ScienceGL 3D DredgePRO.

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   3D DredgePRO is a software package specifically developed to provide analytical and 3D visualization capabilities through various stages of dredging projects. In general, dredging is a resource intensive, complex, and expensive process that requires sophisticated heavy machinery and equipment. The process, at a high level, consists of:

(i)   data collection, such as hydrographic survey and/or sonar scanning,

(ii)   project planning and targeted shape design of the output underwater soil with "cut-remove" volume estimation, and

(iii)   Precise control of the physical dredging process i.e. dredge arm positioning while providing displaced soil volume measurement and estimation in real time.

   Even a relatively straightforward first step (i) in a dredging project involves processing of very large amounts of survey data that requires a high-performance advanced multi-dimensional analytical and visualization solution. ScienceGL has invested in developing a set of advanced methods, algorithms and integrated software tools to significantly streamline and modernize entire dredging process while provide significant cost savings and improving accuracy. These R&D efforts resulted in an innovative dredging analysis and 3D visualization package that performs in most realistic 3D mode in real time.

Some of the main differentiating features of 3D DredgePRO include:

- 3D DredgePRO permits multiple layers analysis and visualization during the initial dredging phase e.g. soils, sands, rock formations, etc. Various forms of planned design input such as DTM, DXF, and satellite navigation maps can be imported and visualized within the 3D scene.

- The user might use several hypothetical designs with qualitative and quantitative cross-comparison between them.

- ScienceGL's solution provides detailed cut estimation between all layers with volume calculation for all of area, or selected regions and volumes of interest (ROI, VOI).
  Please see the screenshots of the actual visualizations at the end of the document.

   We added multiple 3D dredging vessel models, each with multiple cutter suction tubes/excavators to provide users with dredging job overall control. Each cutter head can be controlled in regards to position, shape and size which allows for volume calculation comparable in accuracy to a physical method. The advanced 3D visualization capabilities of 3D DredgePRO were specifically designed for network of operators with multiple displays, each of them independent in their choice of 3D orientation angles and multiple intersection plots.

ScienceGL also developed highly optimized algorithms for processing of "dredger-ground interaction" model that simulates effect of dredging on soil. Using streaming GPS data from vessels and our approach described above the user can obtain real-time volume calculations, while dredging is physically being performed. Advanced volume calculation can take in account spillage effects.

Detailed list of major features:

- Support for 3D DTM Matrix, sonar data, and random XYZ point data input formats
- Additional 2D layers: map charts, satellite images, etc.
- Advanced 3D models and visualization for both dredge vessels and underwater terrain
- Flexible zoom, pan, angles of view, stereo display support
- Multiple dredgers with multiple cutter suction tube sections
- Multiple 3D objects such as navigation marks, buoys, lighthouses, etc.
- Multiple CAD/CAM design models: DXF, DTM, custom standards
- 3D line contour and 3D line layers with excavation plan available to operator as separate layers
- Smoothed 3D surface view
- Multiple interactive 3D measurement tools: XYZ read out, intersection planes, volume, pin markers, area selectors, etc.
- Export: Flexible grid matrix output with various (including custom) formats export
- Real time Volume calculation with a possible account of spillage
- Real time new surface reconstruction

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