Mosaic processing improvements for SOCET SET® v5.3

Overview

The Mosaic Manager is an optional module available in SOCET SET, which is licensed and sold as SOCET SET Ortho. The Mosaic Manager application creates large area coverage orthomosaic, orthomosaic sheets or tiles, or individual orthophotos using input georeferenced imagery and terrain data. In addition, to create a nearly seamless output product, there are processing options for automatic seamline generation, seamline feathering and image balancing.

The SOCET SET v5.3 Mosaic Manager has been enhanced to provide increased performance for orthomosaic production. In conjunction with enhancements to the Mosaic Manager application, a new licensing system allows for the production of mosaics on multiple processors.

Mosaic Licenses

In SOCET SET v5.3, each SOCET SET Ortho license issued for the Mosaic Manager application consists of three individual licenses.

The first license is the application user interface license (MO).

The second and third are two mosaic processing licenses (MO_BA), which are new in v5.3. The mosaic processing licenses are issued in pairs with each mosaic user interface license. The mosaic processing licenses control the algorithmic process of the mosaic, which can be distributed across multiple processors (CPUs) within one computer as controlled by the operator. The number of CPUs used in mosaic production is an optional selection on the user interface, as seen in Figure 1.

Customers who wish to process mosaics on more than two CPUs, must purchase additional mosaic licenses. As mentioned above, two mosaic processing licenses are issued with each SOCET SET Ortho license. Therefore, a four CPU system using all four processors requires four mosaic processing licenses (MO_BA), which are issued as a result of purchasing two SOCET SET Ortho licenses (MO).

The total number of processors available is displayed on the Mosaic Manager user interface, allowing the user to select between one and the total number of processors on the computer. For a dual core workstation with hyper-threading, four processors are detected by the Windows® operating system and the Mosaic Manager application. The number of mosaic processes is limited by the number of CPUs detected and number of mosaic processing licenses. The display on the user interface only shows the number of CPUs detected and not the number of application licenses.

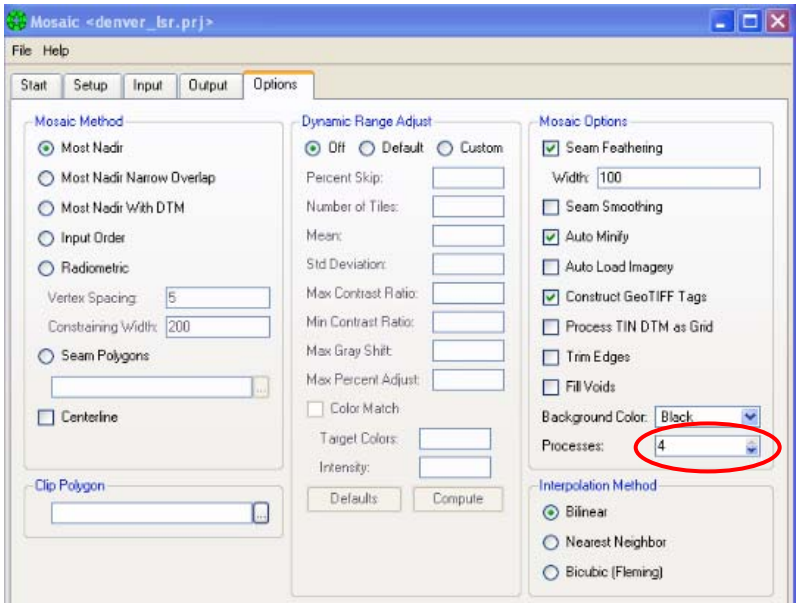

Figure 1. ***Mosaic Manager Options*** *tab, showing four processors selected for the example: dual core Dell® 470 with hyper-threading used in the final test shown in Table 1.*

Mosaic Production

When mosaic production begins, the output mosaic is divided into strips, whereby the strips are processed concurrently on the processors selected. The strips are stored temporarily on the disk and are reassembled into a complete mosaic at the completion of all the strips. Therefore, the amount of disk space needed is approximately 50% greater than running a mosaic without concurrent processing.

Disk I/O, which is the process of writing and reading (input/output) data from local or networked disk, becomes the bottleneck in the processing flow if only one disk is employed. If additional disks are available, the mosaic production will use the disks for reading, storing temporary strips, and combining the strips into a final mosaic.

Theoretically, the decrease in time required to process a mosaic from SOCET SET v5.2 compared to v5.3 with a dual processor computer has an upper limit of 50%. The upper limit is not attainable because of disk I/O and the time required to reassemble the strips into a final mosaic. Therefore, performance improvements of around 20 – 40% can be expected when comparing a multiple disk, dual processor computer from v5.2 to v5.3.

Table 1 lists three examples of performance improvements when comparing SOCET SET v5.2 to SOCET SET v5.3. The sample data set consists of 217 color images 4K x 4K in size. The input terrain file has 880,000 points. The output mosaic is 27640 x 34718 pixels or 2.8 GB uncompressed. Each of the three runs used two processors in SOCET SET v5.3.

Mosaic processing computer configuration	SOCET SET v5.2 Processing Time	SOCET SET v5.3 Processing Time	Improvement
Dual processor Dell 650, reading and writing to the same SATA disk	210 minutes	180 minutes	14%
Dual processor Dell 650, reading from the internal SATA Disk and writing to the external USB2 disk	186 minutes	151 minutes	19%
Dual-core, hyper-threaded Dell 670, reading from an internal SATA disk and writing to an internal SCSI disk	112 minutes	68 minutes	39%

Table 1: Mosaic performance improvements between SOCET SET v5.2 and v5.3 using two mosaic processing licenses (two CPUs) and various disk configurations.

The results in Table 1 indicate that disk speed is a critical component to increased productivity. The 39% decrease in processing time shown in Table 1 is most likely attributed to the fact that two internal high-speed disks were used in the test. The amount of time required to reassemble the image strips in this run was ten minutes. Although the time was accounted for in the total processing time listed in the table, if the time were removed from the 68 minutes, the net improvement would be 48%, which is approaching the theoretical processing limit of 50% mentioned above.

Since four processors are available with the dual-core, hyper-threaded Dell 670, a final run was made using all four processors. The four processor run requires two user interface licenses (2x MO), allowing for four processing licenses (4x MO_BA). The same data used in table 1 was used in the four processor example. The results are listed in table 2. In this example, one user interface license and all four processing licenses are consumed.

Mosaic processing computer configuration	SOCET SET v5.2 processing time	SOCET SET v5.3 processing time	Improvement
Dual-core, hyper-threaded Dell 670, reading from an internal SATA disk, and writing to an internal SCSI disk	112 minutes	51 minutes	54%

Table 2: An example of improvements between SOCET SET v5.2 and v5.3 using a dual core hyper-threaded Dell 670 computer. SOCET SET v5.2 is using one processor, and SOCET SET v5.3 is using all four processors.

The final run listed in Table 2 exceeds the 50% threshold mentioned above because the threshold is based on two processors. In the case of four processors, the upper limit for improvement is 75% when comparing a single CPU run. By subtracting the ten minutes for reassembling the images from the 51 minute processing time, the results for improved performance are 63%.

Conclusion

Significant improvements in processing mosaics can be achieved by distributing the processing across multiple CPUs. Upgrading from SOCET SET v5.2 to v5.3 provides productivity improvements of up to 40% without additional software cost.

The GXP product focus on productivity and accuracy are essential to help shorten the timelines between image acquisition and product generation. The SOCET SET v5.3 Mosaic Manager is one example of timelines being reduced without additional software cost and without sacrificing quality or accuracy of the final orthomosaic product.

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