

Modelling of the temporal changes of the green infrastructure in urban digital twins

Summary

The PhD project focuses on the modelling and the visualization of green infrastructure in urban digital twins. It will explore the new opportunities and use cases related to the algorithmic modelling of urban nature, especially from the point of view of urban planning and citizen engagement.

Research field:	Building and civil engineering and architecture
Supervisor:	Prof. Dr. Fabian Dembski
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

Description

Supervisors:

Supervisor: Fabian Dembski, professor of Digital Participatory City Planning, Academy of Architecture and Urban Studies, TalTech, Estonia

Co-supervisor: Pia Fricker, professor for Computational Methodologies in Landscape Architecture and Urbanism, Aalto University, Finland

The Academy of Architecture and Urban Studies at Tallinn University of Technology (TalTech) invites applicants to apply for a 4-year PhD position in the field of architecture and urban studies. The PhD student will join the GreenTwins project (2021–23). The PhD project will continue after the project is finalized in May 2023.

This PhD position is full-time and fully funded as part of the GreenTwins pilot project, which is developed as part of the establishing of a new multidisciplinary Smart City Centre of Excellence and carried out in the framework of the project "Smart City Centre of Excellence" financed by the European Regional Development Fund and the Estonian Ministry of Research and Education. GreenTwins is a collaboration between TalTech, Aalto University, City of Tallinn, City of Helsinki and High-Performance Computing Centre Stuttgart. The four-year PhD position will make it possible to conduct research under the supervision of experienced professors and in a multidisciplinary team of motivated researchers.

The GreenTwins project

The GreenTwins project contributes to the development of participatory urban planning, which relates to one of the global Sustainable Development Goals (SDG 11) provided by the United Nations. The on-going development of urban digital twins (UDT) is creating new opportunities for better citizen engagement and the improvement of democratic processes in the civic society.

This project builds upon the internationally recognized research excellence on digital participatory planning practices at Aalto University and the cutting-edge knowledge of High-Performance Computing Center Stuttgart in applying UDTs in participatory planning processes in Central Europe.

GreenTwins works on a knowledge gap recognized in UDTs: the representation of environment in UDTs is limited concerning the green infrastructure, which is one of the most important quality factors of urban environment.

The GreenTwins project develops a layer of green infrastructure in urban digital twins of Helsinki and Tallinn, and produces three new user interfaces to them in order to harness the potential of urban digital twins in advancing planning processes and democratic decision-making.

Description of the PhD project

The PhD project focuses on the modelling and the visualization of green infrastructure in urban digital twins. It will explore the new opportunities and use cases related to the algorithmic modelling of urban nature, especially from the point of view of urban planning and citizen engagement.

Examples of relevant questions that the proposed PhD project could address:

- How can green infrastructure be integrated into digital twins and how can this "living" layer be extended to include analyses, simulations and their visualization?
- Which factors in plant structure and life cycle need to be modelled realistically in digital twins, to capture what is essential in green areas to citizens in terms of urban planning?
- What kind of processes could combine agile methods with user-centered activities, usability studies and action research?
- Does the green digital twin improve planning processes in terms of valuable resources and factors such as urban climate, quality of stay and biodiversity?
- How can the data produced by citizens be brought to the official urban planning process in a usable and useful manner?
- What are the benefits and limitations of onsite versus online methodology in public participation?
- How can digital tools contribute to the democratization of urban planning and, specifically, to the self-organization of stakeholder groups in urban planning?
- In what ways can digital planning support technology support societal transition towards human-centered smart cities?

Requirements

The applicants are required to fulfil the following requirements:

- A university degree (M.Sc.) in the field of architecture, landscape architecture or other discipline relevant to the topic;
- Experience in analyzing urban data in geographic information systems (GIS);
- Experience in collecting urban data from different public and private databases;
- Basic or advanced computing and 3D-modelling skills related to modelling of urban environment.
- Proven ability to carry out independent research and to work as a part of a broader team. In addition, the PhD student is required to have a strong interest in the presentation and publication of scientific results in high-quality scholarly journals.
- Good command of the English language (verbal and written).

Experience and skills in the following topics are considered positive:

- Experience in modelling of green environment;
- Usage of city data and city model sources;
- Interest in and knowledge of game engine technologies;
- Interest in and knowledge of virtual reality as a participatory tool.

The PhD student is expected to work full time for a duration of 4 years as a part of the Academy of Architecture and Urban Studies and the PhD program of the School of Engineering.



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