

# Signaling system selection based on a full fuzzy hierarchical-TOPSIS algorithm

Javad Lessan<sup>1\*</sup>, Ahmad Mirabadi<sup>1</sup>, Yaser Gholamzadeh Jeddi<sup>2</sup>

<sup>1</sup> School of Railway Engineering, Iran University of Science and Technology, Tehran 16846-13114, Iran

<sup>2</sup> Department of Industrial Engineering, Bu-Ali Sina University, Hamedan 65174, Iran

*(Received 12 January 2010, Revised 22 March 2010, Accepted 25 June 2010)*

---

**Abstract.** This paper proposes a full fuzzy TOPSIS as an optimization model for railway signaling system selection issue. The study is a new approach to such problems in railway domain. Analysis of the obtained results is explained and they indicate that the proposed approach as full fuzzy decision support model is a feasible and practical approach. The approach needs no defuzzification and it considers both the qualitative and quantitative. The fuzzy approach is employed to cope with imprecision in the assessment of the relative importance of criteria and alternatives. In proposed method given a linguistic verbal judgment matrix, fuzzy normalized judgment matrix is constructed by implementing a new developed normalization method. Then the fuzzy scores of the alternatives are determined based on solving of a non-linear programming model. Finally the ranks of the alternatives are determined through a fuzzy ranking method. The aforementioned algorithm was applied in one of the railway lines of Iran.

**Keywords:** signaling system selection, fuzzy multi criteria decision making, fuzzy-TOPSIS, non-linear programming, fuzzy ranking

---