The development of advanced grid modeling software for 3D grid model with borehole data

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Various methods for constructing 3D underground structure models have been proposed. Here, we implement the construction method proposed by Kimura et al. (2014) using Python. In this presentation we will describe the current version of the software package, its usage and what tasks remain.
The 3D grid model refers to a 3D underground structure model of a voxel model. The modeling method proposed by Kimura et al. (2014) was developed based on the method of constructing a 3D grid model of N value and soil from borehole data (JACIC XML format) by Eto et al. (2008). The main contribution of this method is that it combines the conventionally used voxel model with a surface model. By using surface models, it is possible to incorporate expert knowledge into the geological model. By outputting in voxel format, output result can be used in various application analysis .
Python3 was chosen as the programming language to support the widest possible range of operating systems. The process of this software can be divided into two stages. In first step the necessary information from the borehole data is extracted. The second stage consists of combining the extracted information and the surface model to generate a 3D underground structure model (Fig. 1).
For spatial interpolation in the second stage, this software uses inverse distance weighting where various parameters such as the number of reference direction, or maximum and minimum number of references can be set. Furthermore, an emphasis filled version of the model can be generated. S wave velocity, one of the application analysis of interpolation result, can also be output using emphasis filled model.
There are two problems remaining in the current version:
- preparing the input data is time consuming (for instance there are no standardized soil names).
- the number of supported file formats for surface models is small.
These problems will be addressed in the next major version.

Keywords: 3d geologic model, borehole data