Agisoft Metashape Command Line Details

This information was collected from the Agisoft Metashape User manuals. Description of model building workflow and settings was taken from the Agisoft Metashape User Manual Professional Edition. Details from the GUI user manual were integrated with code descriptions from the Metashape Python API User Manual to provide a cohesive document that provides descriptions of commands and the arguments used to adjust settings in Metashape. I have bolded and underlined quotes from Agisoft Metashape User Manual Professional Edition to highlight important/informative information for non-modeling experts.

i. chunk.addPhotos(x)

ii. chunk.matchPhotos(accuracy= , generic_preselection= , kepoint_limit= , tiepoint_limit=)

<u>Accuracy options:</u>

Metashape.HighestAccuracy
Metashape.HighAccuracy
Metashape.MediumAccuracy
Metashape.LowAccuracy
Metashape.LowestAccuracy

Notes: “Higher accuracy settings help to obtain more accurate camera position estimates. Lower accuracy settings can be used to get the rough camera positions in a shorter period of time.

While at **High accuracy** setting the software works with the photos of the original size, **Medium** setting causes image downscaling by factor of 4 (2 times by each side), at **Low accuracy** source files are downscaled by factor of 16, and **Lowest value** means further downscaling by 4 times more**. Highest accuracy** setting upscales the image by factor of 4. Since tie point positions are estimated on the basis of feature spots found on the source images, it may be meaningful to upscale a source photo to accurately localize a tie point. However, **Highest accuracy** setting is recommended only for very sharp image data and mostly for research purposes due to the corresponding processing being quite time consuming.”

<u>Preselection options:</u>

generic_preselection=True/False
reference_preselection=True/False

Notes: “Image pair preselection option may speed up this process due to selection of a subset of image pairs to be matched. In the **Generic preselection mode** the overlapping pairs of photos are selected by matching photos using lower accuracy setting first.

In the **Reference preselection mode** the overlapping pairs of photos are selected based on the measured camera locations (if present). For oblique imagery it is necessary to set Ground altitude value (average ground height in the same coordinate system which is set for camera coordinates data) in the Settings dialog of the Reference pane to make the preselection procedure work efficiently. Ground altitude information must be accompanied with yaw, pitch, roll data for cameras. Yaw, pitch, roll data should be input in the Reference pane."

Key point limit Options: custom options

"The number indicates upper limit of feature points on every image to be taken into account during current processing stage. Using zero value allows Metashape to find as many key points as possible, but it may result in a big number of less reliable points."

*For coral photos, every photo is maximizing to 40,000 key points; may indicate increasing the tie point limit may result in more points and better models

Tie point limit options:

"The number indicates upper limit of matching points for every image. Using zero value doesn't apply any tie point filtering.

Tie point limit parameter allows to optimize performance for the task and does not generally affect the quality of the further model. Recommended value is 4000. Too high or too low tie point limit value may cause some parts of the dense point cloud model to be missed. The reason is that Metashape generates depth maps only for pairs of photos for which number of matching points is above certain limit. This limit equals to 100 matching points, unless moved up by the figure "10% of the maximum number of matching points between the photo in question and other photos, only matching points corresponding to the area within the bounding box being considered."

*Requires optimization for types of models to built

iii. chunk.alignCameras(adaptive_fitting= True/False)

"This option enables automatic selection of camera parameters to be included into adjustment based on their reliability estimates. For data sets with strong camera geometry, like images of a building taken from all the sides around, including different levels, it helps to adjust more parameters during initial camera alignment. For data sets with weak camera geometry, like a typical aerial data set, it helps to prevent divergence of some parameters. For example, estimation of radial distortion parameters for data sets with only small central parts covered by the object is very unreliable. When the option is unchecked, Metashape will refine only the

fixed set of parameters: focal length, principal point position, three radial distortion coefficients (K1, K2, K3) and two tangential distortion coefficients (P1, P2)."

iv. chunk.buildDepthMaps(quality= , filter=)

Quality Options:

Metashape.UltraQuality
Metashape.HighQuality
Metashape.MediumQuality
Metashape.LowQuality
Metashape.LowestQuality

Notes: Higher quality settings can be used to obtain more detailed and accurate geometry, but they require longer time for processing. Interpretation of the quality parameters here is similar to that of accuracy settings given in Photo Alignment section. The only difference is that in this case Ultra High quality setting means processing of original photos, while each following step implies preliminary image size downscaling by factor of 4 (2 times by each side)

Filter Options:

Metashape.NoFiltering
Metashape.MildFiltering
Metashape.ModerateFiltering
Metashape.AggresiveFiltering

Notes: "Due to some factors, like noisy or badly focused images, there can be some outliers among the points. To sort out the outliers Metashape has several built-in filtering algorithms that answer the challenges of different projects.

If there are important small details which are spatially distinguished in the scene to be reconstructed, then it is recommended to set Mild depth filtering mode, for important features not to be sorted out as outliers. This value of the parameter may also be useful for aerial projects in case the area contains poorly textured roofs, for example. Mild depth filtering mode is also required for the depth maps-based mesh reconstruction.

If the area to be reconstructed does not contain meaningful small details, then it is reasonable to choose Aggressive depth filtering mode to sort out most of the outliers. This value of the parameter normally recommended for aerial data processing, however, mild filtering may be useful in some projects as well (see poorly textured roofs comment in the mild parameter value description above).

