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"Geologic Toolbox": Three-dimensional GIS Tools for Subsurface Model Visualization and Publishment

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1. Project Aims

Geographic information system (GIS) technology offers a promising means to support spatial decision-making processes or to communicate geo-information to the public. This also applies to geologic application scenarios. Since 3D functionality is available inside GIS environments today, and since platforms to access geospatial information on the Web are utilizable by almost everyone, the provision of geologic models inside 3D GIS seems to be highly desirable.

However, GIS environments rarely support geologic modeling approaches, e.g. topologically interrelated surface layers and volumetric solids or voxels in between, or 3D triangulations (instead of GIS-like "2.5-D" surfaces), what would be needed to represent stratigraphic layers or discontinuities. Moreover, specific software tools such as drillhole data import, cross-section generation, or model consistency checks (e.g. surface/surface intersection) often are missing on the GIS side.

Thus, to overcome the mentioned deficits while opening the application potentials offered by GIS technology to geologists, in the context of the "Geologic Toolbox" project a suitable generic software-architecture will be set up.

2. Solution Approach

As a first prototype implementation, a toolbox extension for ESRI's prominent ArcGIS Pro will be developed and examined with respect to its geology-specific functionality as well as technical aspects such as processing and rendering performance and software abstraction. The software will be provided as open-source Python application via GitHub.

The works are carried out at the Geovisualization Lab at Bochum University of Applied Sciences in cooperation with ESRI Deutschland GmbH. The open project is accompanied by the Ruhrkohle AG and the Hessian Agency for Nature Conservation, Environment and Geology (HLNUG).

3. Results and Conclusions

The prototype implementation offers promising application perspectives. Particularly emphasized are the option of combining geologic data with geo-information from other application areas, Web

publishing options (e.g., 3D Web scenes in ArcGIS Online/Portal), and highly-interactive data exploration facilities.

However, there still is a demand for specific model importers and more data exploration tools. From the software engineering perspective, the introduction of an abstract conceptual geologic GIS model (interface classes abstracting from the underlying GIS implementations) will be part of further research and development activities.