Introduction

The project is aimed at creating a visual Three-Dimensional graphics model of a coal resource underlying the surace of earth. This computer orebody modeling project starts with a review of existing drill hole sample data, then the drill hole sample files are set-up to provide all the quantitative and qualitative information necessary to build a resource model. From there, the project can provide the user with the following things.

- Three Dimensional model representing the above surface of the mining area.
- Cross-Sectional, longitudinal view of each borehole showing the lithological distribution in the borehole.
- Three Dimensional view of borehole distribution below the surface.
- Three Dimensional representation of the underlying coal seam.
- Resource Estimation done using Inverse Distance interpolation.
- Contour plot of the surface of the mining area.

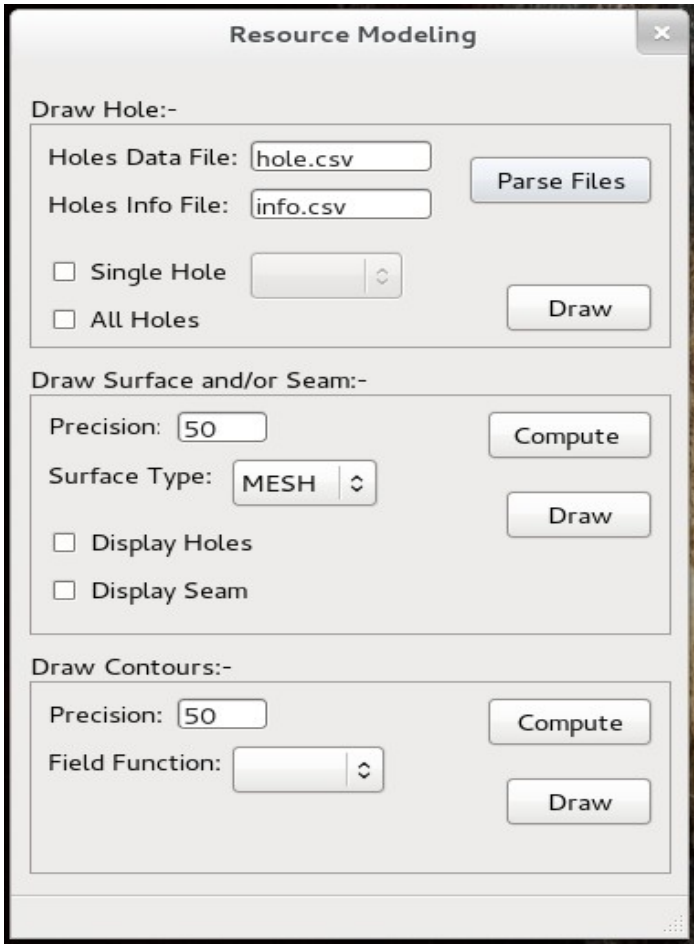

Fig 1. Snapshot of main window

Literature

➢ Drillhole Log :-

- Drillhole logging is the practice of making a detailed record (a well-formed log) of the geological formations penetrated by a borehole. Drill holes cut intersect downwards successive layers. Mechanical properties of waste layers and quality values of ore layers are determined by applying several tests on hole cores.
- Generally, mineral formations are not monolithic and single piece bodies. Inter-burden layers may intersect mass or mineralisation may occur with waste layers in alternating forms. In other words, valuable mineral layers may exist in different thickness and quality amounts. During numerical calculations, a single thickness and grade value may be needed.
- Some classical reserve estimation techniques such as triangulation and polygon methods need composite values. In that case, what is the net thickness of valuable part and its quality? Here, compositing computation is applied to have total thickness and a unique grade (quality) value for each drill hole.

➢ Significance of Resource/Orebody Modeling :-

- The dependence of a mining operation on an accurate 3D Ore Body Model is growing for all scales of operations from small to large mines. This trend can be attributed to an increasing demand for efficiency in mining industries expecting accurate information on a regular basis. All requests relating to the resource or reserve ultimately lead back to the OreBody Modeling on which planning and production activities are based.
- It is necessary to understand real concept of orebody modeling which is important for effective mine planning. Once the modeling is done, the planning alternatives can be proposed and then optimal plan can be selected which gives more production with less losses.It is also possible by the model to answer the several types of questions that may arise in mine planning and it also helps in decision making process.

