Digital Globe

Accelerating Disaster Relief Efforts

Background
Digital Globe owns and operates a sophisticated fleet of high-resolution Earth-imaging satellites that collect over two million square km of imagery each day.

68 percent of all commercial satellite data acquired since 2010 has been done by Digital Globe. The company sells these images to the US federal government, as well as to agencies like FEMA, to support disaster rescue, relief and recovery efforts. As such, the timeliness of acquiring and delivering images is critical to these customers.

Challenge
While Digital Globe's satellites can produce stunning, high-resolution images to aid in the response to natural disasters and many other uses, the topographical variations in the surface of the earth and the tilt of the satellite camera can cause significant image distortions. As a result, it is extremely difficult to make accurate calculations with regard to distances, angles and orientation.

Solution
DigitalGlobe employs a number of technologies that remove the distortions and restore the proper orientation, and improves the overall image quality of satellite images.

The first is "orthorectification," which adjusts the image for topographic relief, lens distortion and camera tilt, providing an accurate representation of the Earth's surface.

Another is known as "pan sharpening." Pan sharpening is used to produce the best quality, high-resolution color images possible, by combining several high-resolution black and white images with medium resolution color images.

The problem is that orthorectification, pan sharpening and Digital Globe's other advanced image processing processes are highly mathematical in nature, and require significant computational processing power.

CPU-based systems running the complex orthorectification and pan sharpening algorithms are typically slow, often requiring many minutes to hours to complete. As a result, this could delay the analysis and delivery of actionable information based on satellite images to the field, such as FEMA disaster relief workers.

However, by adding NVIDIA® Tesla™ GPUs to its computer systems, DigitalGlobe is able to significantly reduce the time it takes to process and deliver high-quality images to those that need them so urgently.

Digital Globe's orthorectification algorithm runs more than 12x faster on a GPU-enabled system as compared with a CPU-only system, cutting the processing time from minutes to seconds. GPU acceleration of the pan sharpening process is even more dramatic, providing a 41x speed up compared with that of a single-threaded CPU.

Impact
During a major natural disaster, such as a tornado, tsunami or large earthquake, the clock is ticking. Every second lost in the rescue and recovery effort could mean more property damage, additional injuries or even greater loss of life.

Agencies like FEMA rely on highly accurate, up-to-the-minute satellite imagery from Digital Globe to make critical real-time decisions about how best to react and respond in these situations. This ranges from identifying points of entry to a flood-ravaged region where the waters have receded, to ensuring those bridges and other important roadways are safe for emergency vehicles.

By dramatically accelerating the time it takes to process and deliver high-quality satellite images to the field, rescue workers can immediately assess the situation, create a response plan and quickly deploy resources to reach those in need.

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