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Volunteering for the future – Geospatial excellence for a better living



# VRscan3D – an Interactive Simulator for Terrestrial Laser Scanning

**Darius Popovas**, **Thomas Luhmann** (IAPG, Germany), **Denys Gorkovchuk**, **Julia Gorkovchuk** (KNUCA, Ukraine) **Maria Chizhova** , **Mona Hess** (Bamberg University, Germany)

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# VRscan3D – an Interactive Simulator for Terrestrial Laser Scanning

Motivation:

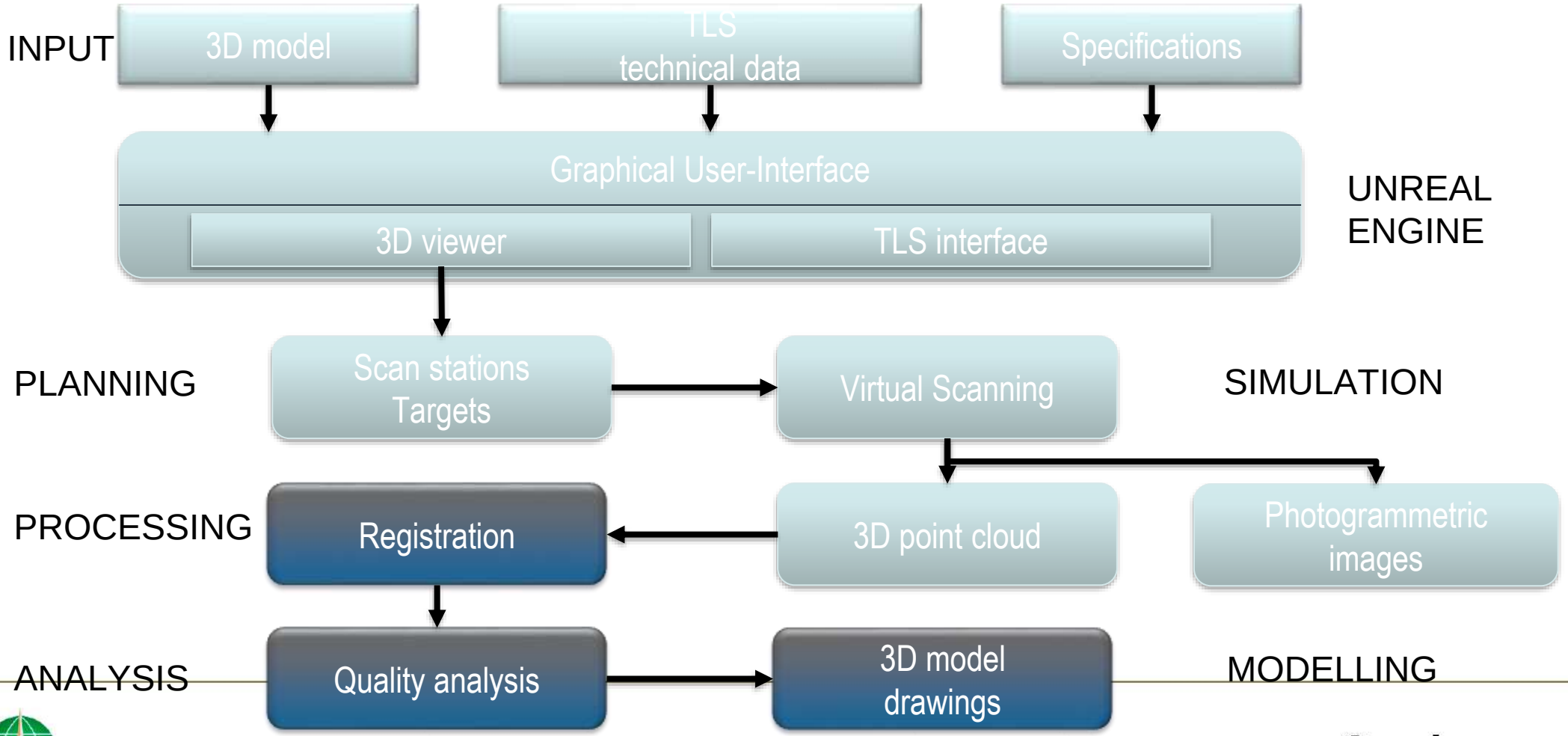
- Virtual devices if no (expensive) instruments available
- Labs may not be accessed (e.g. pandemic)
- Online training of students (and teachers, employees)
- Modern AR/VR technologies
- Gamification of learning processes

# Simulator functionality

- Unreal Engine
- Real-time laser scanning simulation
- Real scanner emulation
- Intensity, color and noise
- Targets
- Integrated BIM and 3D models
- Data export (ptx, E57)


www.vrscan3d.com

# Simulator functionality



# Virtual Environment

- Simulation of real-world objects, i.e., buildings, monuments or sites
- Integration of existing buildings as (reduced) 3D model
- “Scan to BIM” approach can be used to create model. Site can be scanned and modelled using Autodesk Revit or other modelling software.