➢ Existing Softwares :-

- Standard Mine planning software packages like Surpac,Datamine, GEMCOM, Vulcom etc are available for creation of Ore Body Models from the exploration data and for mine optimization.
- As already explained, the purpose of a OreBody Model is to accurately represent not only the grade,tonnage and grade distribution of the mineral deposit, but also its boundary and the internal structure based on which the mine planners can plan the effective mine planning with full respect to the viability, feasibility and longevity of mining operations in totality.
- These commercial software packages have modules for Bore hole data entry, Survey, Ore reserve Estimation, Ore Body Modeling, Pit design, Haul Roaddesign, Pit optimization, Mine scheduling etc. They have strong graphic user interfaces and are user friendly.
- So, This project provides a platform for the evolution of a full-fledged open-source Resource Modeling software that may include as improvements, all the above stated features found in commercial softwares.

Existing Project Components

➢ Drill hole's Lithology

- ➢ Using the drillhole data, the lithological distribution of each borehole is computed.
- ➢ Below, figure shows, all the relevant information about a particular drillhole, provided in the input drillhole data.

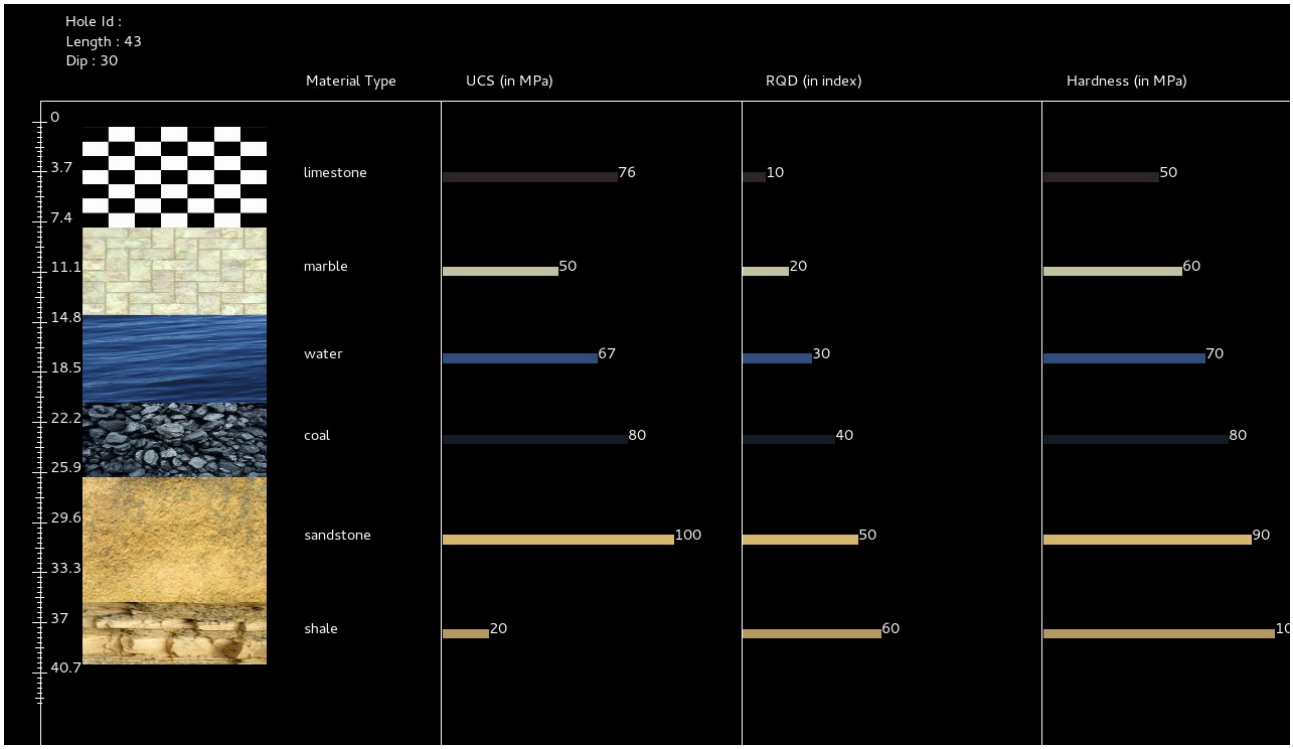

Fig 2. Drill hole Lithology display

➢ Surface Display

- Surfaces are important visual outputs of computer aided orebody modeling systems. Surface can be prepared for any parameter assigned to grid system. (x,y) coordinate pairs of each node can be calculated easily. Then the z coordinate of each node can be calculated easily using different interpolation techniques.
- Although, the project currently plots for elevation, the third coordinate may be topographical elevation, thickness, grade or anything else. Surface will be named according to this third parameter such as topographical surface, thickness surface, grade surface, etc. 3D visualisation of surfaces helps researcher imagine parametric changes.
- The figure below shows the topographical elevation in the mining area.

