

3D modeling and Web3D display of near-surface geophysical survey results

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Near-surface, mainly composed of man-made strata, weathered layers, and Holocene soft sediments, inherently implies small-scaled irregular or various structures. Accordingly conventional geotechnical boring information is inadequate to reconstruct surface 2D geology of the region of interest because of their sporadic distribution, rough log description, and insensitiveness of SPT N-values to lithofacies. In contrast, near-surface geophysics can provide high-resolution, quantitative, and reliable information to the near surface as continuous 2D or 3D profiles. The authors have been developing near-surface geophysical investigation techniques for delineating internal detailed structure in man-made strata up to 3 m, and have demonstrated the usefulness of Web3D rendering of 3D geophysical models reconstructed by integrating various types of surface data. The surface data incorporated in our 3D model consisted of GPR aided by high-precision VRS-GNSS positioning system, non-contact type high-frequency surface wave measurement, ultra-shallow seismic reflection survey, and high-resolution DC resistivity survey. Surface DSM of the site was generated from MMS (Mobile Mapping System) data. We also built a surface orthophotograph with Agisoft Photoscan. Surfer and Voxler provided by Golden Software were utilized to make a 3D surface model. In addition, we developed a Web3D system which can render combined 3D models without any plug-ins based on WebGL. The Web3D system was quite helpful to understand spatial orientation for a near-surface heterogeneous structure.

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