The Kaunas University of Technology Monitors Real-time Building Energy Use within a City-scale Digital Twin

The Team Can Optimize Energy Use and Determine How to Incorporate Renewable Generation

Building a City-scale Digital Twin
As part of the Kaunas University of Technology's mission to conduct leading research that contributes to global scientific knowledge, the university's Smart Cities and Infrastructure (CSCI) team moved to create a city-scale digital twin. This digital twin would not just encompass the university itself, but also the Old Town and central areas of Kaunas, the second-largest city in Lithuania. Though city-scale digital twins have the potential to produce many benefits, the team was interested in incorporating an array of leading technologies, including the ability to analyze indoor climate conditions and optimize building energy consumption.

Incorporating Numerous Technologies
To meet the project goals, CSCI needed to use reality scanning, including photogrammetry and LiDAR, Internet of Things sensors, and machine learning. Previously, the team used 2D GIS data for designs, which limited accuracy and would make modeling the surrounding environment time-consuming and difficult. Though CSCI wanted to shift to 3D data, they realized that incorporating all the features they required, including the building climate analysis functionality, would require many different applications, potentially causing compatibility problems. The team needed an intuitive, unified platform to meet the goals of their city-scale digital twin.

Low-carbon Reality Modeling
After studying various options, CSCI determined that the Bentley iTwin platform, as well as Bentley applications, could help them develop a unified city-scale digital twin with the energy analysis features they needed. First, they used drones to scan the city of Kaunas, obtaining a high level of detail while reducing the project's carbon impact compared to in-person scans. The team then created a 3D mesh model of the city, including detailed information about the contents of each building. For university facilities, sensor data captures air pressure, humidity, indoor air quality, temperature, and carbon dioxide levels in real-time, allowing users to easily monitor conditions within the digital twin.

Optimizing Building Energy Use
CSCI produced a dynamic, detailed digital twin that showcases the university and the surrounding city. By obtaining detailed, real-time sensor data into university buildings and feeding that information into the digital twin, the university can determine how to reduce the energy use and environmental impact of facilities while improving the working environment for employees and students. The team plans to use the digital twin to determine how to incorporate renewable energy sources, including solar panels, into the university grid. Additionally, the

digital twin can provide virtual tours of the campus, encouraging potential students to enroll and pursue advanced degrees.

Project Playbook: ContextCapture, Descartes iTwin, LEGION, LumenRT, MicroStation, OpenBuildings, OpenCities Planner

Outcome/Facts:
- The Kaunas University of Technology wanted to produce a city-scale digital twin that included information on the conditions and energy use within buildings.
- They used Bentley technology to seamlessly incorporate an array of technologies within the digital twin, giving it the flexibility to support numerous initiatives.
- The university can now use the digital twin to reduce energy use at the campus and determine how to effectively incorporate renewable energy sources.

Quote: "The Kaunas University of Technology is aiming to develop a smart campus ecosystem, where university infrastructure is used for education, research, and innovation. This ecosystem goes beyond the university campus and extends to Kaunas city as well. – Darius Pupeikis, Head of Centre for Smart Cities and Infrastructure, Kaunas University of Technology

Image Link: https://cdn2.webdamdb.com/1280_EZtccg9ead23QrVN.jpg?1671635809

Image Caption: The Kaunas University of Technology produced a city-scale digital twin that includes information on the conditions and energy use within buildings. *Image courtesy of Kaunas University of Technology.*

Author: *Prathamesh Gawde is a senior product marketing manager at Bentley Systems. He can be reached at prathamesh.gawde@bentley.com.*