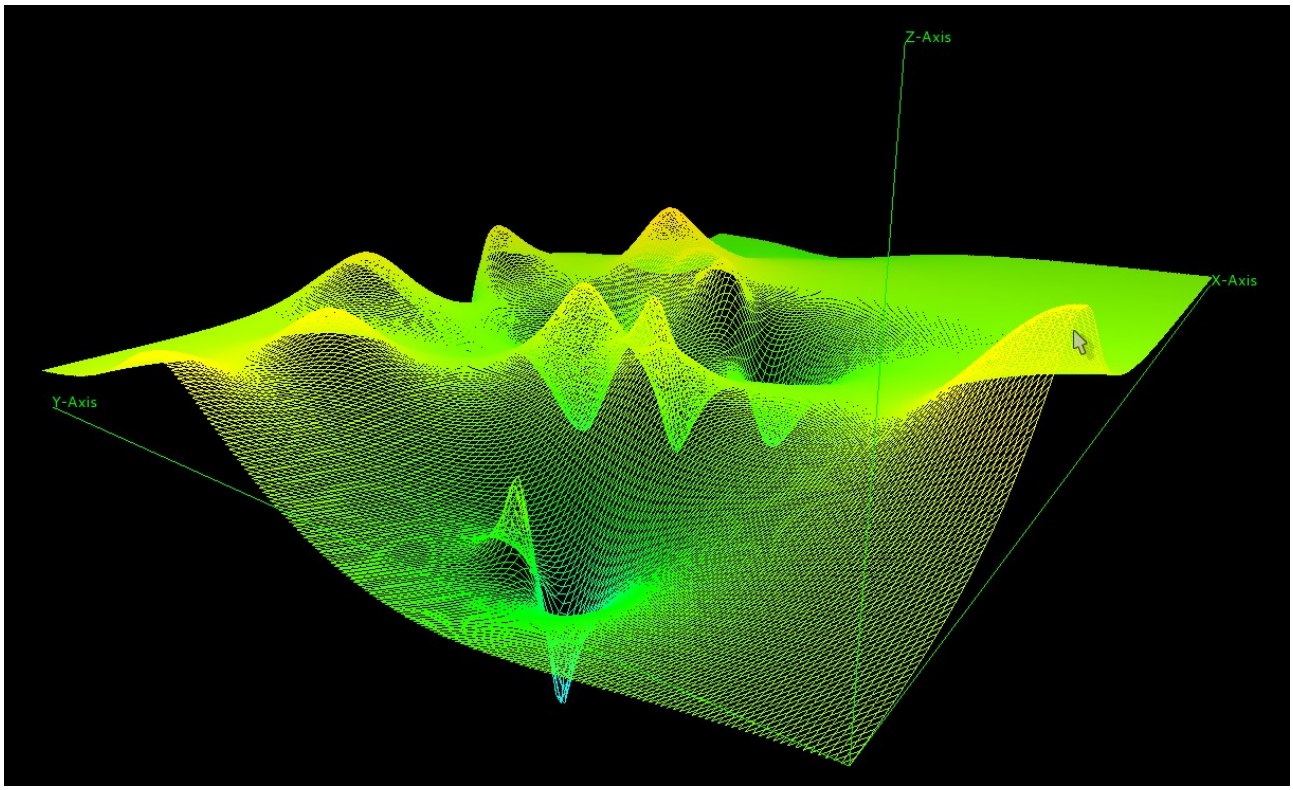

Fig 3. Surface display

➢ Drillholes distribution under surface

- The figure below shows the drill holes' distribution under the overlying surface. Each drill hole has been shown in red color at the points (x,y,z) where it was drilled.
- Optionally the figure also shows the position of the coal seam patches encountered in the drill hole. The patches are shown in blue in each drill hole.

