

White Paper

IMAGINE VirtualGIS™



September 1997



Geographic Imaging Made Simple.™



IMAGINE VirtualGIS™

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IMAGINE VirtualGIS™

IMAGINE VirtualGIS™ is a unique, three-dimensional (3D) analysis tool that allows you to visualize and analyze geographic data. This powerful application module extends the sophisticated visual analysis capabilities of ERDAS IMAGINE® within the same, easy-to-use environment. The objective of IMAGINE VirtualGIS is to support dynamic visualization, flight sequences, and the management/assimilation of multiple geographic data types in a real-time, 3D environment. IMAGINE VirtualGIS also gives you the ability to simultaneously operate in the 2D and 3D environments via dynamically-linked viewers.

IMAGINE VirtualGIS enables you to...

- Extend the Geographic Imaging functions in ERDAS IMAGINE, within a real-time, 3D environment
- Experience real-time, 3D navigation through a large database of image, map, and attribute data
- Apply enhancement functions and spatial filters within the 3D environment
- Query attributes of image and vector data interactively in 3D
- Easily generate flight sequences
- Output to standard movie formats
- Perform viewshed analysis

Problem Solving with IMAGINE VirtualGIS

Road/Highway Engineering and Corridor Siting

Transportation infrastructure projects often cause great controversy within a community. Public inquiries are common, requiring projects to be explained in great detail.

Siting the ideal transportation corridor requires careful analysis of large GIS databases. IMAGINE VirtualGIS allows you to analyze any number of feasibility constraints in 3D, including terrain slope, visual impact, urban density, public lands, wetlands, and more.

When attempting to clarify the issues related to the construction of a new road, IMAGINE VirtualGIS allows the GIS to be brought to the public in an understandable manner. IMAGINE VirtualGIS can be used to create simulation fly-throughs of several route proposals, providing the public with an intuitive look at the possible scenarios. But it goes beyond simple flight sequences with its interactivity. For example, if a member of the audience asks a question about a specific area, the presenter can simply navigate over to the region of interest. If the audience needs details, attributes can be queried or buildings can be rendered in three dimensions.

Images draped over terrain can be from any source (satellite or aircraft) or resolution desired. Vector databases drape correctly over the terrain and retain the ability to be queried. IMAGINE VirtualGIS invokes a new era for public presentation of this type.

Military Simulation

Both training and actual battle situations benefit when accurate obstacle and terrain information are available. IMAGINE VirtualGIS brings the necessary visual elements together in an intuitive manner.

The Battle Group Training Unit (BGTU) in the United Kingdom uses IMAGINE VirtualGIS for exercising units in battle scenarios within the British Army. IMAGINE VirtualGIS software is used to provide realistic 2D and 3D views of the battlefield exercise area. Draping geographic information layers over terrain data allows them to perform mission planning or familiarize troops with inaccessible or hostile terrain.

After an exercise, an After Action Review (AAR) takes place to allow personnel to determine exactly what happened during the exercise, discuss their strengths and weaknesses, and make recommendations for future operations. ERDAS IMAGINE and IMAGINE VirtualGIS software provide an effective means of presenting AAR material by accurately capturing the exercises on video for playback and aiding in the discussion of "what if" scenarios.

**Urban/
Telecommunications**

The global demand for cellular communications networks and services is expanding rapidly. ERDAS IMAGINE and IMAGINE VirtualGIS provide key data synthesis and analysis capabilities in support of cellular network infrastructure planning.

The quality of cell networks depends upon accurate terrain, vegetation, and building clutter information tied to a geographic base. PHOENICS (Photogrammetric and Environmental Technical Services), a German telecommunications planning services provider, made effective use of ERDAS IMAGINE and IMAGINE VirtualGIS in a recent project planning a network in Cologne. Work was completed for a third of the cost of more traditional data collection and analysis methods.

