Towards immersive Urban Digital Twins

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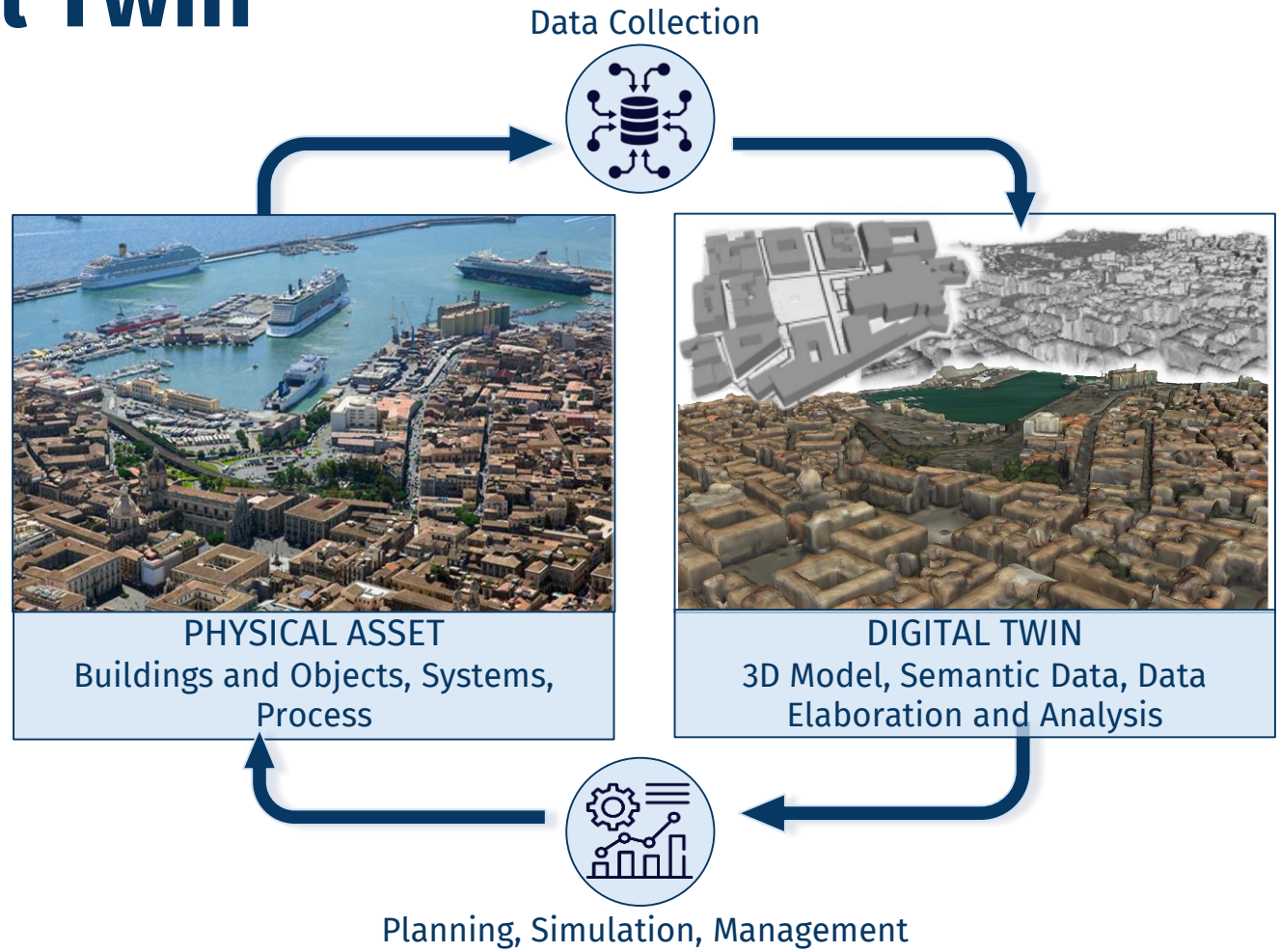
BUILD-IT2023 Workshop

Urban Digital Twin

Virtual representations of physical processes, systems, and subsystems of a city

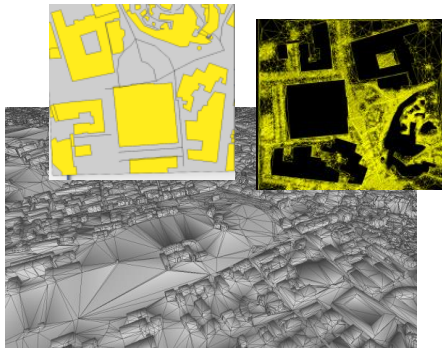
Integration of heterogeneous data for monitoring, predicting, and simulating real scenarios

