

APPENDIX C – SPLIT FX BEST PRACTICES**EXTRACTING ROCK MASS CHARACTERIZATION INFORMATION (SPLIT FX TIPS)**

At the present time, the only point cloud processing package that has a number of built-in features for extracting rock mass characterization information is Split FX. Based on using the software for a number of years, some best practices are given below.

Automatic Extraction of Fracture Planes.

In general, the automatic fracture finder (find patches menu item) can do a better job of finding fractures than going through the point cloud by hand (and much faster). However, the settings should be optimized so that 1) a large number of fractures are extracted, and 2) at least initially, only fractures with a high degree of planarity (R^2 of best-fit plane through the points greater than about 0.9) are extracted. Typical settings to achieve this are shown in Figure 26. Requiring initially that the automatically extracted fractures have a high degree of planarity eliminates unwanted patches, such as patches formed from part of an excavated slope, due to a portion of the rock face coincidentally satisfying the flatness criterion. In particular, for a trim blasted slope, not requiring a high degree of planarity can cause the entire slope to be selected as a fracture.

Extracting Rough Fractures

To delineate rough fractures, the recommended approach is change the filter settings to allow fractures with a lower best-fit R^2 to be accepted, and to pick out these fracture manually (after finding all the smooth fractures automatically).

Stereonet Plotting

It is recommended that when plotting fracture poles extracted from LiDAR data, always weight by fracture area. Traditionally this is not done, because fracture area is typically not measured along with orientation in traditional site characterization. Also, in traditional site characterization, strike and dips are generally only taken on large fractures to begin with (area greater than 1 m^3). An example of stereonets with and without weighting, including data collected with a traditional scanline, is shown in Figure 27.

