MULTI-CRITERIA DECISION MAKING MODEL FOR TOWER CRANE OPERATIONS

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ABSTRACT

Multi-Criteria Decision Making (MCDM) deals with the process of solving decisions problems considering multiple criteria emerging from the preferences of decision-maker. The basic working principle of MCDM process is the selection of criteria, the selection of alternatives, and the selection of weighting methods to represent importance. The main purpose of this paper is to rank several alternatives for tower cranes operation movements. The methodology employed is based on Analytical Hierarchy Process (AHP) for finding out criteria weights and the ELECTRE (Elimination Et Choix Traduisant la REalité) outranking procedure to find the best alternative. A case study considering four important criteria that have influence on the operation motion of tower cranes are employed. They are the total project time, the total project cost, the coverage area, and the availability of tower cranes. Six alternatives were evaluated by ELECTRE method. The results of the case study determine the best alternative based on the concordance-discordance ELECTRE evaluation. Also, in this paper, sensitivity analysis has been performed considering the most critical criterion and the most critical measure of performance. The most sensitive criterion is the coverage area of tower cranes and the most sensitive alternative is the third one.

KEYWORDS: Multi-criteria decision making, Analytical hierarchy process, ELECTRE, Tower crane operation, Sensitivity analysis.

1. INTRODUCTION

Operation motion of equipment is an important activity for effective process development in construction activities. Determining the most appropriate motion process led to low cost with respect to shortest route and transportation time. MCDM is implemented when finding out the best alternative among different alternatives of tower crane motion that depend on different criteria.

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