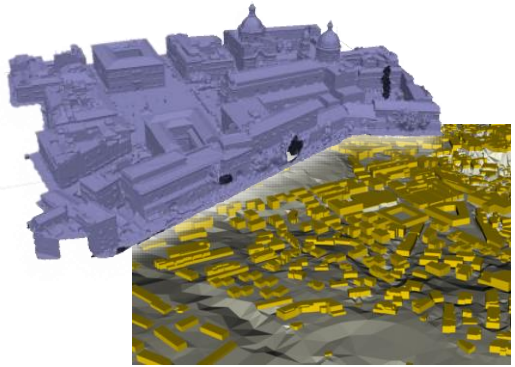


Motivations and Goal

The GEOMETRIC LAYER represents the morphology and the physical features of the city

Acquisition → Processing → **3D Model**





Different Resolutions / Level of Details

Definition of a pipeline for generating a 3D model suitable for VR

- smart tourism management
- virtual tours in non-accessible sites (for specific users or for everybody)
- plan events
- ....

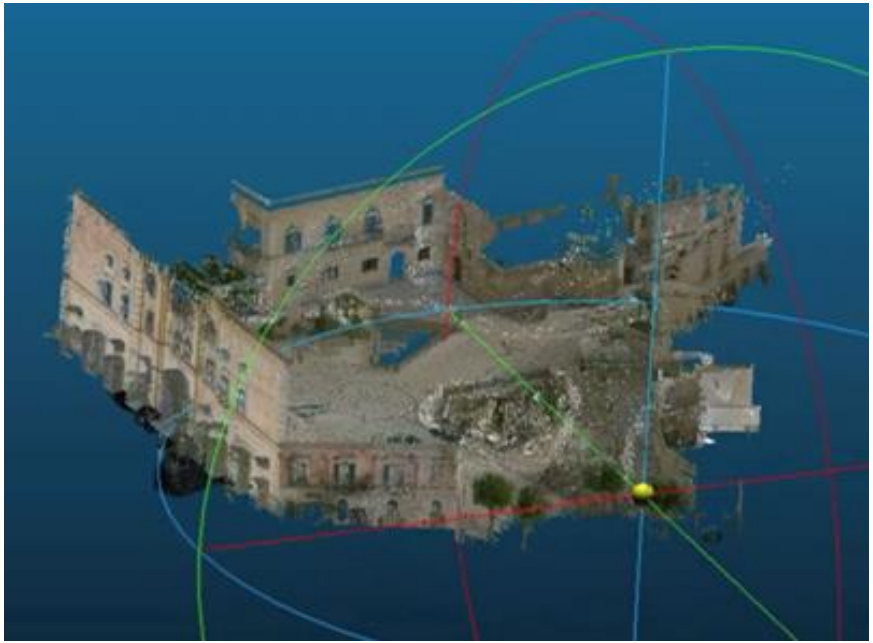
The Data

Leica BLK2Go

ACQUISITION WITH SENSORS

Real data Not-accessible places

Noise and defects

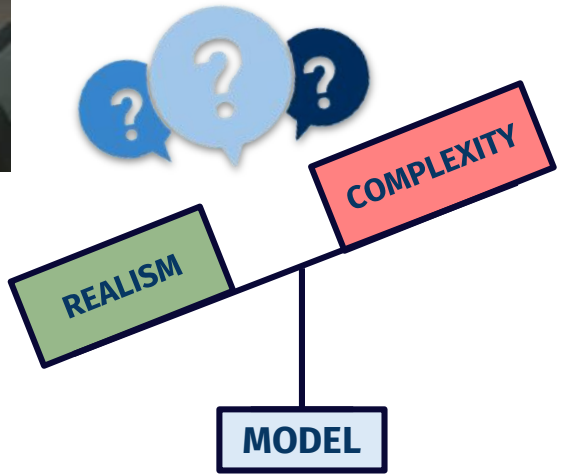


POINT CLOUD
(resolution is one point per mm)

High level of details Complex model

Exploration in VR

Immerse individuals in the city digital twin with a 1:1 scale as if they are in the real city

