



Operations Research Seminar

Methods for Improving the Tractability of the Block Sequencing Problem for an Open Pit Mine

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Location: Glasgow 115

A surface mine optimizes its profits by maximizing the net present value (NPV) of its operation. One important operational component is production scheduling, i.e., defining when each section, or block, of ore should be removed. A production schedule requires adherence to geospatial and operational constraints. A common exact method for determining this block extraction sequence is formulating the problem as an integer program where binary variables represent when (and if) a given block is removed from the orebody. We suggest methodologies to expedite solution times for instances of this block sequencing problem: (i) we apply deterministic variable reduction techniques to eliminate blocks from consideration; (ii) we add cuts that strengthen the model's formulation; and (iii) we implement Lagrangian relaxation techniques that allow us to determine an optimal (or near-optimal) solution more quickly than solving the monolith (original) problem. Our techniques on data sets ranging from 100 to 10000 blocks reduce solution times by up to 80%.

Bio: Marty Gaupp is a Major in the US Air Force. He received his BS in Economics and Operations Research from the US Air Force Academy, an MBA from St Martin's College, and an MS in Operations Research from the Air Force Institute of Technology. He is currently a PhD candidate at the Colorado School of Mines conducting research in deterministic OR techniques applied to surface mining. Throughout his Air Force career he has served as a contracting officer, scientific analyst for the Director of Personnel at the Pentagon, and an assistant professor in the USAFA Math Department. Upon completing his PhD, he will be stationed at Randolph AFB in San Antonio, TX to assume the role of Chief Scientist for the AETC Studies and Analysis Squadron.