Mapping Matters

Your Questions Answered

The layman's perspective on technical theory and practical applications of mapping and GIS

By Qassim A. Abdullah, Ph.D., PLS, CP**

Q: What does oblique imagery mean and how effective it is in GIS and mapping activities?

Answer: Rather than collecting imagery directly beneath the aircraft with the camera pointing at nadir, oblique imagery is acquired from an angled position. Oblique imagery has been used for decades by military intelligence during aerial reconnaissance missions. In recent years, however, its use has spread to the commercial market with an expanded range of applications. The modern approach combines oblique and vertical imagery to produce accurate 3D digital maps that can be interfaced with any modern GIS database or used for fly-through analyses and measurements. This solution has proven valuable to users in emergency management, law enforcement, homeland security, tax assessment, engineering, insurance, and real estate, among others.

Most existing oblique mapping systems comprise the following components:

- Acquisition subsystem: While oblique imagery traditionally was achieved by jerking the aircraft so the camera could view the enemy lines from a safe distance, today's commercial operations use a number of different techniques:
  - **Multi-camera subsystem.** Multiple cameras are positioned on a base frame to view the ground from multiple look angels. The most popular oblique look angle is 45 degrees to the side and ahead of the aircraft; nadir cameras meanwhile obtain orthogonal viewing.
  - **Scanning cameras subsystem.** Rotating cameras and/or mirrors are positioned to obtain panoramic views of the ground. This approach is less popular than the fixed frame multi-camera subsystem.

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- Processing subsystem: The processing subsystem manages data download and georeferencing, making the imagery suitable for oblique applications.
- Applications subsystem: In my opinion, this is the most important part of the entire system as it determines the value of the oblique mapping capabilities and therefore the value of the oblique mapping system. Often people confuse the terms "oblique imagery" and "oblique mapping." Oblique imagery is easy to achieve in many different ways, but utilizing the oblique imagery for GIS applications is more challenging and less understood. Oblique imagery can be used to provide the following:
  - **Wide area coverage for generation of orthoimagery and reconnaissance-type investigations.** Most commercial orthoimagery generation software can incorporate oblique imagery to produce orthorectified image maps for this purpose.

"...many of the oblique applications software require accurate and expensive building elevation models in the form of a wire-frame building model. The most attractive solution is the one that does not require prior existence of a wire-frame building model as it is cumbersome and very costly despite the side benefit of providing an accurate 3D model that can be used for other applications"

  - **3D textured object viewing and data extraction of buildings and other ground objects.** This type of application provides the fly-through style analysis and measurements. Buildings are textured by adding facades for a realistic appearance. The details of these facades are obtained either from the 45 degree oblique imagery, from on-site close-range photography, or from a combination of the two using sophisticated mathematical models and ray tracing techniques with or without an accurate and detailed digital elevation model of the buildings. Most "oblique mapping" data requires special, and in many cases, proprietary software for viewing and extracting data. In addition, many of the oblique applications software require accurate and expensive building elevation models in the form of a wire-frame building model. The most attractive solution is the one that does not require prior existence of a wire-frame building model as it is cumbersome and very costly despite the side benefit of providing an accurate 3D model that can be used for other applications.

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