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Photo of selected object

Scanned and registered pointcloud

# Virtual Environment

- BIM model can be integrated into Unreal Engine environment using the Datasmith importer plugin.
- high-polygonal models cause a significant drop of performance;
- large coordinate numbers might cause a loss in coordinate precision;
- collision generation need to be considered for correct navigation within the model.

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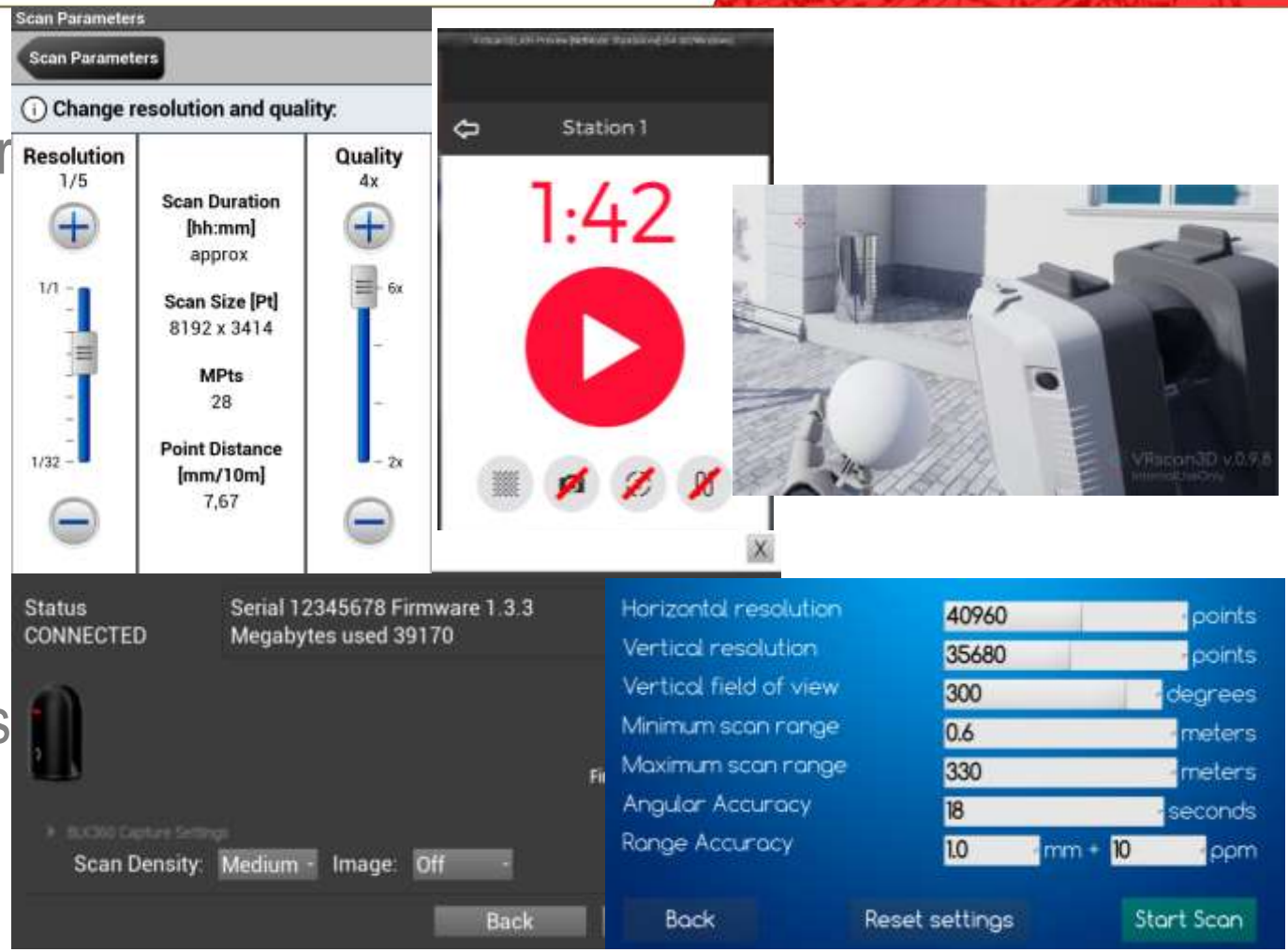
Autodesk Revit model

