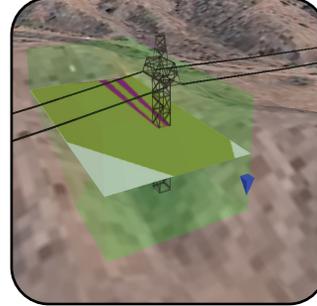


Exceptional service in the national interest



INTERACTIVE SYSTEMS SIMULATION AND ANALYSIS (ISSA) DEPARTMENT

Operations Viewshed (OpShed™)

Visualization & Analysis of Sensors, Paths, & Behaviors for Security & Operations

Visualization and Analysis

The OpShed™ tool suite allows a user to analyze sensors and plan optimal paths in a 3D terrain environment, creating easily-understandable visuals for analysts and decision makers. It allows stimulation of the environment with simulated sensors, vehicles, people, and other objects to understand operations and areas of sensed coverage, or viewsheds. OpShed™ maps high and low areas of coverage, plans optimal paths based on user-defined behaviors, and calculates sensor placement for maximum coverage and performance, all while minimizing time and cost to the user and providing tangible, inspectable evidence of a science and engineering approach to security design.

Sensor Layout and Optimization

OpShed™ provides an interactive layout of sensors that allows users to evaluate the performance of proposed security systems and operational tactics to maximize sensor coverage and performance. OpShed™ can model a variety of sensors including ground, seismic, sonar, and line-of-sight, and can analyze the coverage of single sensors or multi-sensor layouts. These layouts can be modified quickly, generating multiple scenarios in minutes and

providing different setup options in minimal time.

Multi-Objective Operations Planning

OpShed™ is a reconfigurable, flexible planner that provides path generation capability based upon multiple influences such as terrain features, sensor fields, data from imagery, and energy signatures. For example, it can plan intelligent movement around a camera's view and take threats into account when finding an optimal route. OpShed™ offers a variety of options that can either be applied simultaneously or individually for independent analyses.

Vulnerability Detection

OpShed™ can detect vulnerabilities in tactical operations by analyzing the environment based on geography, sensing, and timing. Users can conduct specified analyses, such as the effectiveness of observation posts in detecting targets and exploring multiple phenomenology including physical, cyber, and human behavioral effects. These analyses can allow a user to target specific areas of concern, minimizing overall system costs.

Model Validation

OpShed™ is built upon the Umbra software framework, which gives it the ability to use real-time data and

manage live, virtual, and constructive (LVC) components in a single simulation. These capabilities allow users to validate site simulation models by comparing live field data to a corresponding simulation and evaluate for accuracy and effectiveness.

Sensors

OpShed™ allows multiple sensor types to be used for coverage and sensing calculations.

- Radar
- Radiation
- Seismic
- Viewshed (2D or 3D line-of-sight)
- Magnetic
- Sonic
- Electromagnetic
- User-defined

Operations - Behavioral Planning and Movement

OpShed™ provides multiple options to quickly plan paths and define movement through different costers, configurations, and end conditions, showing various path options. The path options can be influenced by shortest distance, stealth, overall speed, attractions to particular areas, and more.

Costers

- Sensor performance
- Terrain features: soil conditions, snow cover, slope
- Imagery: user-defined values

Configurations

- Single-coster
- Multiple-coster with weighted emphases
- Variable-resolution path planning meshes

End Conditions

- Use a function to determine success

Sensor Placement Optimization

Sensor placement designs are accomplished quickly and optimized within OpShed™ for maximum effective coverage. Single sensors may be optimized for location, height, and tilt. Groups of sensors can be optimized for placement using a variety of fast, efficient methods. Path optimization options also exist within OpShed™ to use variable starting locations, showing where common paths merge and high-traffic areas will exist.

These optimization methods can quickly cut down on in-the-field setup time of real sensors, saving time and money when optimizing layouts with OpShed™.

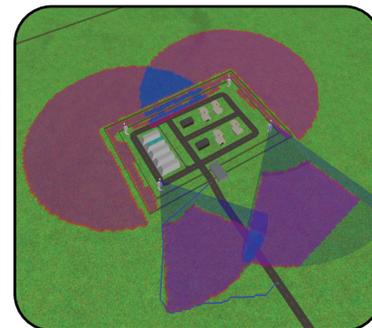
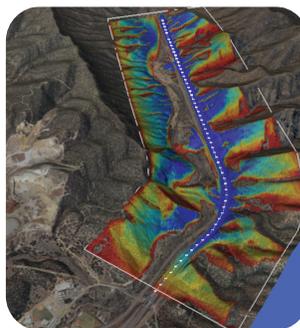
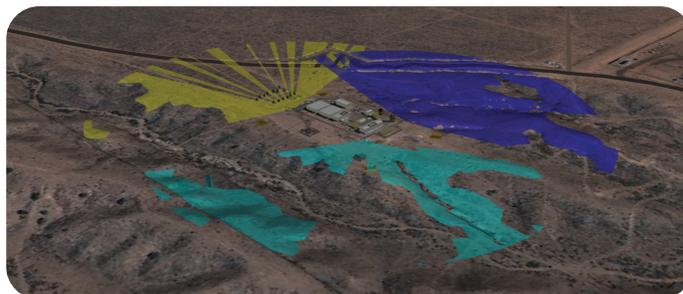
Coverage Analysis

Coverage analysis exists in OpShed™ based upon various user inputs.

- Single sensor coverage
- Multiple sensor coverage using heat maps or boolean operations
- Multiple bounding areas

System Capabilities

OpShed™ has been built upon the Umbra Simulation Framework using a C++ core with managed C++ and C# user interfaces. Both 32 and 64-bit installations are available for use with Windows systems. Terrain information created by Sandia's Simulation and Gaming Terrain Team (SGTT) or imported directly can be highly detailed (sub 1-meter resolution) and large in size (gigabytes).



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