PHOENICS' strategy was to use the ERDAS IMAGINE suite to derive and integrate the various layers of geographic data into the network planning process. Using IMAGINE OrthoMAX™, elevation data (DEMs) were derived from high-resolution aerial stereo pairs. Using the vector editing tools, building footprints were digitized as ARC/INFO polygons. Building height attributes were then automatically derived for each building using a spatial model in ERDAS IMAGINE to analyze the building coverage and the DEM. The resulting geographic data was then draped and analyzed in three dimensions within IMAGINE VirtualGIS. With the ability to navigate through all data layers, IMAGINE VirtualGIS allowed "what if" scenarios to be presented to their client. Based on their success in Cologne, PHOENICS has since won similar contracts for clients planning networks in Dusseldorf, Hamburg, and Hannover.

Other capabilities of IMAGINE VirtualGIS which are useful for cell planning include numerical attributes of vector data to extrude them as solid objects in the third dimension. Buildings rendered in this manner can be visualized from any angle and queried for additional attributes. A viewshed creation tool provides the ability to interact with the 2D viewer to generate line-of-sight maps for multiple observer locations and heights.

Disaster Investigation

In a recent investigation of a multiple helicopter crash in Australia, IMAGINE VirtualGIS was used to produce 3D video fly-throughs to examine the helicopters' flight paths over the terrain.

To begin, three flight lines were digitized through a 2D planometric view of the topographic map, and then the coordinates were stored in IMAGINE VirtualGIS's Flight Path editor. Each flight line was given an altitude above the terrain of 40 meters, 60 meters, and 80 meters. To make the flight scenarios as realistic as possible, atmospheric conditions such as light fog were applied, as well as a blackened background with greenish terrain (to simulate night vision goggles) and the pilot's field of view was established.

From an observer's point of view, the area of interest was examined at different positions relative to the crash site. The output of these observations was placed directly onto video tape for examination by a board of investigation. This entire process was completed in a few days, enabling the board of investigation to draw timely and accurate conclusions regarding this incident.

Technical Specifications

Key Benefits

- Assimilate disparate geographic data types into a seamless, global database, for example:
 - Include any number of overlapping and adjacent elevation layers
 - Integrate satellite, radar, aircraft, and scanned images from several map projections
 - Drape multiple vector GIS layers simultaneously
- Visualize and understand terrestrial phenomena and features that are only discernible in three dimensions, for example:
 - Reveal the relationship between multiple surfaces, such as geological bedding planes
 - Integrate images with magnetic, gravity, seismic (surfaces) and other data sources

- Understand the relationship between habitat and terrain
- Enhance and query quantitative attributes in imagery and GIS data
- Simulate unknown or dangerous environments, increasing training safety and saving on logistical costs, for example:
 - Simulate forest environments for field personnel during fires
 - Include the GIS data base within a battlefield simulation
 - Recreate the flight path of an aircraft from recorded telemetry
 - Provide an up-to-date perspective for search and rescue operations
- Make clear, dynamic presentations to those with little or no experience within the mapping sciences, for example:
 - Provide interactive explorations of transportation and other engineering projects
 - Clearly demonstrate environmental and structural relationships to managers and the public

Key Features and Capabilities

- Real-time fly-throughs of geographic data in a 3D environment
- Renders images using multiple resolutions for high speed performance
- Optionally display images in wire frame and as reduced resolution solids
- Drape vector GIS data (point, line, polygon) across the landscape
- Simultaneously render multiple adjacent or overlapping surfaces
- Display of vector and annotation polylines and polygons as 3D objects
- Billboarded text and symbols that always face the observer
- Ability to save all viewing parameters to project files for use and in movie creation
- Interactive level of detail control
- Create, manage, and optimize large data sets with the Virtual World editor
- Viewpoint control tool with terrain profiles
- Print 3D views via Map Composer
- Positions editor, which allows you to save and recover viewpoints
- Advanced, tabular flight path editor
- Full X,Y, and Z splining of flight paths
- Variable pitch, azimuth, roll, and speed
- Optional terrain following mode
- Tools to generate viewshed maps from single or multiple observation points, from various heights, and with desired viewing angles
- Movie creation for screen and output to several movie formats, including PC AVI, SGI Movie, ERDAS IMAGINE Movie, and YUV for professional video equipment

