The race between data production and processing capacity has been going on for many decades, with data production usually on the winning team. This is also true for airborne and space-borne imagery, as the amount of images captured by satellite sensors and aerial cameras is growing not only steadily but also rapidly. How can the abundance of pixels be processed into photogrammetric products quickly and effectively? The answer lies in parallel computing. Today, computer clusters enable fast and affordable processing of photogrammetric tasks. Read on to learn how parallelism speeds up the creation of seamless orthomosaics.

By Andrey Yu. Sechin, Racurs, Russia

Traditionally, software has been written for serial computation. The algorithm is put into operation as a series of instructions which are executed on a central processing unit (CPU), one instruction at a time in succession. Parallel computing – a dominant research area in computer architecture aimed at speeding up computation – is mainly implemented through multi-core processors. The use of multiple CPUs enables many calculations to be conducted simultaneously. As a result, complex computational tasks are broken down into smaller components which can be processed at the same time. Each CPU executes its part of the process simultaneously with and independently of the others. The results are combined afterwards. Photogrammetric processing of massive volumes of images may also benefit from parallel computing. To illustrate the massiveness of the amount of data produced by spatial and airborne sensors, European Pleiades-1D and Pleiades-1B satellites have the capacity to acquire 2,000,000 km² per day, while the VisionMap A3 Edge aerial camera captures 5,000 km²/hour of imagery with a GSD of 20cm.

Seamless Mosaics

The creation of seamless orthomosaics consists of several steps, including (Figure 1):

1. project creation and reading the images from storage devices
2. ortho creation of each image using the corresponding digital terrain model (DTM)
3. determination of seamlines
4. image statistic gathering for brightness adjustment
Photogrammetric algorithms can be effectively run on computer clusters with 100 to 200 CPUs. A fast data retrieval and storage

Concluding Remarks

Photogrammetric algorithms can be effectively run on computer clusters with 100 to 200 CPUs. A fast data retrieval and storage
system and high LAN throughput ensure the highest productivity.

**Biography of the Author**

Andrey Sechin graduated from Moscow Institute of Physics and Technology, Russia, in 1980 and obtained a PhD degree in mathematics in 1984. He is co-founder of Racurs, a photogrammetric company based in Moscow, where he has been scientific director since 1994. Before founding Racurs he was with Troitsk Institute for Innovation & Fusion Research.

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**Figure captions**

*Figure 1*, Flowdiagram of the orthomosaic creation process.

*Figure 2*, Block of around 200 GeoEye images on a background representing the DTM and detail (bottom).

*Figure 3*, Speed-up using multiple CPUs: $T_1$ and $T_p$ are computing time on one and $p$ CPUs, respectively; $a$ is a nonparallel ratio.

*Figure 4*, GeoEye orthomosaic – over 600 sheets have been produced at scale 1:10,000.