Dynamic Modeling of 3D Urban Terrain with Accurate Topology and Geometry

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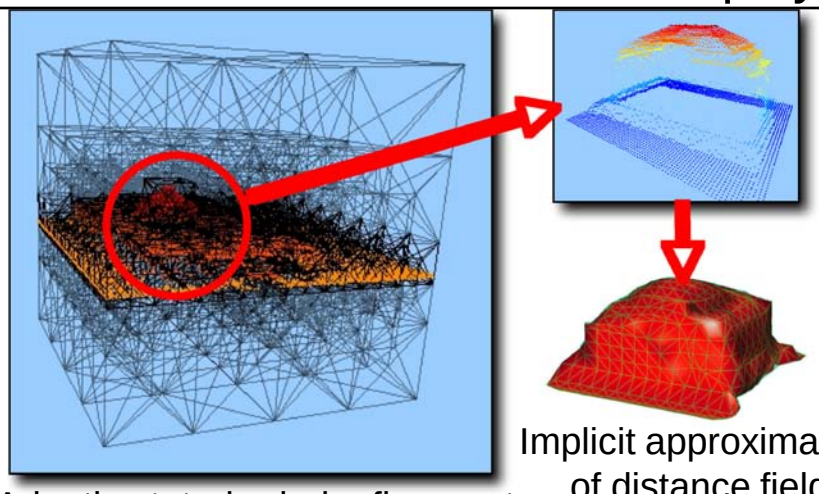

Adaptive tetrahedral refinement of pt cloud occlusions

Implicit approximation of distance field

OBJECTIVE

Develop data representation for effective and efficient processing of large-scale, fully 3D point cloud data

DOD CAPABILITIES ENHANCED

- Situational awareness in complex urban situations
- Rapid line-of-sight and viewshed analysis in urban terrain

SCIENTIFIC/TECHNICAL APPROACH

- Highly non-uniformly distributed point-cloud
- Highly non-Gaussian or unknown probability distributions
- Nonparametric quantification
- Explicit-implicit hybrid approach
- Multiresolution and progressive decoders for variable bandwidth transmission
- Online assimilation and compression
- Local operations for scalability
- Fovial/burn-in capabilities

ACCOMPLISHMENTS (Year 1)

- Developed tetrahedral-based, 3D adaptive occupancy partitions for fast estimation of occlusions, distance field, and isosurfaces
- Implemented GPU algorithms for fast evaluation of Hausdorff distances (20 - 180 times speedup)
- Implemented joint visibility fields from multiple vantage points using level sets of signed distance fields to occlusions.