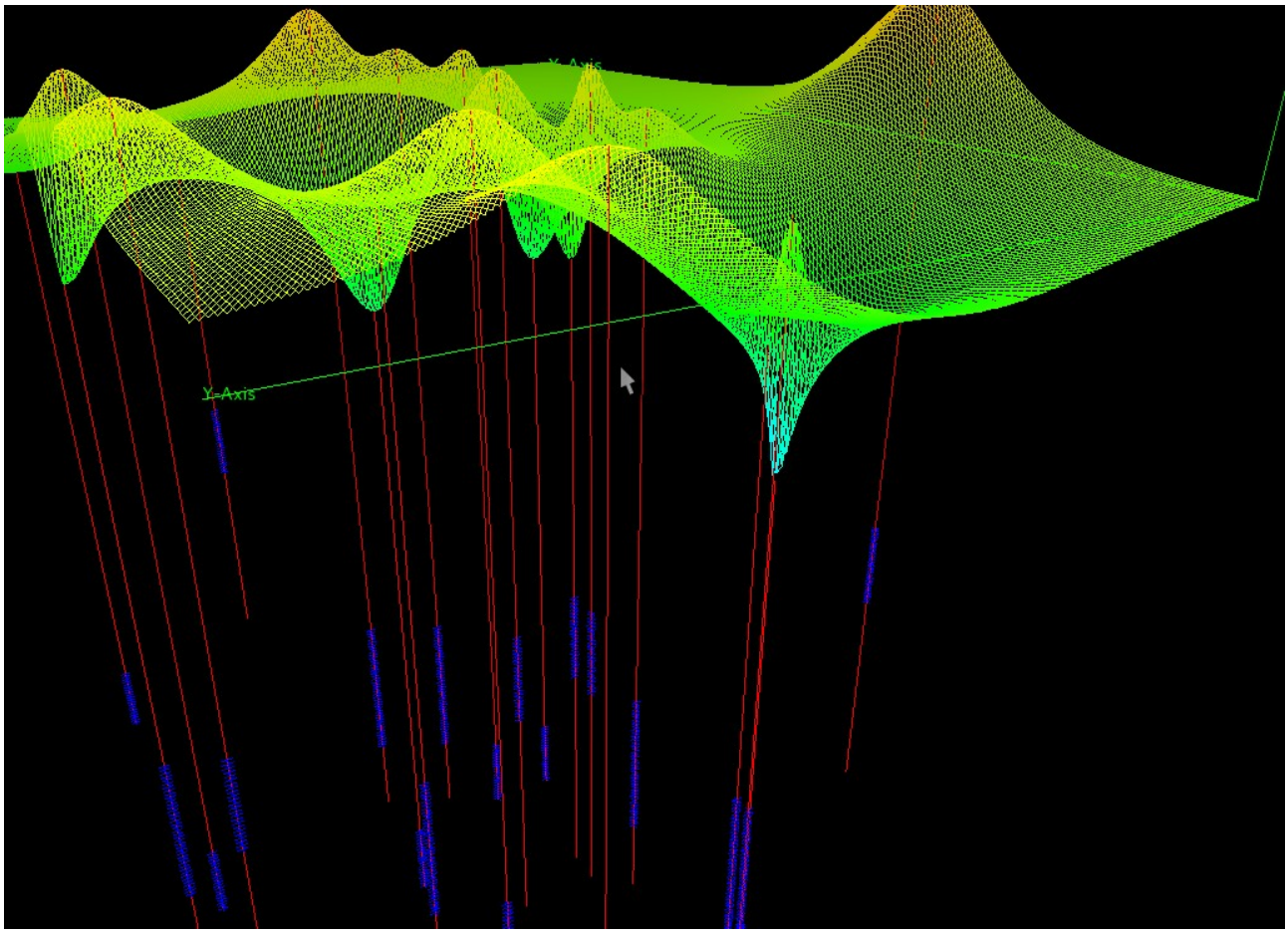

Fig 4. Drill holes distribution under surface

➢ Contour maps

- Contour maps are generally based on triangulated or gridded networks, which are superimposed onto mine area to represent topography in computerised environment.
- Node points on network wire are assigned several values such as topographical elevation, composited thickness and grade, ore seam upper or bottom surface elevations, etc.
- Main idea and purpose is to estimate several parametric values at node points using sample values obtained by drill holes.
- Here, inverse distance square, geostatistics and artificial neural networks can be applied to assign node values. Thereafter topographical, thickness and grade contour maps can be drawn.
