



Risk Assessment of Geological Hazards in a Tunneling Project Using Harmony Search Algorithm (Case Study: Ardabil-Mianeh Railway Tunnel)

Reza Mikaeil ^a, Sina Shaffiee Haghshenas ^{b*}, Yakob Shirvand ^a,
Mehdi Valizadeh Hasanluy ^c, Vali Roshanaei ^d

^a Department of Mining and Metallurgical Engineering, Urmia University of Technology, Urmia, Iran.

^b Young Researchers and Elite Club, Islamic Azad University, Rasht Branch, Rasht, Iran.

^c Department of Civil engineering, Islamic Azad University, Arak branch, Arak, Iran.

^d MSc Graduate of Civil Engineering, Sazab Kian Paad company.

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Abstract

During the design and implementation of underground constructions, the risk assessment and management of geological hazards are important due to the hazards such as the water inflow, collision with crushed fault zones, squeezing and instability around excavation zones. In the present research, it is attempted to study and assess the risk of geological hazards in 378+021 km of the route of Ardabil-Mianeh railway tunnel using the harmony search algorithm (HSA). In the first section of research, after studying structural and geological characteristics during 24 sections of the excavation route, the risk relating to geological hazards including the tunnel instability, squeezing, water inflow and swelling was assessed in three separate classes using HSA. In order to study the accuracy of results, geological hazards recorded during the implementation of excavation operations were used. Studies obtained from the comparison of observed and predicted results indicate the high accuracy of HSA in the assessment and prediction of geological risks in the tunnelling project.

Keywords: Tunneling; Risk Assessment; Geological Hazards; Harmony Search Algorithm; Ardabil-Mianeh Railway Tunnel.

1. Introduction

In most engineering projects faced with uncertainty condition, risk management can be the most important element in the design and implementation of such projects in which neglect and carelessness lead to irreparable problems in tunneling projects. Due to the high significance of such issue and its influence on the time and cost, identification of characteristics and prediction of geological risks are necessary. Generally, risk management includes the identification, assessment and control of the existing risks, and geotechnical risks, risks in the area of economics and management, and implementation and exploitation risks are important ones in tunneling projects. So far, extensive studies have been conducted on geotechnical risks in the area of tunneling. The identification and assessment of tunneling hazards in the railway tunnel in Thailand were addressed by Ghosh and Jintanapakanont (2004). Their research results showed that the hazard classification has provided the possibility of dealing with accidents and led to minimum hazards in tunneling [1]. In a research, geological hazards were studied and predicted by Panthi and Nilsen (2007) in the route of tunneling in weak rocky environments. In this research, the degree of squeezing in the route of excavation two tunnels was studied using a new method based on the geomechanical characteristics. Results obtained from studies showed that the degree of squeezing can be assessed and predicted using the suggested method [2]. The identification of hazards, the quantitative study of risk and risk reducing measures in tunneling using earth pressure balanced

* Corresponding author: S.shaffiee@yahoo.com