



Investigation of Mechanofacies of Rock Mass through Fuzzy TOPSIS Method

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Abstract

The purpose of the present article is to investigate rock mass according to Fuzzy Logic. Assessing the mechanofacies was carried out on the basis of multi-criteria decision-making and through fuzzy technique for order performance by similarity to ideal solution. This study uses 8 experimental relations used in the modulus estimation and 6 criteria to assess the relations. Finally, it indicates that Mehrotra relation achieves the highest score.

Keywords: Mechanofacies, Rock mass, Multi-criteria decision-making.

1. Introduction

Deformation modulus of rock mass is one of the most important specifications and characteristics of rock mass mechanical behavior and applied to investigation of mechanofacies of stratigraphy units. Deformation modulus is the proportion of tension to the corresponding obeisance which includes the elastic and plastic behaviors of the rock mass. Proper determination and estimation of the modulus enjoys a particular importance. Since designing the structures which are due to be constructed in or on the rock mass, improper determination of the modulus may bring about heavy financial and nonfinancial damages. Hence, determining this deformation modulus of rock mass attracted the attention of many researchers in some fields such as geo-technique. Determining this deformation modulus through experimental relations is one of the most economic, simplest, and fastest techniques to estimate the modulus. Many researchers have attempted to present an appropriate experimental relation to estimate the more accurate amount of the modulus. Most of them have presented their experimental relations based on application of classification parameters of rock mass. Lack of reliability and certainty of the applied data is one of the most important problems of using the relations. Many researchers have tried to reach the validity and reliability of the relations through different methods.

In this paper uses fuzzy multi criteria decision making (FMCDM) and fuzzy technique for order performance by similarity to ideal solution (FTOPSIS) to investigate 8 experimental relations applied in estimating deformation. modulus of rock mass and 6 criteria to investigate the 8 relations.

2. Matherials and Methods

The six criteria have been selected based on geo-mechanical classification of CSIR or Bieniawski rock mass rating which is one of the multi-parameter classification methods of rocks. The 6 determined criteria constitute the rock mass rate according to (1). [1]

$$RMR = R_s + R_{ROD} + R_{sd} + R_{cd} + R_w + R_{od}$$
(1)

The six determining parameters of the rock mass rate R_S , R_{RQD} , R_{sd} , R_{cd} , R_w and R_{od} which are the same six criteria under study respectively include the rate of single-axis pressure resistance for healthy rock, the index rate RQD, the rate of closures intervals, the rate of closures status, the rate of underground water conditions, the rate of the closures relative direction. The first, Four criteria are positive and the rates of underground water conditions, closures relative direction are negative.