BIM & Scan®

AutoCorr
Open BIM Validation Software

Scanning Requirements

As with other tools that support the capture and use of reality data, BIM & Scan AutoCorr™ requires proper scan management and planning to assure interoperability and processing of that data. We have done our best to briefly explain scan related requirements for BIM & Scan AutoCorr™, i.e. San Planning, Scan Processing, etc.

Scan Planning

Scan planning should be carried out with all relevant personnel to ensure the required detail will be captured during the laser scan survey. Personnel responsible for modelling or model checking should indicate any critical areas where scan coverage may be required. Best practice in relation to scan planning and BIM & Scan AutoCorr™ is to *capture the most data possible with the minimum amount of scan positions*. Further explanation in these regards can be found below in the section on *noise*: proper scan planning and scanning itself can high impact the quality of your BIM & Scan AutoCorr™ Output File.

Also, similar to that discussed above, scan coverage should be achieved for all relevant areas with minimal occlusions in scan data. By doing this, one can increase the accountability for, and the association of, the objects in the input E57 point cloud that correspond with objects in the input IFC building information model.

Before the laser scan survey is carried out, a plan should be established with all personnel working on the project to identify the best way to segment scans into clusters for processing. Segmenting and organising scans on a room by room basis for clustering is recommended to facilitate quicker BIM & Scan AutoCorr™ runs and re-runs of specific areas of interest. During scan planning, it should also be decided if a control network is needed to register scans. For large scan projects a control network should be established with a total station and laser scan targets should be measured from this control network.

Scan Processing

Registration & Segmentation
Scans should be registered using clusters based on the segmented areas defined during scan planning. Scans should be registered as accurately as possible to ensure minimum registration errors. Mean registration error should be less than 5mm. Visual checks should also be carried out to validate scan registration. Checks include, but are not limited to, all scans are accounted for and registered/overlapping properly, and spheres, checkerboards, and other points of interest are properly aligned/registered, and/or points of interests used for cloud-to-cloud registration, etc. The best practice for any scan project, scan clusters should be registered with targets measured using a total station.

Export Settings

Let's begin this section with the end in mind; the goal when using BIM & Scan AutoCorr™ is always to try and decrease the processing time. Scans should be exported in E57 format as ordered scans that contain individual scan positions, e.g. in Faro Scene export *ordered scans* from a *cluster of scans*. Furthermore, scans should be exported in segments, i.e. clusters, as defined during scan planning. Small clusters, such as individual rooms, will results in faster model checking and processing using BIM & Scan AutoCorr™. Each cluster of scans should be exported as a *single E57 file* for input into BIM & Scan AutoCorr™. Scans or scan clusters for areas that are not in the model or areas that are not of interest should be excluded from the export. Large amounts of un-necessary point cloud data will increase processing time. Decreasing the processing time is always the goal.

File Size

Optimum file size is less than 8GB. BIM & Scan AutoCorr™ has been set to take a maximum file size of 8GB for Beta and Standard subscriptions. For these basic subscriptions, larger file sizes will take longer to upload. When possible, it is best practice and recommended to use clusters of 2GB file sizes, which has proven to be more optimum in relation to processing to download time.

Noise

BIM & Scan AutoCorr has Noise related phenomenon. These phenomena are discussed below, and they can be resolved to not impact the user experience.

False Negative Noise:

Scan Planning Issue

False Negative Noise occurs with the BIM & Scan AutoCorr Output File if an area is over scanned. A resolution to this phenomenon is; maximum coverage with minimum scan positions. Do not over scan congested nor open space environments.
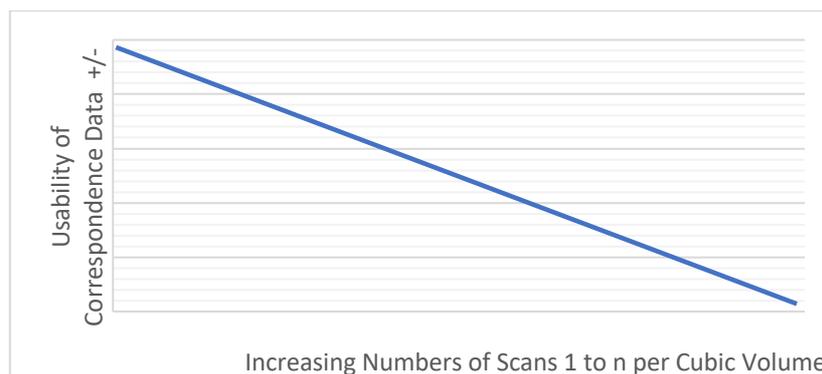

Figure 1: Usability Increases as Noise Decreases.

To decrease the probability of noise, capture the most data possible with the minimum amount of scan positions.

NOTE:
False Negative Noise - Within the computed tolerance, rouge red points do exist that should be ignored.

