

SCREENING ALEXANDRIA PORT SIMULATION MODEL BY USING SEQUENTIAL BIFURCATION PROCEDURE

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Abstract

Screening simulation experiments is intended to eliminate unimportant factors from a simulation model. It usually results in a short list of important factors, so that effort may be concentrated upon this list. Sequential bifurcation (SB) procedure, developed by Bettonvil and Kleijnen [1], is a screening method that has proved to be efficient and effective. In this study, the SB procedure is used to determine the most important factors of the port of Alexandria, Egypt simulation model. Sixteen out of 44 factors are considered important. In addition, Cioppa [2] procedure is used to verify that the assumed unimportant factors by the SB procedure are really unimportant. This procedure is used to confirm that the suspected non-influential (unimportant) factors do not significantly affect the response output of interest. This procedure emphasized that the set of unimportant factors determined by the SB procedures is really unimportant.

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Key Words: Simulation, Screening, Sequential Bifurcation

1. INTRODUCTION

Screening in simulation is to find the most important input parameters. It is the first phase of a design of experiments study for simulation models. Screening is the process of searching for the few important factors among the great many potentially important factors that affect a system's performance. Therefore, the purpose of screening is to eliminate negligible factors so that efforts may be concentrated upon just the important input parameters. The idea of screening is based on the "parsimony principle" which says that only few factors are responsible for most of the effect in response variable [2].

Trocine and Malone [3] determined four criteria for selecting a screening method. These criteria are efficiency, effectiveness, robustness and ease of use. The efficiency of the screening method is measured by the number of required runs. The efficient screening method is the one that needs a manageable number of runs. Effectiveness of the screening method is the ability of determining the important factors of the simulation experiment. The robustness of the screening method is how the method works without prior knowledge of the problem. A robust method is the one that works well without conditions. The last criterion is the ease of use; it is desirable but not necessary. It can be dropped for the sake of efficiency, effectiveness and robustness.

According to Trocine and Malone [4], the choice of a screening method depends on the number of factors in the model. For few factors (less than or equal to five), the full factorial (2^k) design is the best. The fractional factorial (2^{k-p}) is the best for fewer than 20 factors. For

of Alexandria, in order to reduce the ship's turnaround time, there is no need to construct additional berths and spend millions of dollars. Instead, the port authority needs to hire the required cargo handling workers, reduce the crane cycle time by using qualified gangs and better cranes, or reduce the time that the ship stays at berth after finishing the cargo handling operations; for example, reduce the required time to finish the departure permission.

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