- Currently, the project offers an implementation of the contour plot but lacks sufficient reliability and needs improvement.
- Below, figure shows the current support for contours.

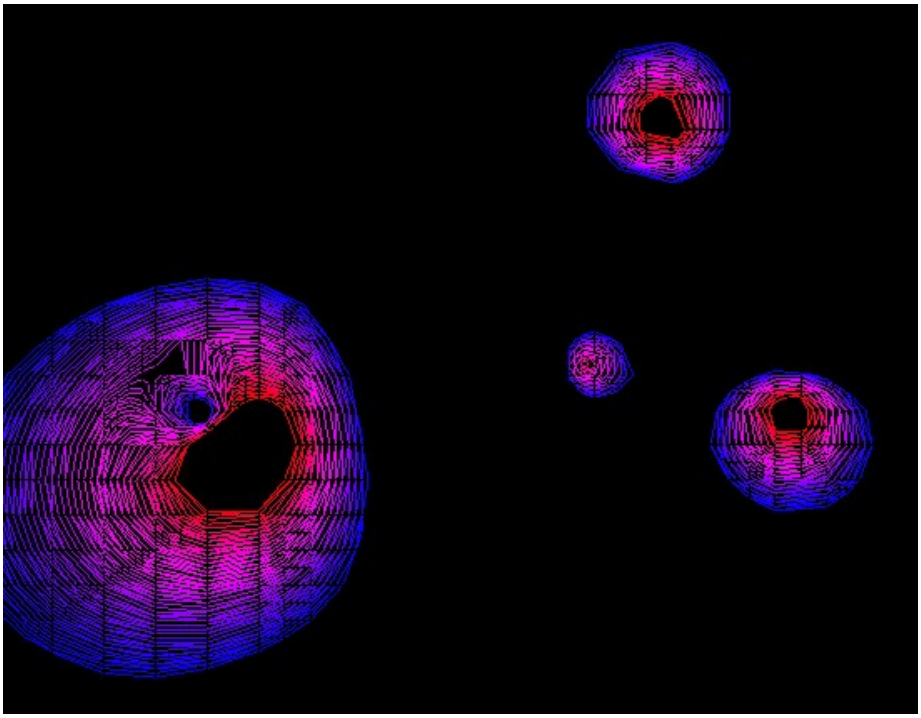

Fig 5. Contour plot display that needs improvement

➢ Coal Seam

- ➢ The underlying coal seam is plotted in the same way using interpolation.
- ➢ The seam patches are utilized.
- ➢ Currently, it is supposed that each drill hole encounters less than or equal to one seam patch.
- ➢ Below, figure shows the current support for displaying coal seams.

