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Testing the efficiency of selected numerical approaches for retrieving the average orientation of subsurface data

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The three-point approach in geology allows the orientation of a plane to be computed on the basis of three non-collinear points. This method is often applied for subsurface planes whose orientation cannot be measured using geological compasses. An extension of this approach involves using computational geometry algorithms for extracting the orientation measurements at a larger scale. From a numerical point of view, 2D Delaunay triangulation can be recommended because it tends to minimise the number of degenerate configurations. The observations obtained can be subsequently analysed using qualitative and quantitative methods. The former embrace spherical projections whose beneficial property is that the orientation trend can be visualized using scatterplots or contour plots. The latter involve mainly Fisher mean and inertia moment analysis approaches for finding the average orientation. In the presentation given, we will present a preliminary analysis with 820 borehole records included, within Cracow-Silesian Homocline in Poland. The surface selected represented the bottom of ore-bearing clays deposits of Middle-Jurassic age. The methods followed were only partially successful for determining its average orientation: while the value of dip angle seem to be acceptable, the value of dip direction was not consistent with the spherical projection. We conclude that due to the noise in the data set, the accessible techniques can fail and denoising methods should be introduced.