What's New in Version 8.3

- **Virtual roaming** allows you to move smoothly through the data when using larger data sets. IMAGINE VirtualGIS will automatically display lower resolution data in areas that are farther from the observer or in areas of lower relief, and higher resolution data in areas closer to the observer or in areas of higher relief. As you move through the data, the required resolution and data are dynamically rendered while being read as needed from the disk.
 - The **Virtual World editor** is designed to manage the layers of data that you want to visualize in IMAGINE VirtualGIS. This project editing tool enables you to define any number of datasets, including imagery, vector, and annotation (e.g., two adjacent DEMs, three adjacent TM images, one overlaying air photo, five vector layers, and four annotation layers). Data entered into the Virtual World editor are compiled into a "virtual world." A virtual world can include overlapping and adjacent data sets, images with various resolutions, and data with different map projections. A virtual world allows you to extend your visual landscape indefinitely, limited only by disk space.
- **Full resolution DEMs** and raster overlays are displayed in real-time. You can interactively set the level-of-detail (LOD) to adjust the performance versus the quality of the image.
- **Vector and annotation** overlays can be draped or rendered as 3D objects with height attributes. You can also select, query, and update styles and symbology.
- The **project file** is a mechanism that enables you to save a current scene. When a project is saved, all viewing parameters, as well as layers that were added to the scene, are referenced in the project file along with any flight paths or positions.
- **File size limitations** are circumvented. IMAGINE VirtualGIS is not intrinsically limited by file size, but operating system limitations do apply. Also, while IMAGINE VirtualGIS and ERDAS IMAGINE cannot work with any single file which exceeds two Gbytes, IMAGINE VirtualGIS will allow imagery to be distributed among multiple files using Virtual World and project files.
- The **background option** is enhanced from previous versions, and you can now choose to **fade** your background from one color to another (e.g., light at the horizon fading to dark as it reaches the sky).
- An **on demand fallback mode** assists users on lower-end systems as they move through a scene at a relatively high speed. It works similar to the fallback on motion mode, except that when you stop the motion, the image is not rendered over the DEM until you press the Apply button.
- An **eye/target selector** represents the observer's position, direction, and field of view when an IMAGINE VirtualGIS viewer and an ERDAS IMAGINE Viewer are linked. You can move the selector to update the position in the IMAGINE VirtualGIS viewer.
- A **coverage selector** shows the field of view graphically. You can interact with the graphic to position the eye point.
- A **positions editor** enables an interactive save and restore of several previous positions. Acting as a memory of past views, this allows you to jump or fly from one position to another.
- The **flight path editor** is easy to work with when splining. IMAGINE VirtualGIS now splines (smooths) the line in the Z direction, as well as interpolates from point-to-point a spline of pitch and azimuth. The functions in this CellArray™-based tool provide control over roll and speed.
- **Terrain following** offers another navigation mode. In this mode, you are located on the ground and can navigate through the image as if you were in

a vehicle.


- **Ground collision detection** keeps you from accidentally flying through the terrain.
- **Elevation exaggeration** can be set interactively, without having to reload the image data.
- A new, separated **dashboard** detaches the tool from the viewer.
- A **text/symbols mode** interface and tools enable you to set the scale and offset for annotation text, symbols, vector symbols, and labels.
- **Vector and annotation symbols and labels** can be displayed as billboards that rotate to always face the observer. All other vector and annotation elements drape the terrain or can be extended vertically as 3D objects.
- **Vector and annotation objects** (lines, polygons, rectangles, ellipses) can be extruded in the Z direction using a height attribute to produce simple, 3D objects. This enables you to quickly create a 3D scenario from the footprints of buildings in a vector or annotation layer.
- A **viewshed analysis tool** enables single and multiple observer points to be defined. Multiple elevations, viewing cones, and diameters can also be specified.
- Automatically **create a movie** by recording free interaction, capturing frames in a flight sequence, or by selecting a project file and using the definitions within.


If you would like more information about other Geographic Imaging solutions, please contact us. We'll respond immediately.


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