Genetic Algorithms for Two-Phase Construction Dynamic Site Layout

Amr Fathy and Ibrahim Abotaleb
The American University in Cairo
Egypt

Abstract

Construction site layout planning is a complex problem that has significant impacts on work and cost efficiency. It includes the identification and placement of temporary facilities: location of site offices, cranes, storage areas, fabrication shops, warehouses, entrances and exits gates, temporary roads and water tanks. The objective of this research is to develop a model for optimum dynamic site layout of two-phase construction projects consisting of two phases or buildings that are part of one project taking into account mobilization, demobilization, operation, relocation and traveling costs. Factors affecting site layout planning include: project type and size, access routes, material handling, operational areas, organization of work and location of permanent buildings. The case study examined is a twin tower retail mall that is constructed sequentially such that when the first building is complete, it would operate simultaneously with the commencement of construction of the second building. With the constantly changing nature of two-phased projects, site layout becomes a dynamic problem that is difficult to specify and interrelate. In this research, genetic algorithms are proposed as possible solution techniques to address the emerging issue of optimizing the dynamic site layout for two phase construction projects. The developed model does not only cover the positioning of temporary facilities with respect to time, but it also takes into account the cost of operation, travel, handling of material and equipment and mobilization and demobilization of facilities. Results show that the model can be an effective tool in supporting decision makers in achieving optimal site layout.