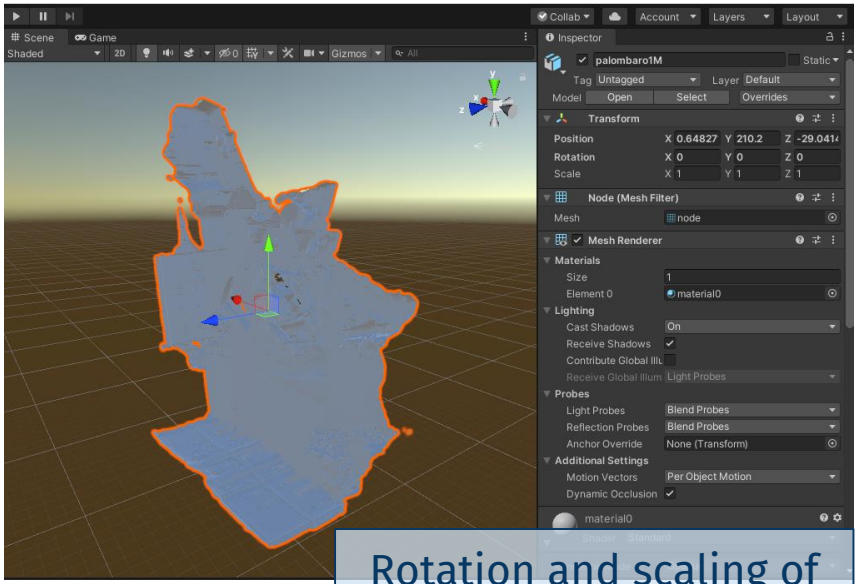


CHALLENGES:

- hardware limits
- ensure realistic experience

Methodology

Unity + Meta Quest 2



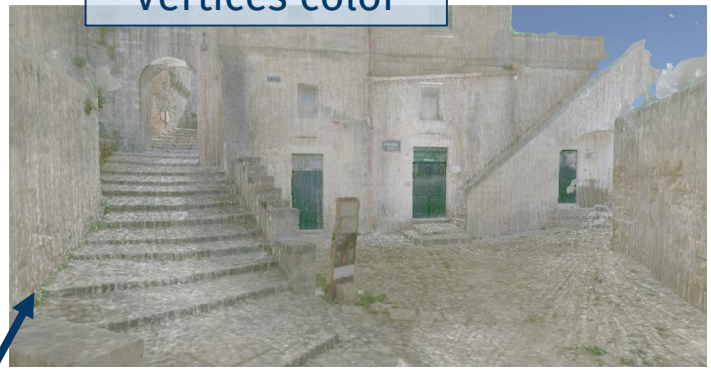
Rotation and scaling of the model

Methodology

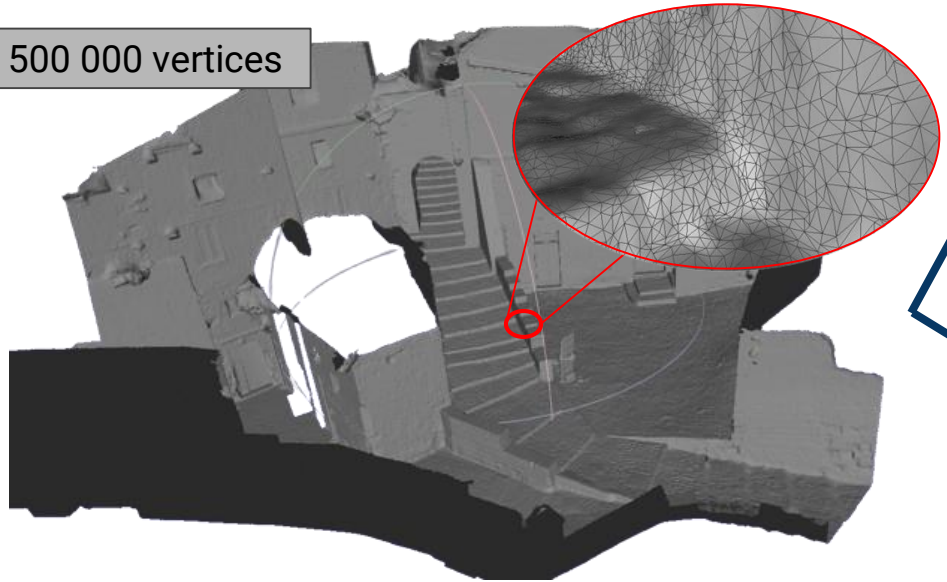
Meta Quest:
limit on number of vertices (<100K)

