EXTENDED REALITY AND HUMANOID ROBOTICS: NEXTGEN ASSETS FOR REMOTE CB RESPONSE AND OPERATION

Structurally Consistent Rapid Internal Building Estimation (SCRIBE)

Scott Kreyenhagen Aeris, LLC   **Paul Bieringer** Aeris, LLC   **Jordan Lefebvre** Aeris, LLC   **Oscar Lopez** Aeris, LLC
Donovan Quimby, Areis, LLC

Accurate visual representations of environments subjected to chemical and biological (CB) hazards represent consequential information to first responders, allowing them to gain critical situational awareness and training before an operation or response. Scenarios in urban environments and inside buildings amplify this issue, where the details required to replicate the area of operation (AO) accurately may be absent or incomplete. As such, we have recently begun development of the Structurally Consistent Rapid Internal Building Estimation (SCRIBE) system, which integrates a suite of bespoke software, artificial intelligence/machine learning (AI/ML) models, and transport and dispersion (T&D) simulation tools to reconstruct and produce physically consistent 3D building models and T&D simulation inputs/results from multiple data modality types. SCRIBE demonstrates an application that can automatically provide realistic 3D building models for extended reality (XR) systems accompanied by physically consistent single and multi-zone T&D simulation inputs/results in real-time from incomplete and disparate data types. SCRIBE employs AI and ML models to automate tedious and time-consuming processes that previously required human interaction and expertise, such as building feature estimation, object recognition and segmentation, image translation and transformation, and internal floorplan and layout inference. We provide an end-to-end proof-of-concept (POC) capability to demonstrate these technologies for a notional building reconstruction system for three separate input data modalities: 3D architectural files, two-dimensional (2D) building blueprints, and overhead satellite imagery. The outputs of the SCRIBE demonstration are 3D model objects capable of being imported into UnrealEngine 5 (UE5) along with the physically consistent inputs and results of a single-zone ICEBOX and multi-zone CONTAM T&D simulation.