Moderate depth filtering mode brings results that are in between the Mild and Aggressive approaches. You can experiment with the setting in case you have doubts which mode to choose.

Additionally, depth filtering can be Disabled. But this option is not recommended as the resulting dense cloud could be extremely noisy."

*May require fine tuning for specific type of subject

v. chunk.buildDenseCloud(point_colors = True/False)
This option can be unchecked in case the points color is not of interest. This will allow to save up processing time.

vi. chunk.buildModel(surface= , source= , interpolation= , face_count= , quality=)

Surface Options:

Metashape.Arbitrary
Metashape.HeightField

Notes: "Arbitrary surface type can be used for modeling of any kind of object. It should be selected for closed objects, such as statues, buildings, etc. It doesn't make any assumptions on the type of the object being modeled, which comes at a cost of higher memory consumption.

Height field surface type is optimized for modeling of planar surfaces, such as terrains or base reliefs. It should be selected for aerial photography processing as it requires lower amount of memory and allows for larger data sets processing."

Source Options:

Metashape.PointCloudData
Metashape.DenseCloudData
Metashape.DepthMapsData
Metashape.ModelData
Metashape.TiledModelData
Metashape.ElevationData
Metashape.OrthomosaicData
Metashape.ImagesData

Notes: "Specifies the source for the mesh generation procedure. Sparse cloud can be used for fast 3D model generation based solely on the sparse point cloud. Dense cloud setting will result in longer processing time but will generate high quality output based on the previously reconstructed dense point cloud. Depth maps setting allows to use all the information from the input images more effectively and is less resource demanding compared to the dense cloud based reconstruction. The option is recommended to be used for Arbitrary surface type

reconstruction, unless the workflow used assumes dense cloud editing prior to the mesh reconstruction."

Interpolation Options:

- Metashape.DisabledInterpolation
- Metashape.EnabledInterpolation
- Metashape.Extrapolated

Notes: "If interpolation mode is Disabled it leads to accurate reconstruction results since only areas corresponding to dense point cloud points are reconstructed. Manual hole filling is usually required at the post processing step.

With Enabled (default) interpolation mode Metashape will interpolate some surface areas within a circle of a certain radius around every dense cloud point. As a result, some holes can be automatically covered. Yet some holes can still be present on the model and are to be filled at the post processing step.

In Extrapolated mode the program generates hole-less model with extrapolated geometry. Large areas of extra geometry might be generated with this method, but they could be easily removed later using selection and cropping tools."

Face count options: preset options are optimized per model

- Metashape.LowFaceCount
- Metashape.MediumFaceCount
- Metashape.HighFaceCount
- Custom (insert number)

Notes: "Specifies the maximum number of polygons in the final mesh. Suggested values (High, Medium, Low) present optimal number of polygons for a mesh of a corresponding level of detail. For the dense cloud-based reconstruction they are calculated based on the number of points in the source dense point cloud: the ratio is 1/5, 1/15, and 1/45 respectively. It is still possible for a user to indicate the target number of polygons in the final mesh through the Custom value of the Face count parameter. Please note that while too small number of polygons is likely to result in too rough mesh, too huge custom number (over 10 million polygons) is likely to cause model visualization problems in external software."

Quality Options: used when source = DepthMapsData

- Metashape.UltraQuality
- Metashape.HighQuality
- Metashape.MediumQuality
- Metashape.LowQuality
- Metashape.LowestQuality

Notes: “Specifies the desired reconstruction quality of the depth maps, providing that they are selected as a source option. Higher quality settings can be used to obtain more detailed and accurate geometry, but they require longer time for the processing. Interpretation of the quality parameters here is similar to that of accuracy settings given in Photo Alignment section. The only difference is that in this case Ultra High quality setting means processing of original photos, while each following step implies preliminary image size downscaling by factor of 4 (2 times by each side).”

vii. chunk.buildUV(mapping=)

Mapping Options:

Metashape.LegacyMapping
Metashape.GenericMapping
Metashape.OrthophotoMapping
Metashape.AdaptiveOrthophotoMapping
Metashape.SphericalMapping
Metashape.CameraMapping

Notes: “The default mode is the Generic mapping mode; it allows to parametrize texture atlas for arbitrary geometry. No assumptions regarding the type of the scene to be processed are made; program tries to create as uniform texture as possible.

In the Adaptive orthophoto mapping mode the object surface is split into the flat part and vertical regions. The flat part of the surface is textured using the orthographic projection, while vertical regions are textured separately to maintain accurate texture representation in such regions. When in the Adaptive orthophoto mapping mode, program tends to produce more compact texture representation for nearly planar scenes, while maintaining good texture quality for vertical surfaces, such as walls of the buildings.

In the Orthophoto mapping mode the whole object surface is textured in the orthographic projection. The Orthophoto mapping mode produces even more compact texture representation than the Adaptive orthophoto mode at the expense of texture quality in vertical regions.

Spherical mapping mode is appropriate only to a certain class of objects that have a ball-like form. It allows for continuous texture atlas being exported for this type of objects, so that it is much easier to edit it later. When generating texture in Spherical mapping mode it is crucial to set the Bounding box properly. The whole model should be within the Bounding box. The red side of the Bounding box should be under the model; it defines the axis of the spherical projection. The marks on the front side determine the 0 meridian.”

*other arguments can be used in chunk.buildUV, I am exporting Mesh only

viii. chunk.buildTexture(blending= , size= , fill_holes=True/False)’