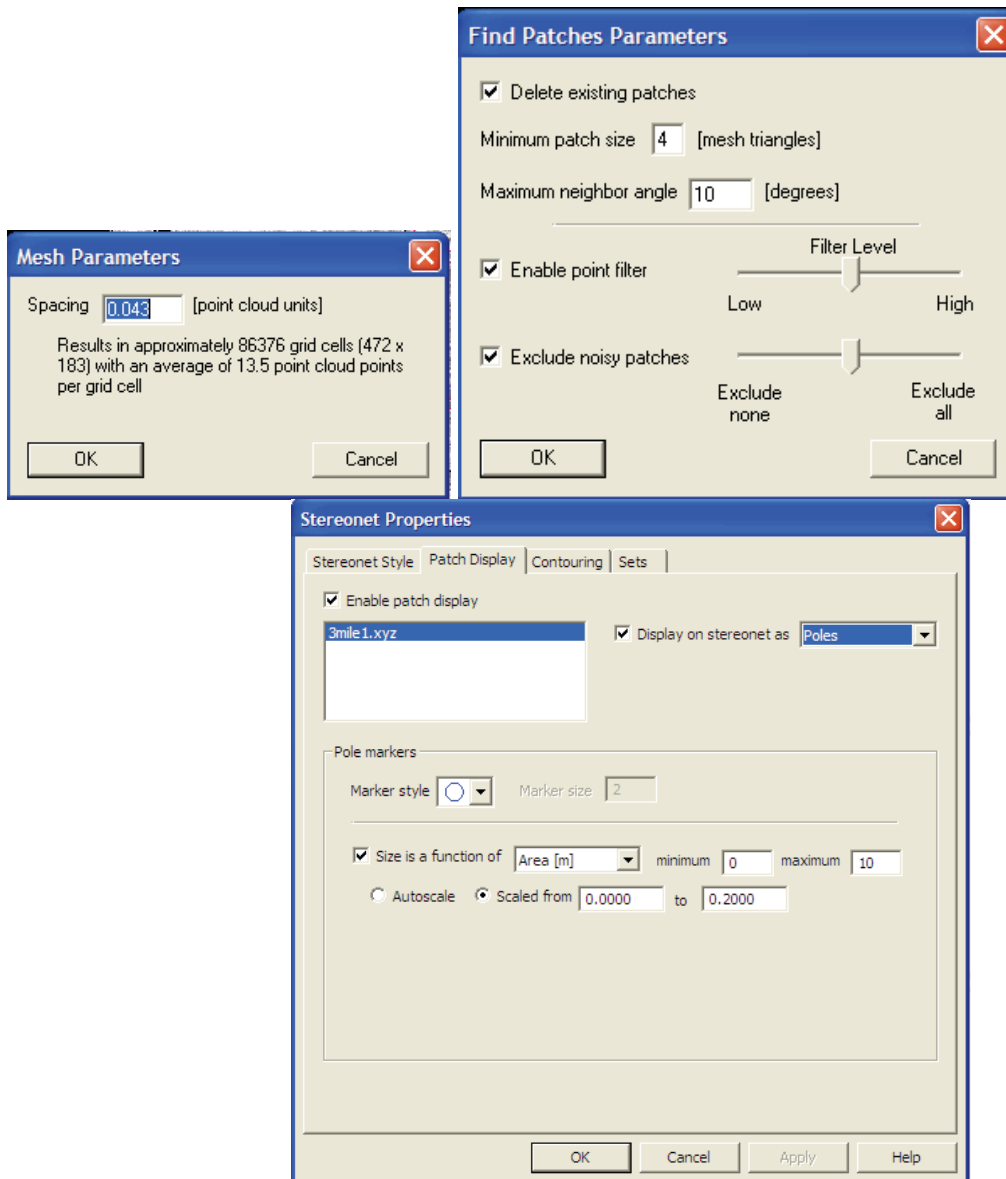


Figure 26. Screen Capture. Recommended Split FX settings for mesh generator, patch finder, and stereonet plotting, for a scan of Mt. Lemmon Highway near Milepost 8.

Fracture Tracing on Digital Images (Including Draped Photos)

At the present time, most automatic edge detectors are not able to properly delineate fracture traces, at least without extensive parameter “tuning” or post editing. Therefore, it is recommended to trace the fractures by hand. This only takes a few minutes for each digital image of interest.

Complete .FX File For Each Site

A Split FX file (.fx file format) can store multiple point clouds, draped or undraped digital images, difference point clouds, joint set information, field notes, etc. It is a complete data base

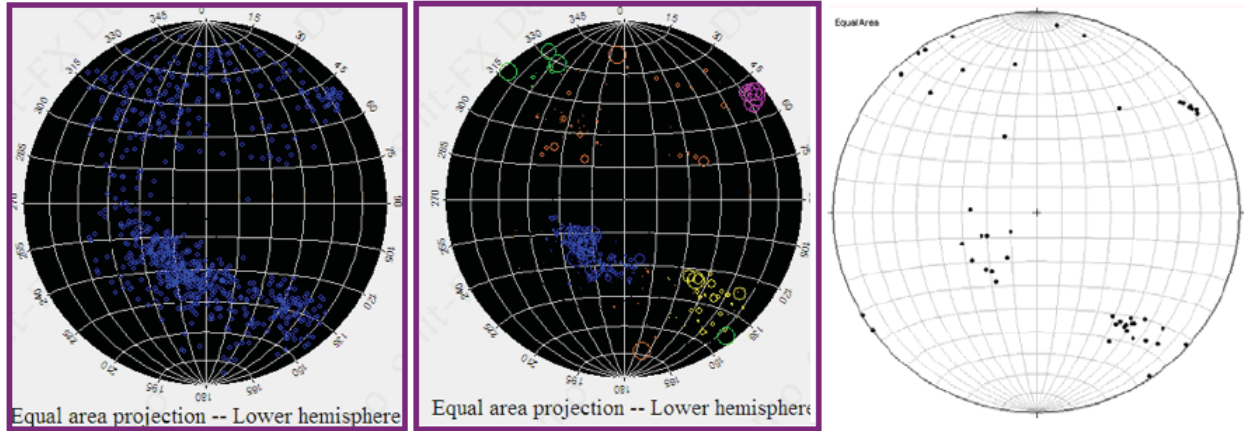


Figure 27. Schematics. Comparison between plotting poles with (left) and without (center) “weight-by-area”. Weighting by area results in a much better comparison with standard fracture mapping (right).

for a site that can be updated as additional scans are made (to look at rockfall, for example). It is recommended that an .fx file containing all this information is made for each site, as it is a good way to organize the data.