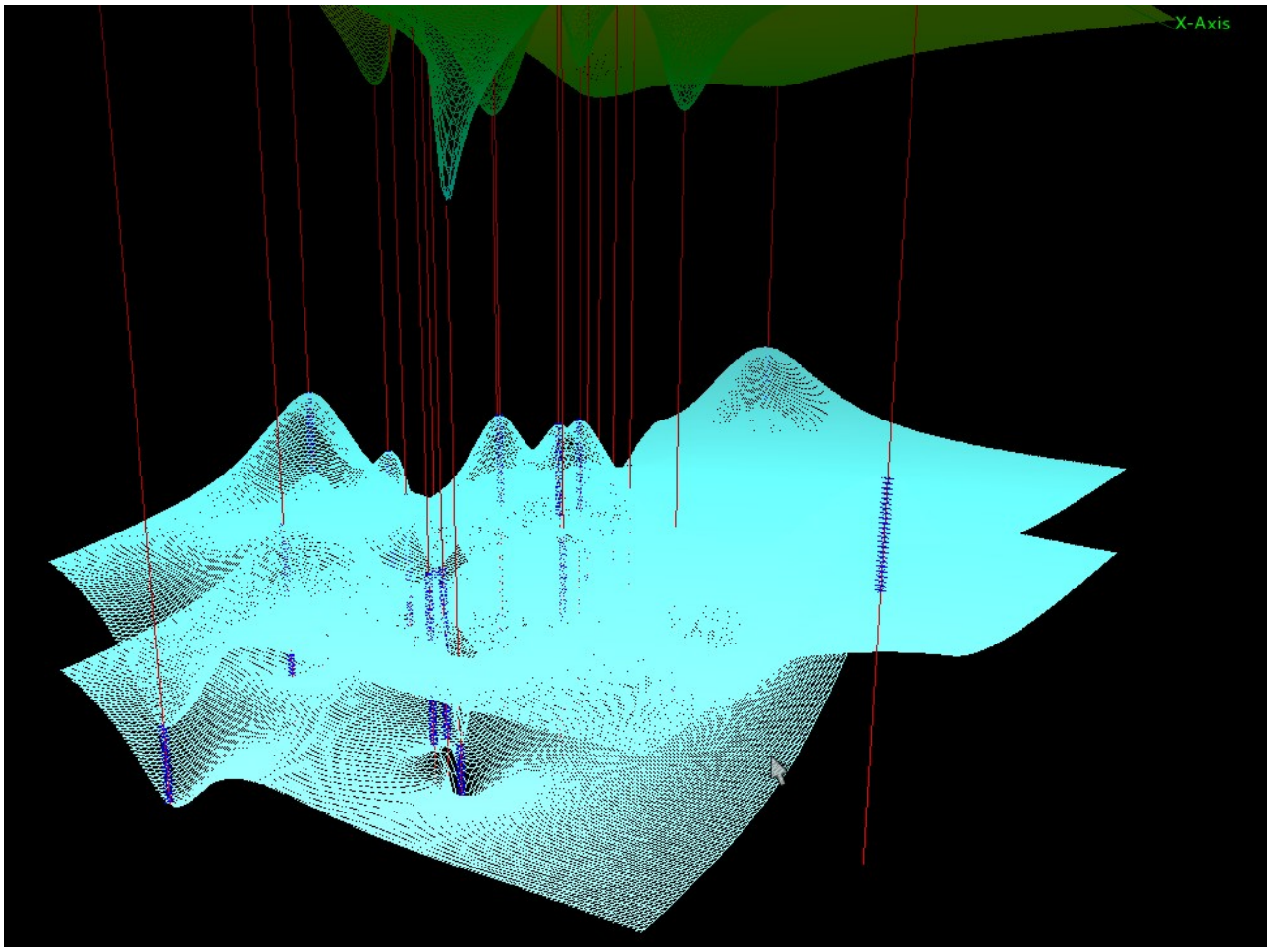

Fig 6. Underground coal seam projection