Optimization of BIM-based Virtual Reality environments: a workflow proposal

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Abstract

The implementation of pivotal methodologies such as Building Information Modelling (BIM) in the Architecture, Construction, and Operations sector (AECO) draws new opportunities to complement traditional working approaches towards a more technological and collaborative industry.

Still, many stakeholders and industry actors do not possess the necessary skills to operate with BIM models, thus leading to research efforts combining more natural ways of interacting with virtual models. In this regard, Virtual Reality (VR) environments demonstrate several advantages when combined with BIM models, such as the understanding of the overall building space and related construction project specifics otherwise not so easily recognized through non-immersive interfaces. However, developing BIM-based VR environments still faces many hurdles and constraints, particularly when working with process-demanding models (e.g., BIM models holding a vast extent of geometrical elements).

The present paper demonstrates a workflow to improve the development of BIM-based VR environments by addressing current challenges when integrating heavy geometric models into a game engine to achieve a smoother performance and visual quality, thus making them suitable to be used by AECO actors.

Results from a comparative test show that the proposed workflow achieves increased frame-per-second rendering and overall graphics performance. The workflow structure is thoroughly described from grouping and exporting several BIM models from a BIM authoring tool, implementing optimizations within a game engine, and performing virtual walkthroughs.

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