Announcing the Final Examination of Ali Shehadeh for the degree of Doctor of Philosophy

Time & Location: October 14, 2019 at 2:00 PM in Eng. 2 211p
Title: MULTI-OBJECTIVE OPTIMIZATION FOR CONSTRUCTION EQUIPMENT FLEET SELECTION AND MANAGEMENT IN HIGHWAY CONSTRUCTION PROJECTS BASED ON TIME, COST, AND QUALITY OBJECTIVES

The sector of highway construction shares approximately 11% of the total construction industry in the US. Construction equipment can be considered as one of the primary reasons this industry has reached such a significant level, as it is considered an essential part of the highway construction process during highway project construction. This research addresses a multi-objective optimization mathematical model that quantifies and optimize the key parameters for excavator, truck, and motor-grader equipment to minimize time and cost objective functions. The model is also aimed to maintain the required level of quality for the targeted construction activity. The mathematical functions for the primary objectives were formulated and then a genetic algorithm-based multi-objective was performed to generate the time-cost Pareto trade-offs for all possible equipment combinations using MATLAB software to facilitate the implementation. The model's capabilities in generating optimal time and cost trade-offs based on optimized equipment number, capacity, and speed to adapt with the complex and dynamic nature of highway construction projects are demonstrated using a highway construction case study. The developed model is a decision support tool during the construction process to adapt with any necessary changes into time or cost requirements taking into consideration environmental, safety and quality aspects. The flexibility and comprehensiveness of the proposed model, along with its programmable nature, make it a powerful tool for managing construction equipment, which will help saving time and money within the optimal quality margins. Also, this environmentally friendly decision-support tool model provided optimal solutions that help to reduce the CO2 emissions reducing the ripple effects of targeted highway construction activities on the global warming phenomenon. The generated optimal solutions offered considerable time and cost savings.

Major: Civil Engineering

Educational Career:
Bachelor's of Civil Engineering, BS, 2012, Jordan University of Science and Technology
Master's of Civil Engineering, MS, 2014, Jordan University of Science and Technology
Master's of Civil Engineering, MS, 2019, University of Central Florida

Committee in Charge:
Omer Tatari, Chair, Civil, Environmental and Construction Engineering
Haitham Al-Deek, Civil, Environmental, & Construction Engineering
Hatem Abou-Senna, Civil, Environmental, & Construction Engineering
Elena Flitsiyan, Physics

Approved for distribution by Omer Tatari, Committee Chair, on April 17, 2019.

The public is welcome to attend.