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Digital Twin for University Campus: Workflow, Applications and Benefits

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Abstract : The ubiquity of data gathering and smart technologies, advancements in virtual technologies, and the development of the internet of things (IoT) have created urgent demands for the development of frameworks and efficient workflows for data collection, visualisation, and analysis. Digital twin, in different scales of the city into the building, allows for bringing together data from different sources to generate fundamental and illuminating insights for the management of current facilities and the lifecycle of amenities as well as improvement of the performance of current and future designs. Over the past two decades, there has been growing interest in the topic of digital twin and their applications in city and building scales. Most such studies look at the urban environment through a homogeneous or generalist lens and lack specificity in particular characteristics or identities, which define an urban university campus. Bridging this knowledge gap, this paper offers a framework for developing a digital twin for a university campus that, with some modifications, could provide insights for any large-scale digital twin settings like towns and cities. It showcases how currently unused data could be purposefully combined, interpolated and visualised for producing analysis-ready data (such as flood or energy simulations or functional and occupancy maps), highlighting the potential applications of such a framework for campus planning and policymaking. The research integrates campus-level data layers into one spatial information repository and casts light on critical data clusters for the digital twin at the campus level. The paper also seeks to raise insightful and directive questions on how digital twin for campus can be extrapolated to city-scale digital twin. The outcomes of the paper, thus, inform future projects for the development of large-scale digital twin as well as urban and architectural researchers on potential applications of digital twin in future design, management, and sustainable planning, to predict problems, calculate risks, decrease management costs, and improve performance.

Keywords : digital twin, smart campus, framework, data collection, point cloud
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