Monthly Report - May 2023

Project: Development of Efficient Well Profiles for Target Coordinates

Summary:

The assigned task involved developing a well profile capable of hitting multiple target coordinates efficiently. The team successfully completed the project by creating a Python package that accomplishes this objective. This report provides an overview of the developed solution, including details on the logic used to select the kickoff point and an explanation of two key interpolation methods employed in the model.

Solution Overview:

The developed Python package addresses the task of generating efficient well profiles for given target coordinates. It takes as input the coordinates of the targets and the formation aggressiveness at various points below the well. Based on this information, the model determines the best kickoff point, adhering to both the minimum point set by the driller and a minimum aggressiveness requirement (defaulting to 0.6 if not specified).

Interpolation Methods:

The model utilizes two primary interpolation methods, namely Akima1DInterpolation and PCHipInterpolation from the scipy library. While other options are available, these two methods were identified as the most suitable for this particular case, with the PCHipInterpolation method showing particularly promising results.

1. Akima1DInterpolation:

The Akima1DInterpolation method is a type of piecewise cubic Hermite interpolation. It computes smooth interpolations based on the input data points, ensuring the resulting function is continuous and possesses continuous first derivatives. This technique is ideal for generating a well profile that maintains smoothness and avoids abrupt changes.

2. PCHipInterpolation:

The PCHipInterpolation method, short for Piecewise Cubic Hermite Interpolating Polynomial, is another form of piecewise cubic interpolation. It constructs a smooth interpolant based on the input data points, while emphasizing shape preservation. This method is particularly advantageous when dealing with well profiles, as it helps maintain the integrity of the desired curvature and shape.

Survey Stations and Data Generation:

The model calculates the inclination, azimuth, measured depth, eastings, northings, and depth at each survey station. By default, these survey stations are established at a depth difference of 10 units. However, the units and difference in survey stations can be modified as per the project's requirements. The output of the model includes a Pandas dataframe and a CSV file containing the aforementioned data, providing a comprehensive overview of the well profile.

Conclusion:

In conclusion, the team successfully developed a Python package capable of generating efficient well profiles for given target coordinates. By employing the appropriate interpolation methods, such as Akima1DInterpolation and PCHipInterpolation, the model ensures the resulting profiles remain smooth and preserve desired curvatures. The generated output, in the form of a Pandas dataframe and a CSV file, provides comprehensive data on the inclination, azimuth, measured depth, eastings, northings, and depth at each survey station. The completed solution fulfills the assigned task requirements and can be further utilized to optimize well drilling processes.

Next Steps:

Moving forward, the team will continue to improve the package by incorporating additional functionality and enhancing the user interface. Furthermore, the team plans to conduct rigorous testing and validation to ensure the accuracy and reliability of the well profiles generated.