Performance Optimization and Processing Method on Massive Oblique Photogrammetry Models

This document will focus on how to process and optimize massive oblique photogrammetry models.

Important Factor

Frame rate, as known as number of frame per second, is an indicator to describe how many times of updates can happen per second for graphic processors.

If the frame rate is 15, there will not be any pause for displaying scene. If it reaches 24, human eye cannot identify the flicker. And the pictures are smooth if the frame rate reaches 30.

CPU is like our brain, the higher utilization, the slower the computer will be. The low constant utilization of CPU determines the smooth operation of computer.

For the optimization of performance, some key technologies are embedded in SuperMap 3D GIS, like Global scale region partition, dynamic dispatching for effective rendering, multi-resolution LOD (double LOD for model and texture, can be adjusted according to camera view and model distance), patch rendering.

Operation Procedure

The oblique photogrammetry model can be divided into 2 outcomes according to modeling technique, which are the discrete model and automatic modeled model.

Optimizing the performance of discrete model mainly depends on cache tiling based on multi-resolution LOD technology with pyramid architecture (quadtree or octree), making city-level massive data quickly adjusted. Also the layer parameters like visibility distance, LOD scale, etc. can be adjusted.

Why choose load OSGB model data directly instead of reconstructing the data architecture?

If we reconstruct data architecture, the original LOD information will be abandoned, only keeping the most detailed layer data, the data like this cannot be loaded. We need to generate new LOD information, but the feature of automatic modeling is all the TIN networks are
connected, so generating LOD is not a wise choice, since that will need to cut the data, and then simplify the TIN and its texture. This method will lead to the distortion of model data and unsmoothness of the transitions of different layers.

While oblique photogrammetry data in OSGB format is embedded with multi-level resolution LOD data, this LOD is generated in constructing the model, which is TIN model according to the density of point cloud. In the viewing process of 3D scenes, the transition between different layers is smooth.

Since OSGB has so many advantages, why do we need to optimize the performance of model of OSGB data?

For the automatic modeled models, the optimization can be taken from following aspects:

1 Texture compress

The surface detail of model in 3D scene is shown by texture, the higher resolution of texture, the more vivid of the model, but the problem with this is that more utilization of memory and saving memory is important. So choosing texture compress technology can make utilization of display reach a balance.

We have provided texture compress tool, the first purpose is to label texture into OSGB file, decreasing the number of files; the second purpose is to transforming the texture into a format that can be displayed by terminal display card, so that no extra expenses are needed to analyze resolve the texture in the rendering (different devices choose different compress methods, e.g. PC, Android, iOS devices), after compress, the data will be smaller, more convenient to load data and occupies less utilization.

In SuperMap iDesktop product, the texture compress tool is provided, putting parameters can initialize the process.

2 Node merge

In the production of oblique photogrammetry model, the tile lengths need to be set to output model. There is a Tile data in every folder, model results will be named by center area as Tile_+000_+000, and the row and column number will be like that. There is a file with the same name as the folder, we call it root node.
We will demonstrate this by comparing these 2 pictures.

![Figure 1 45m tile](image1)

![Figure 2 450m tile](image2)

From the 2 pictures, we can see when the tile is too small, the number of tiles will increase.

Problems of setting short length of tile: if there are too many nodes, the number of times of rendering of display card will increase, every dispatch will take some time of CPU, eventually the CPU will be overloaded, and there will be pause in the scene.

Patch: Path is a concept to describe how many polygons can be rendered in one rendering. The patch should be less than the maximum render number. Therefore we need to put more polygons in one patch to decrease the number of patches and lower the CPU time.
The purpose of merging the nodes is to enlarge the size decreasing the number to improve the performance.

The node merging tool is provided in SuperMap iDesktop, the adjacent 4 tiles will merge as a rough new node file;

Layers of pyramid means the number of merges, 1 merge means 4 times less of tiles, 2 merges mean 16 times less of tiles.

3 Layer parameter setting

Layer LOD distance scale parameter will zoom the distance of original LOD, the maximum visible distance will not be seen when exceeding the range.

![Figure 3 Layer attribute](image-url)