Model integrated into simulator environment

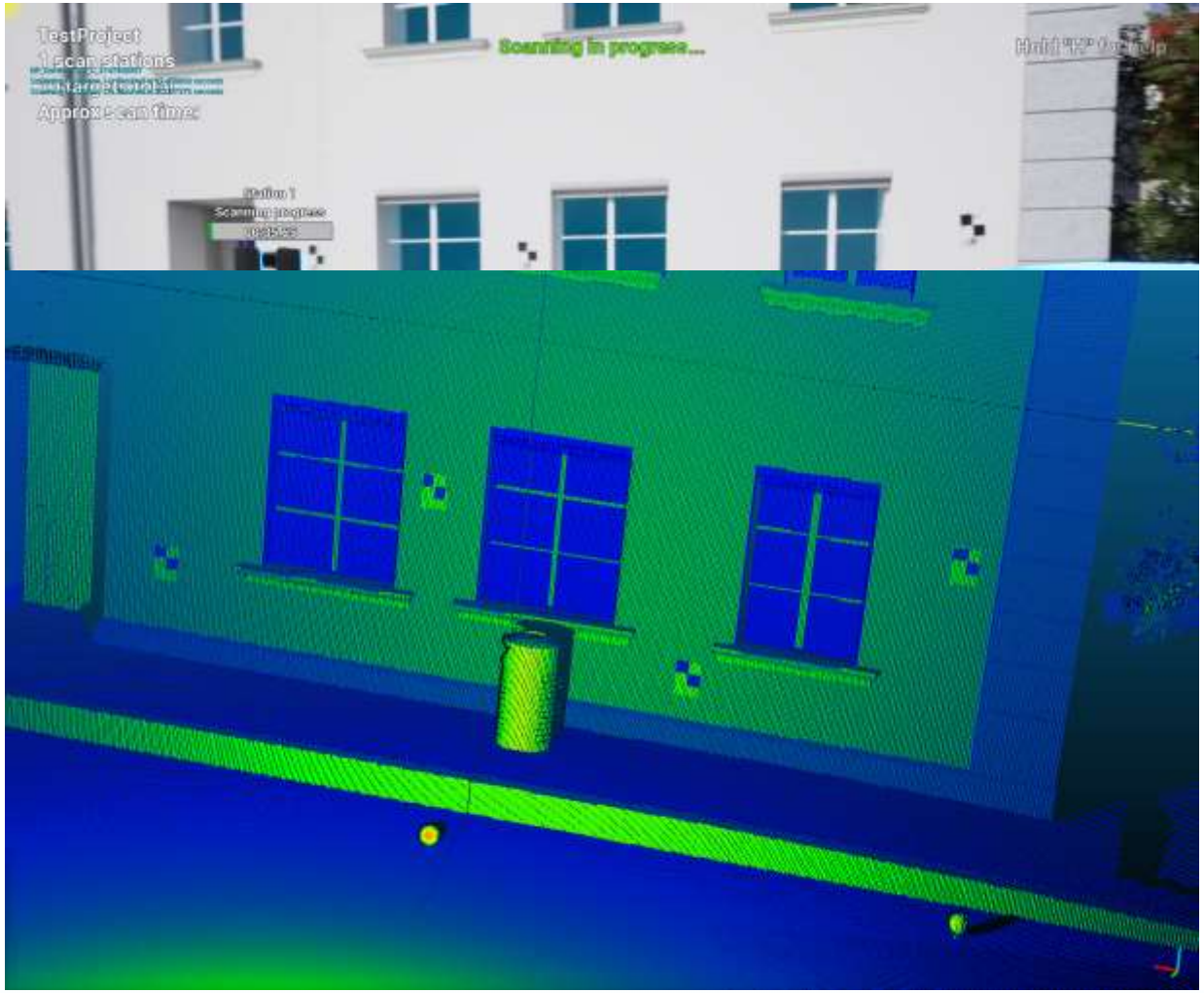
# Integrated scanner models

- The current simulator version offers four integrated scanner models:
  - Generic TLS
  - Faro X330
  - Leica RTC360
  - Leica BLK
- The access to scanner settings is implemented through realistic interfaces
- Resolution, max. range and other parameters simulated according to scanner specifications.



