implementation concept will be developed using UML diagrams and will be tested with data of the utility infrastructure cadastre in the Republic of Croatia. Model will be implemented as postgreSQL database after which utility infrastructure data of electrical, electronic communication, water, heat, gas, oil, and drainage infrastructure will be exported from national utility cadastre into newly created database based on LADM. Furthermore, proposed model for utility registration based on LADM will enable better integration of utility cadastre with other related registers, such as cadastre, registry of buildings and land registry for registering rights, restrictions, and responsibilities on utility infrastructure.

Key words: LADM, land administration, utility infrastructure, utility cadastre

Agribusiness intensification jeopardizes Amazon Tropical Wetlands

Edivando Vitor do Couto[1], Reginal Exavier[2], Marcelo Schmitz[3], Pamela Duran[1], Walter Timo de Vries[1]

[1]- Technical University of Munich, Chair of Land Management, [2]- Universidade de São Paulo, Departamento de Geografia, [3]- State University of Maringá, Graduate Programme in Ecology of Inland Water Ecosystems.

Amazon Tropical Wetlands (ATW) is one of the most productive ecosystems on earth, harboring unique aquatic and terrestrial communities high in biodiversity, play a crucial role in bridging land and water and acting as a cradle of biodiversity, providing countless services to plants, animals and human communities providing multiple ecosystem services such as soil formation, nutrient cycling, primary production, and habitat provisioning (Petsch et al., 2022). In addition, ATW sequesters carbon from the atmosphere through plant photosynthesis and acts as a sediment trap for runoff. However, the progressive advance of anthropic land use has threatened these areas throughout the Amazon basin. Here we evaluate a 35-year time series from 1985 to 2020 to diagnose how the process of land use dynamics has jeopardized Amazon Tropical Wetlands. We used annual land-use and land-cover maps from MapBiomas Panamazonia Collection 3.0 at 30m spatial resolution covering the whole study region and performed the R package OpenLand: Quantitative Analysis and Visualization of LUCC (Land Use and Cover Change; Exavier & Zeilhofer, 2020). An Intensity Analysis quantifies the behavior of a categorical variable across several time intervals to measure the degree to which changes are non-uniform at three levels: The "interval" level denotes the speed of change during each interval as either slow or fast. The "category" level determines the land categories that are relatively dormant versus active in terms of loss and gains during each time interval and if this pattern is stable across intervals. The "transition" level computes the size and intensity of each transition from one category to another during each time interval. Our results show that from 2018 to 2020 there was a greater intensity of changes in the landscape, the natural land cover classes were the ones that lost the most net area over time while the Farming class was the one that had the greatest net gains. At the category level, it was possible to identify that the intensity has been faster since 2018 and at the transition level, we identified that natural classes such as Forest Formation and Wetland have systematically lost area to agriculture. Therefore, actions to preserve the Wetland and its adjacent areas throughout the Amazon basin are urgent, as these areas are threatened by the rapid advance, mainly of agriculture.