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BUILDING INFORMATION MODELING INTEGRATED FRAMEWORK FOR ASSESMENT OF SLIPFORM OPERATIONS

A THESIS

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Abstract

Effective management of Slipforming operations is critical due to operation's linearity that is considered a major source of planning and proper project management complications. This thesis aim is to develop and present a comprehensive decision making tool for feasibility studies of Slipform projects concerning four major project management domains, namely, Time, Cost, Quality and safety domains. Research utilized Building Information Modeling (BIM) as the most emerging technology in the AEC for design and facility management of construction projects reinforced by discrete event simulation as scenario analysis method for achieving the thesis aim and goals.

Consequently, this thesis proposes a twofold developed frame work to assess and compute the aforementioned project management domains of Slipforming projects as following, (1) Develop an integrated BIM and DES framework for the purpose of automating the generation of time schedules (4D), cost estimates (5D), (2) Linking the aforementioned 4D model with quality specifications and safety procedures to assess quality of project defined elements in study, in addition to visualization of safety management plan in slip-forming construction site.

The first framework stage was achieved as following; An Integrated framework is proposed to develop computer software that integrates BIM, DES Schedule and Cost estimates generation. **B**IM **S**chedule and **C**ost and **I**ntegrated module (**BSCI**) software, this software is reinforced by both BIM and DES capabilities. Enhanced by BIMs extracted information, the quantities are used to generate DES input data in order to calculate the execution times for construction processes and exchange data between various software platforms. this framework stage consists of: 1) Slipform BIM model that exports material quantity take-offs, schedules and required resources to an external database, 2) Discrete Event Simulation model encountering complete specification of the interdependencies between activities and resources and 3) Intelligent model that automatically collects, transfers and reserve data among various software programs. Furthermore, to illustrate the software's functionality a preliminary model was developed for a Slipform case of study and validation of the software was conducted for evaluation purposes that showed robust results of 98% for Schedule generation and 96% for cost estimates.

Moreover, the second framework stage was achieved by expanding the 4D model to nD modeling for assessing quality and safety of slip from project by establishing the following approaches; (1) Develop a 4D- BIM based quality management approach (6D) by developing a POP model that integrates the specifications, procedures, quality inspection plan process and checklists with the 4D model and compares field measurements vs design to present a decision whether to accept and proceed to next process or to reject and issue a nonconformance report (NCR), (2) Develop a visualized 4D- BIM based safety management approach (7D) for assessing in visualizing safety procedures conducted through Slipform projects for the following aspects; Site layout plans and crane reach visualization related to a crane collapse, Modelling of safety railings for falling protection and BIM Site safety communication.

This research can facilitate Slipform projects feasibility studies generation. Besides describing low BIM adopted domains as quality and safety in a practical application.

Keywords: BIM, Slipform, Modeling, DES, Slipform, 4D modeling, Quality, Safety, Analysis, Temporary Structures.

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