# Scanning process simulation

- Angular grid of rays is projected from the station point. The intersection of the ray with the first surface gives a discrete point, and XYZ coordinates are stored.
- Real-time visualization of projected laser beam
- It is possible to do a batch scanning of several stations simultaneously
- Point clouds with intensity values and noise are simulated



# Further processing of simulated data

- Export of point clouds (registered or not registered)
- Post-processing (cleaning, registration, modelling) in any available point cloud processing software.
- Quality checking (accuracy, completeness), optionally modify scanning plan and repeat

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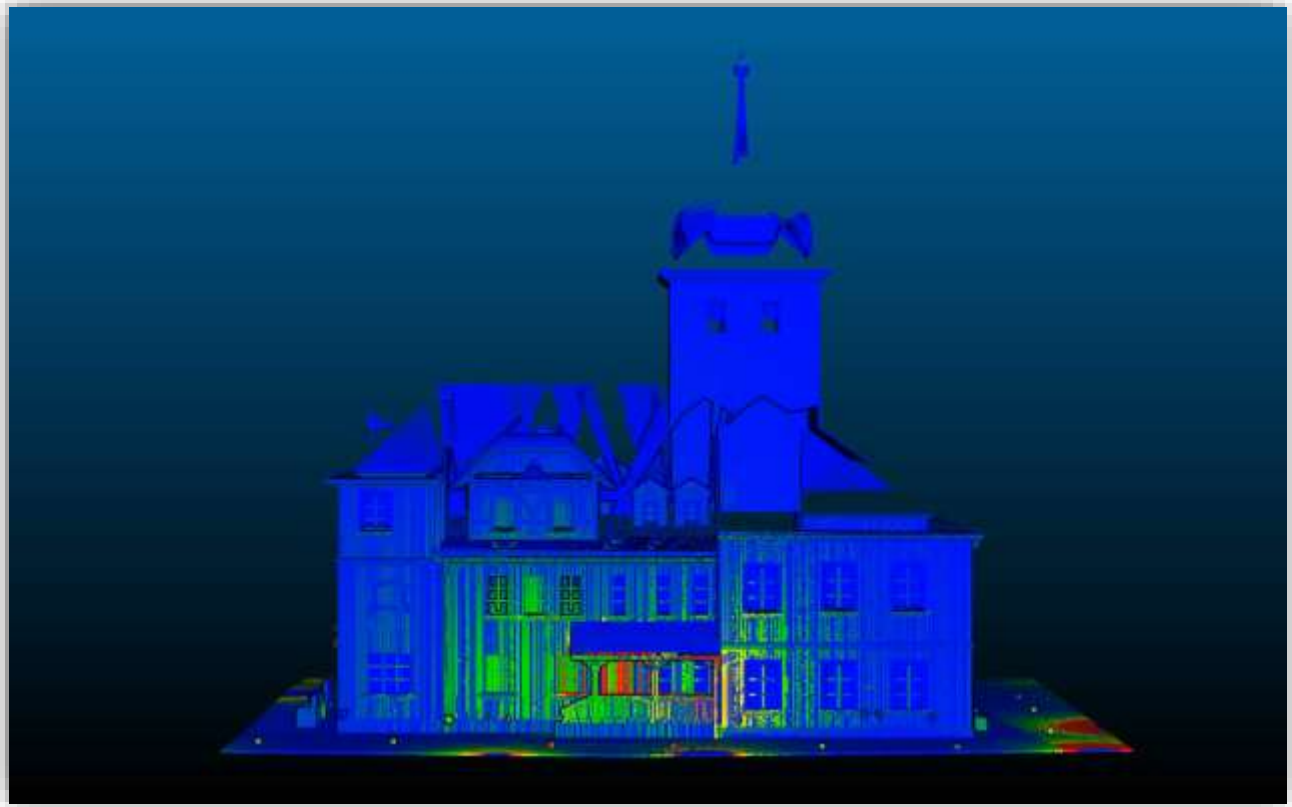

Simulated and registered point cloud

# User tests and future work

- Several user groups performed Beta testing of VRscan3D simulator
- Rigorous qualitative user testing with quantitative questionnaire
- Tease out necessary interface improvements

- Integration in existing or new curricula
- More integrated scenes/3D models
- Serious gaming approach
- More scanner models
- AR/VR glasses

Qualitative user testing of VRscan3D simulator software at the University of Bamberg

www.vrscan3d.com

# Thank you. Questions, comments?

- Try VRscan3D simulator. Download free version from: www.VRscan3D.com