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Multi-Attribute Ore Selection

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Many minerals are mined for a valuable component (such as iron) but contain a number of contaminants (such as silica, alumina and phosphorus) that tend to lower the value of the product. The optimum extraction of ore from a mine depends not only on the available mineable material that it contains but also on the market conditions. This paper considers the process of pit definition, for an open-pit mine, with the pit boundary identified iteratively by distinguishing ore from waste. It is shown that, except in the vicinity of the pit boundary, ore can be identified as material that has marginal value exceeding the cost of shipping and processing, since the mining cost is incurred whether it be waste or ore, and discount issues are not relevant because the marginal costs and benefits are contemporaneous. In addition to issues of ore selection, this paper considers ore sequencing, the order in which ore blocks are extracted and processed. Especially when the mined product provides input to subsequent processing, it is important that the product maintains a consistent composition not only in the mineral of value (such as iron) but also in the contaminants (such as silica, alumina and phosphorus). Methods for the sequencing of blocks so as to maintain a consistent composition are discussed. These methods apply a multi-component cost/benefit function, using stress values based on targets and tolerances, giving smoother control than a constraint based system.

Biography:

Jim Everett gained his BA in Natural Sciences and PhD in Geophysics from Cambridge University, and his MSc during a Harkness Fellowship at MIT. Following a two-year post doctoral at the Australian National University he worked eight years in the petroleum and mining industries. He completed a BCom and an MCom part-time at the University of Western Australia, where he subsequently taught and researched in the Business School for 30 years. Now retired from UWA as an Emeritus Professor, he continues to research and publish.