Chapter 6.7

The State of Computer Simulation Applications in Construction

Mohamed Marzouk
Cairo University, Egypt

ABSTRACT

Construction operations are performed under different working conditions including (but not limited to) unexpected weather conditions, equipment breakdown, delays in procurement, etc. As such, computer simulation is considered an appropriate technique for modeling the randomness of construction operations. Several construction processes and operations have been modeled utilizing computer simulation such as earthmoving, construction of bridges and tunnels, concrete placement operations, paving processes, and coordination of cranes operations. This chapter presents an overview of computer simulation efforts that have been performed in the area of construction engineering and management. Also, it presents two computer simulation applications in construction; earthmoving and construction of bridges' decks. Comprehensive case studies are worked out to illustrate the practicality of using computer simulation in scheduling construction projects, taking into account the associated uncertainties inherited in construction operations.

INTRODUCTION

Simulation is one of the techniques that has been used to model uncertainties involved in construction operations. Although simulation is a powerful tool for modeling construction operations, the application of simulation is still limited in the construction domain. This has generally been

attributed to the difficulty in learning and applying simulation languages to industry (Sawhney and AbouRizk 1996, Oloufa et al 1998, Touran 1990). The simulation process is an iterative process which involves different steps. It has been defined as "imitation of a real-world process or system over time" (Banks et al 2000). Modeling construction operations utilizing discrete event simulation, requires the modeler to define three main elements (Schriber and Brunner 1999): project, experiments and replications (see Figure 1). A "*project*" is performed to study a certain operation which has specific characteristics, for example, an earthmoving operation that contains a definite

scope of work and specific road characterisitics. An "*experiment*" represents one alternative of the project under consideration by changing the resources assigned for the execution of the project and/or its individual activities. A "*replication*" represents one execution of an experiment within the project.

Modeling utilizing simulation can be applied either in a general or special purpose simulation environment. General purpose simulation (GPS) is based on formulating a simulation model for the system under study, running the simulation and analyzing the results in order to decide whether the system is acceptable or not. In case

Figure 1. Elements of discrete event simulation
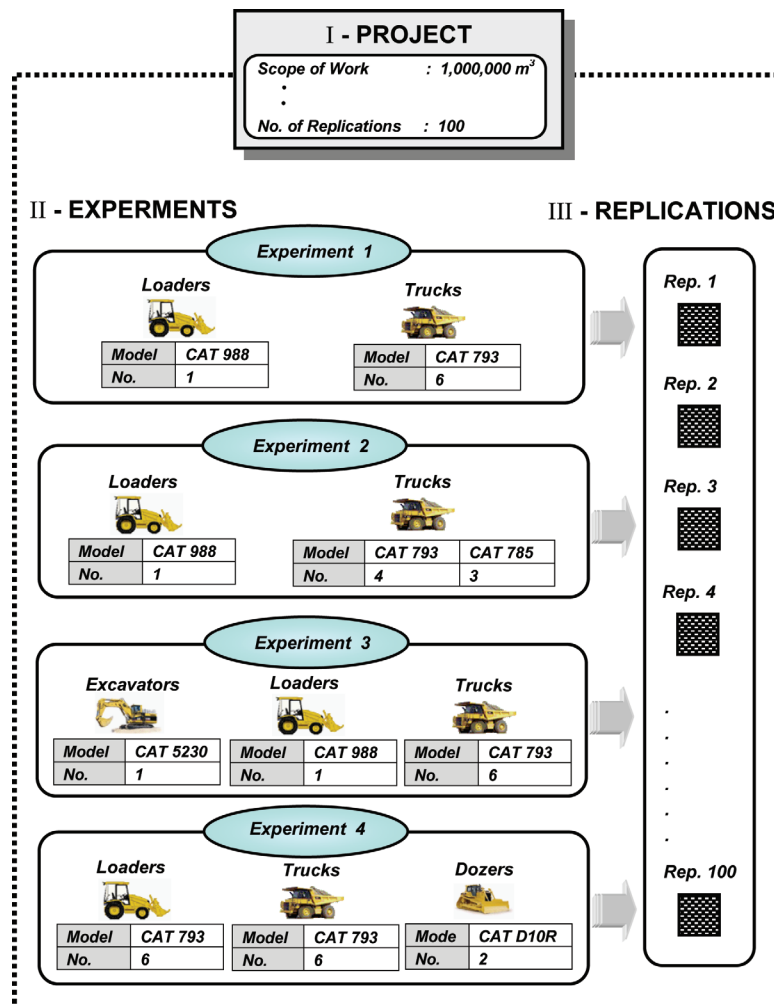
21 more pages are available in the full version of this document, which may
be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/state-computer-simulation-applications-
construction/49467

Related Content