GREEN DIGITAL TWIN FOR DYNAMIC SUSTAINABILITY ASSESSMENT

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Abstract

With the increasing concern on climate change, the world is focusing on achieving the Sustainable Development Goals (SDGs). The SDGs are the set of goals that influence every aspect of life. In efforts to achieve the SDGs, the European Union (EU) Green Deal is a roadmap to transform the EU economy by turning the issues into opportunities. The built environment is an important sector that can expedite the process of achieving the SDGs and have the potential to impact other industries as well. The adoption of the green building rating system globally has proved to be a paradigm shift in the construction industry. The demand for green buildings is increasing and with it, the associated industries are also adapting to meet the demands of the green buildings. Typically, standards for evaluating building sustainability have been structured to evaluation categories, each of which includes many criteria and indicators for each criterion. The objective of this research is to develop the Green Digital Twin framework to be executed on all kinds of built environment domains. The aims are to take advantage of the BIM data, IoT, and digital means to change the static checklist of sustainability into dynamic indicators (Energy, air, material, etc), and performance verification in the virtual reality environment by developing Green Digital Twin. The data from the BIM has been analyzed in virtual reality to conduct the credit compliance of LEED credits from the material and resources category. The furniture element's EPDs and recycled content of the building element were verified in the virtual reality. The research proposed a comprehensive framework for the sustainability assessment in which there are several digital twin models for each KPI (key performance indicator). The case study carried out validated the results. The applications of this research are multifaceted as it provided an effective methodology to digitalize the process of credit verification, data visualization, and real-time monitoring of the parameters through the green digital twin. It was concluded that the use of virtual reality in conjunction with digital twin can further expedite the green building certification process and fast credit compliance of green building rating systems.

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doi: 10.5281/zenodo.5705732