A Modified Approach to Subsidence Modeling in Block Caving Mining

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Abstract:

Block caving is a common underground mining method that enables the economical mining of large, low-grade ore deposits. It consists of letting part of the ore body collapse under its own weight in order to get mass production at a very low operational cost. However, much of the surface is characterized by serious subsidence caused primarily by the progressive caving in of the overburden. Precise prediction and control of such subsidence are essential to mining safety, infrastructure security, and environmental protection. Two well-established subsidence modeling methods, i.e., a Probability Integration Method and a Time Function Model are described. In this paper, we further improve these techniques by introducing dynamic spacetime terms to more accurately represent geological heterogeneity properties and time-dependent deformation effects. Then, a hybrid model, in which a spatially adaptive influence function is combined with a time coefficient that varies with time, is proposed to improve the predictive ability under various mining conditions.