INTEGRATION OF DOWNHOLE GEOPHYSICAL AND LITHOLOGICAL DATA FROM COAL EXPLORATION DRILLHOLES

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The primary variable of interest in a coal resource study is the volume of coal as estimated from the coal thicknesses in each drillhole. It is therefore essential to accurately determine, down to the centimetre level, the thickness of each seam. To attain this accuracy, every drillhole is geophysically logged as the geophysical logs are a much more accurate indicator of seam boundary depths than the geologist's log. Currently, coal geologists spend large amounts of their time integrating their logs with depth information from the geophysical logs. They do this by displaying the two logs next to each other and then manually changing the depths in their logs. Most of this process is relatively routine and thus rather tedious and boring but like many seemingly simple cognitive tasks, not easily transformed into a computer algorithm. The manual methods also suffer from being subjective.

Previous methods to automate this process have used multivariate statistical techniques to assign lithologies down the hole based on the geophysical values at each reading depth. However, despite these methods having been developed and publicized for over thirty years they still have not been widely adopted as they still do not integrate the two sets of data. Geologists still must manually integrate two separate logs.

This current study has successfully managed to develop algorithms to automatically determine both coal/non-coal and clayey/non-clayey boundaries based on the gradients and inflection points of the geophysical logs and then integrate this information with the geologist's log.