Unity + Meta

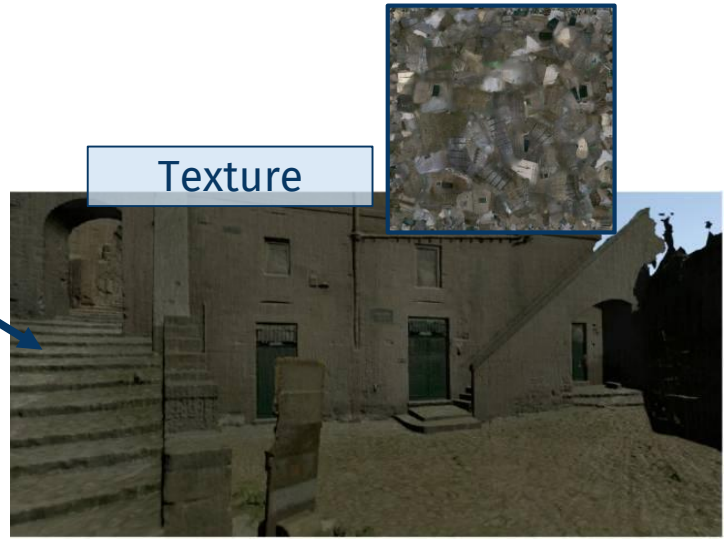
Vertices color



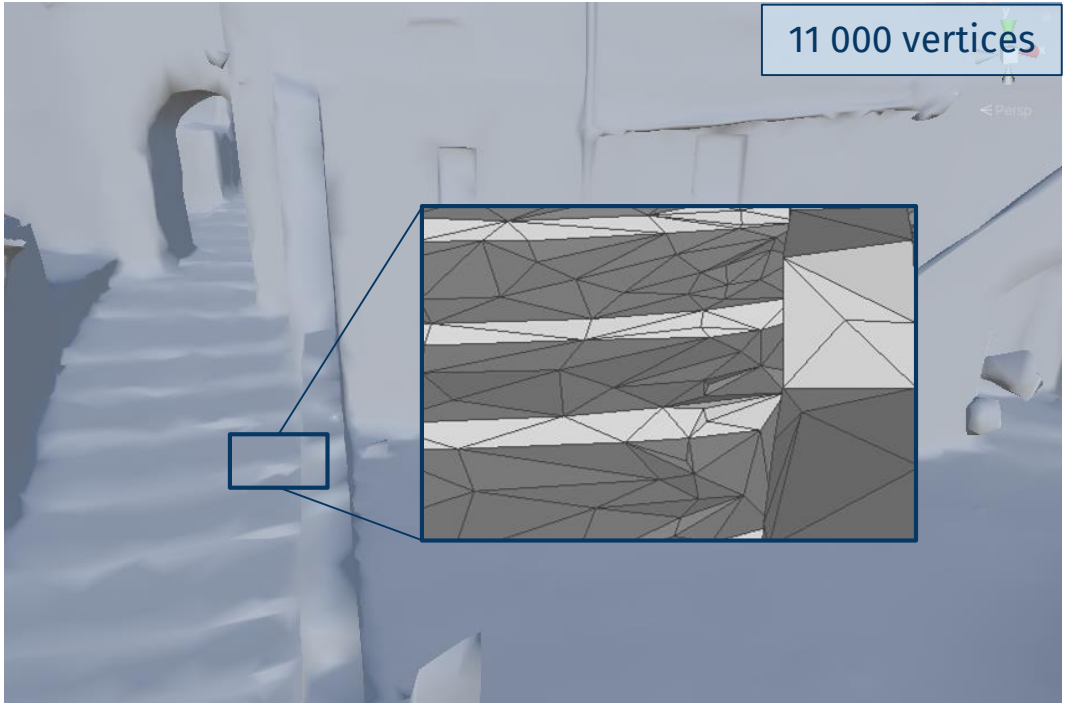
2 500 000 vertices



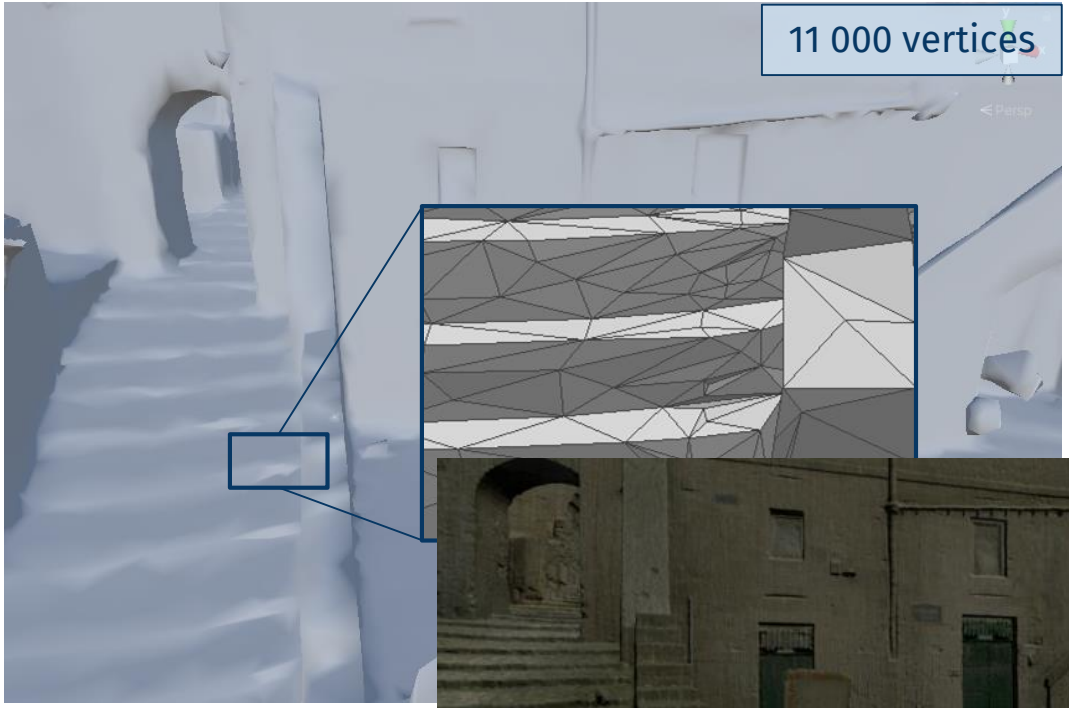
Texture



Test Cases



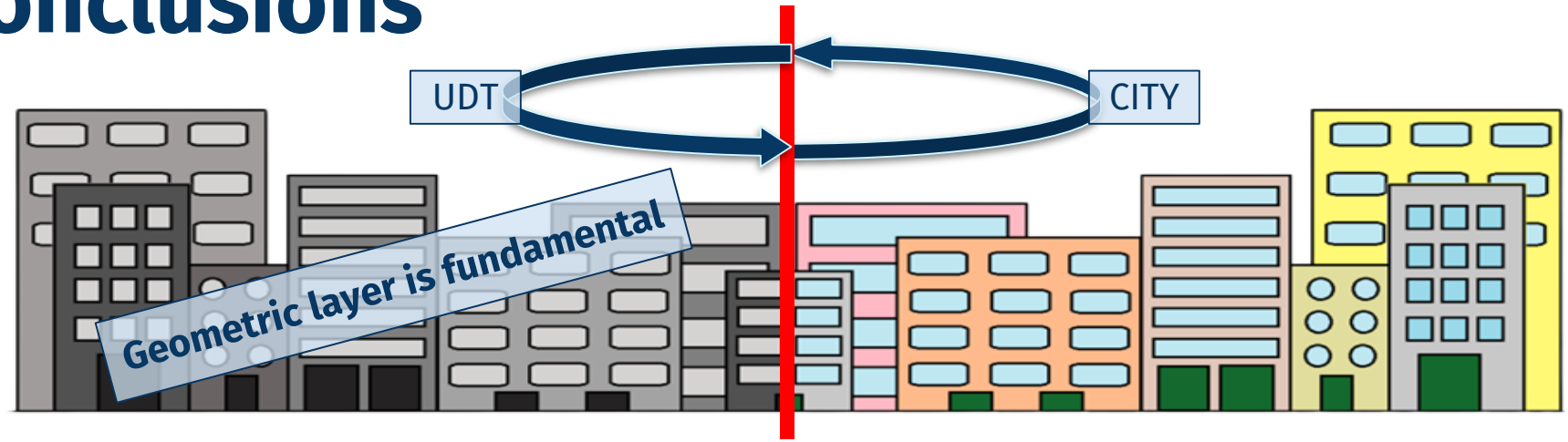
Test Cases



Example

Example

Conclusions



IMMERSIVE DIGITAL TWIN → The computed 3D model is not ready for VR

- [x] Reduce complexity of the model
- [ ] Allow the navigation of the virtual environment
- [x] Ensure realism in the visualization
- [ ] Provide natural interactions and movement

THANK YOU !

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