THE ASSOCIATION FOR GEOGRAPHIC INFORMATION

BIM for the Sub-surface: Challenges

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Most existing BIM 3D models show the ground as a grey amorphous mass, if it is shown at all. The ground is inherently more variable than other construction materials and, in an integrated multi-disciplinary BIM project, it is important that this can be appropriately conveyed in order to avoid poor decision making.

Currently, most software capable of modelling the sub-surface is not designed to facilitate multi-organisation collaboration without separate transfer of significant associated information. Spatial models and information interpreted from factual data cannot readily be transferred in a manner that can easily be reused & modelled. Consequently, information is often utilised in isolation and transfer between different stages in the project lifecycle can be complex. For the same reason, there are also no simple solutions for distributing & updating national geotechnical data for both factual & interpreted info. The BIM for the Sub-surface project focuses on improving data accessibility & subsurface conceptualisation (realised by geologist-driven collaborative geological modelling). The project will allow geologists & engineers to share confidential interpretations securely or contribute their non-confidential interpretations to the national archive & geological model.

This requires significant work to implement complex databases, version control systems, standardised data formats, data validation rules & seamless connection to BGS databases & the cloud.

Some of the technical challenges are to specify standards for transferring interpreted data; storing managing & versioning spatial data; creating a simple to use 3D modelling interface; creating & ensuring a cloud-based solution with the right levels of performance & security; creating sophisticated user interface tools on a lightweight web interface; developing the required rest API services to give enough interoperability; creating robust & flexible validation tools.

In order to achieve this, we will need to make sure that we can clearly and easily convey temporal changes and uncertainty, inherent when modelling the ground, within a BIM environment. For example, we may want to model a surface showing the level at which rock may be encountered differently depending on the purpose of the model. We may choose different levels at the same location when assessing this for excavatability and for foundation design.

Uncertainty is also inherent in the model, and will vary depending a number of factors such as the distance from the nearest exploratory hole available to support the interpretation, and the nature of the data available.

An associated challenge is to transfer this inpterpretation (i.e. the model and associated meta-data) to other parties. IFC format is widely used within the industry for exchanging 3D solid entities and metadata, but is mainly applied to the building environment. Exporting geolocical 3D triangulated or mesh surfaces to this format has yet to be done. One possibility would be to convert the AGS format to an AGS/IFC XML format that would also include surfaces and sections in order to convey this information. The AGS format is a well recognised industry-standard exchange format that provides a means of transferring geotechnical and geoenvironmental data between parties, and the AGS data management commitee is currently looking at this possibility.