Developing Interactive Virtual Environments for User Tests in the Built Environment and in Facility Operations

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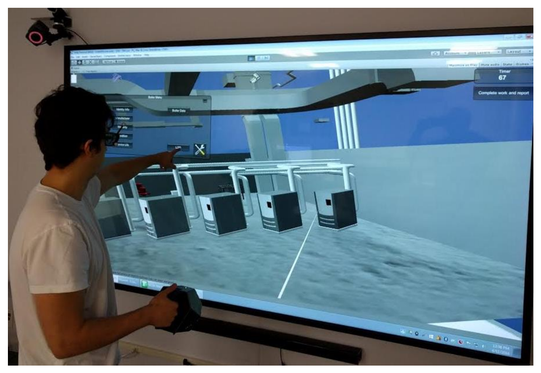
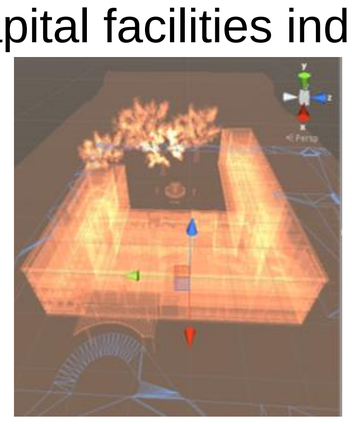
Motivation & Problem Statement

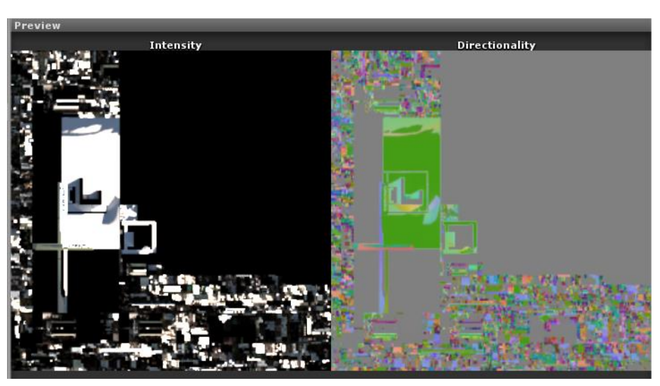
- Building Information Models (BIM) can play a significant role to support facilities management providing facility information in a timely manner.
- Problem:
  - BIM does not allow first person walkthroughs and interactions with objects intelligently;
  - Virtual environments can solve these problems if challenges in the process of converting BIMs to VR environments are identified and the process is streamlined.



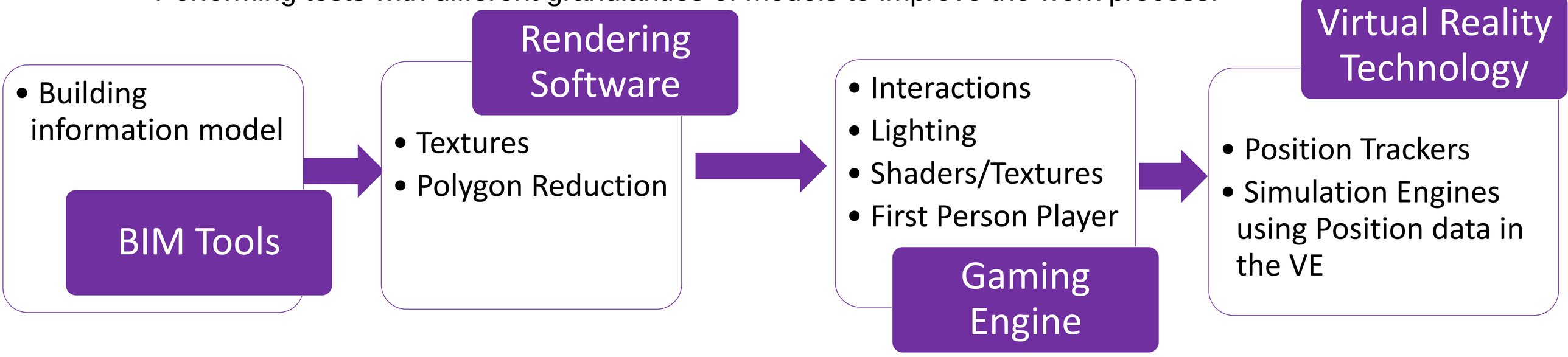
Objective & Research Approach

- Objective:
  - Identification of challenges faced while converting BIMs to interactive virtual environments for use in design, construction and operation of facilities.
  - Formulating a methodology for generating repeatable work processes to streamline the conversion process for implementation in the practice and help capital facilities industry.





- Research Approach:
  - Conducting tests to documenting challenges faced in the conversion process.
  - Performing tests with different granularities of models to improve the work process.



Initial Findings & Expected Contributions

- Data loss in components throughout the workflow;
- Heavier models cause lag in conversion and most importantly during the VE use. Design and game optimization are necessary to create satisfactory VE experience. Several optimization methods are tested, including polygons reduction, lighting system processing and use of occlusion culling;
- Provide real time information in the VE from the building automation system (BAS).
- Expected contributions:
  - A methodology for generating VE from BIMs without semantic information loss and model overloading for visualization.
- References:

  - Nopachinda, S., and Ergan, S. (2016). "Challenges in converting Building Information Models into virtual environments for FM operations and user studies in the built environment."