

PLY2ATTI - ALGORITHM FOR EXTRACTION OF STRUCTURAL ATTITUDES FROM OUTCROP THREE-DIMENSIONAL MODELS

Viana, C.D.¹; Endlein, A.¹; Campanha, G.A.C.¹; Urtiga, L.A.¹; Oliveira, M.

¹Universidade de São Paulo

RESUMO: An algorithm for extracting the orientation of geological structures derived from three-dimensional models arising from photographs (PLY2ATTI) is presented. The main goal of developing such tool is to allow the acquisition of structural data more quickly and efficiently based on data coming from digital photogrammetry. The methodology initially consists in creating a three-dimensional model, which can be processed in any software for this purpose (AgiSoft Photoscan, VisualSFM, Stereoscan etc.). Then, the .obj or .stl file is opened in MeshLab, where the user with the ZBrush tool, taking care to place the brush in the maximum hardness and reduce its size to acquire greater accuracy of selection, selects the plans of interest. At this stage, it is possible to classify structures using different colors for each set of the selected plans. Afterward, the mesh data is exported in .ply (Stanford Polygon File Format), selecting the option to ASCII encoding instead of the default binary. With the mesh, PLY2ATTI is executed, specifying the RGB values of the colors used in the classification. The program is able to generate a file for each data set or one with all the data. It is also possible to calibrate the measures providing the color and the dip direction of a known plan. The PLY2ATTI method uses linear algebra to extract the main axes of a tensor, which in this case represents the three-dimensional dispersion of the cloud points contained in the selected area around its centroid. Thus, the three eigenvalues and its eigenvectors represents the respective axes of the ellipsoid which best fits the data, since the ratio of the axes express the data shape. With this assumption, the smallest eigenvalue is much smaller compared to the other two values, which should be similar, then its eigenvector is the normal vector to the plane that best fits the selected data. As a result, the program generates a text file with the attitudes in dipdir/dip format that can be opened in the OpenStereo software for viewing stereographic projection and processing and interpretation of the measures. The tests show a high correlation between the data measured and extracted from three-dimensional models, indicating that the use of such technique is viable and comparable to the results obtained by the commercial purposes software.

PALAVRAS-CHAVE: DIGITAL MODEL, PHOTOGRAMMETRY, STRUCTURAL GEOLOGY.