

Evaluation of Agent-Based and Discrete-Event Simulation for Modeling Construction Earthmoving Operations

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Abstract:

One of the most common operations to any construction project is earthwork. In fact, most, if not all, construction projects begin with earthwork activities. These activities require heavy equipment, are generally quite costly and consume a considerable amount of time. On another hand, the construction industry is becoming increasingly competitive over the years, whereby the need to continuously find ways to improve construction performance. In order to address the aforementioned adversities, this paper takes the initial steps and presents work targeted at efficiently managing logistics of earthwork operations in the construction field, namely cut and fill processes, and hauling activities. This dynamic and complex problem, which entails a lot of parameters and variables, is addressed in detail through creating two simulation models, a Discrete-Event Simulation (DES) model and an Agent-Based Simulation (ABS) one, using the multi-method simulation software AnyLogic 7.1. The purpose behind this study is two-fold: (1) capturing and visualizing the interaction among the different resources or entities in an earthmoving operation and defining the weak links in order to improve the efficiency of such activities onsite, and (2) comparing DES and ABS approaches and evaluating the advantages and drawbacks of each when modeling earthmoving operations. Results of both approaches are presented and analyzed with regard to improving performance of earthmoving operations, followed by a discussion of the application and effectiveness of using each of the presented simulation approaches in modeling construction activities.