Red points can be embedded with properly colored points within the tolerance *Figure 2*. This noise can be seen as a minimum set of red points within the allowed/processed tolerance for a given object. This noise does not hinder the problem-solving process. This phenomenon can be seen most in _highly congested environments that have actually been over scanned._ If there is noise within the allowable Tolerance, then it should be ignored.

The phenomenon occurs due to rogue red point are caused by occlusions from other objects during the correspondence analysis. If one was to measure in the design/review application, it would be seen that these points are within a 100mm Tolerance of which the Output Files was processed at. This file can be found in the test files as OUTPUT_PlantRm_100mm.e57.
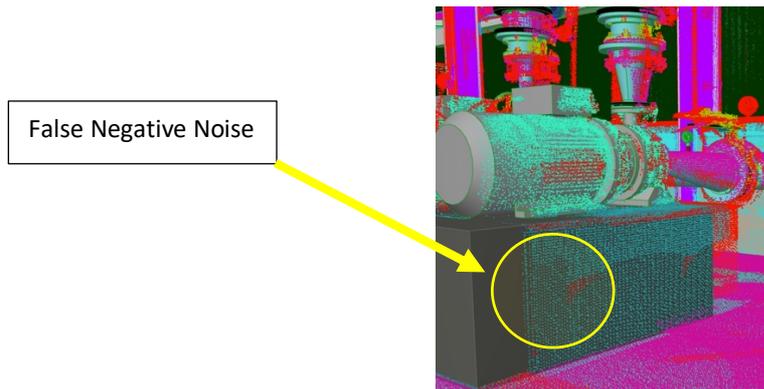

Figure 2: Red Noise on Plinth

False Positive Noise

False Positive Noise- When two related objects are within an unrealistic tolerance for the task and they appear to share IFC Entity Type classification color's, i.e. the classification color of two objects become mixed *Figure 4*.
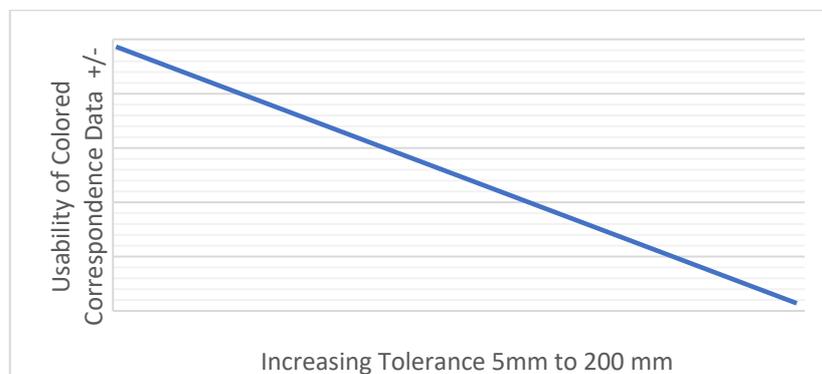
Figure 3: For related objects, Usability Decreases as Tolerance Increases.

The figure below show that a 100 mm tolerance is unreasonable for objects that are so small and so close together. It is unlikely a contract would ever require and analysis of these types of objects at that tolerance, and if so they would simply pass a validation check at 100mm. Note in the image some red points are there, and they are red points over 100mm from the wall, so they are not noise and are in fact correct correspondences.
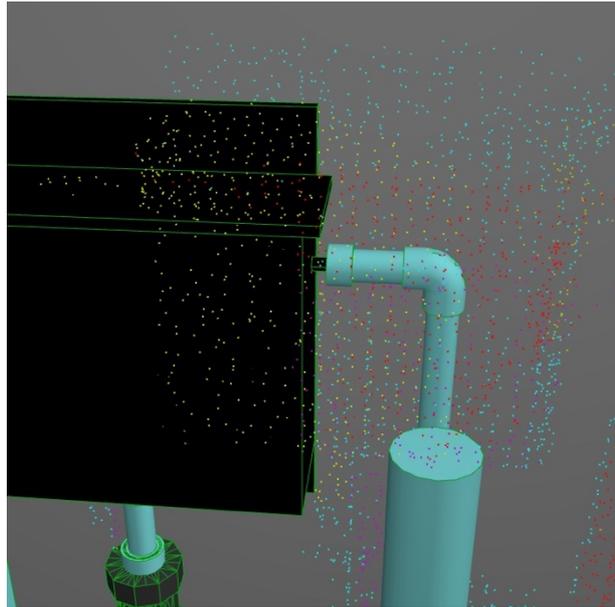
Figure 4: Mixed IFC Element Type Noise

In Summary, as in the case of any noise that exist within the data capture by terrestrial laser scanner or similar, e.g. noise from metal reflective surfaces and noise that occurs with glass objects, the noise shall be ignored. The quantity of points colored within epsilon that are representative of the analysis results, out way quantitatively and qualitatively the number of point in relation to the noise.