Realistic Geo-Specific Feature Densities in Real-Time Synthetic Environments

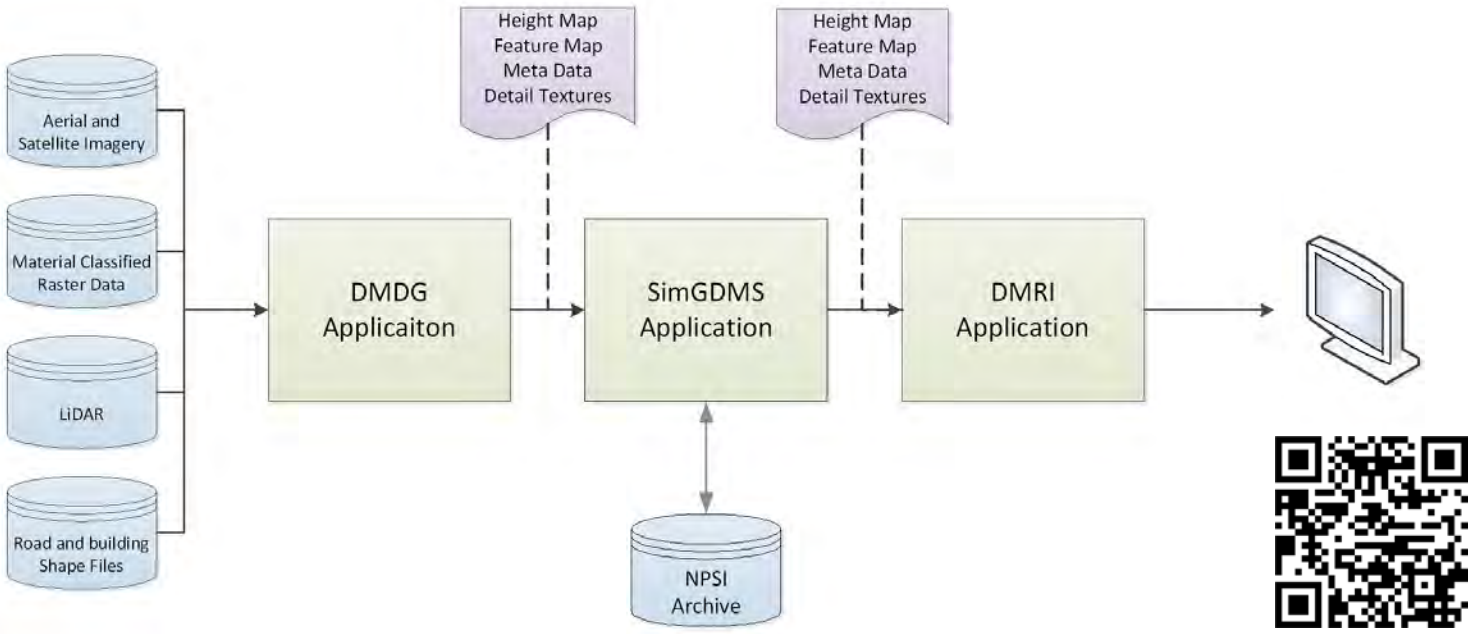
EXHIBIT FACT SHEET

Creating a high fidelity virtual environment for flight simulators can be both expensive and labor intensive. Aircraft simulators rely heavily on geo-specific imagery to provide the trainee with a high fidelity virtual environment which is rich in 2D visual cues. It is well known that the addition of three dimensional (3D) models to this synthetic environment enhances visual cues that enable the perception of depth and motion. Alignment of 3D features with the underlying imagery is crucial to avoid visual distractions, especially at low altitudes. Constraints in hardware performance and budget limit the amount and quality of 3D features that can be included in the virtual environment.

The overall goal of this research was to develop a solution that provides significant improvements to current methods used to generate, integrate, and display highly detailed and accurate geo-specific terrain surfaces used in Navy training simulators.

The solution that has been developed is largely an automated pipeline that goes from refined source as input to a run-time visualization of feature rich synthetic environments as the output. The framework consists of three independent components (Data Generation, Data Archival, and Run-Time) with the connection between them being implemented through the exchange of files in pre-existing open formats. When used together, as shown in the diagram below, they make up a pipeline that goes from refined source data ingest on the left to visualization of a feature rich scene in an IG style application on the right.

The results of our work are two-fold. First, we have developed a generic framework for processing and extracting feature information from commonly available geospatial data. This has been accomplished through a largely automated process that can leverage a wide variety of geospatial datasets including imagery, material classified, digital elevation and vector data.



The second product of this research is an image generator independent run-time rendering library. This component is designed to be a drop-in module that uses the power of modern commercial off-the-shelf graphics processing units and OpenGL 4.0. This run-time technique can be used to enhance feature content in new or existing terrain databases and overcomes current image generator system bandwidth limitations.

This novel work flow and rendering approach has the potential to raise the bar for high complexity and high fidelity virtual environments for real-time training simulators while lowering overall database acquisition costs.

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