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A CONCEPT PAPER ON ASSESSING THE PERFORMANCE OF STOCHASTIC METHODS IN STRUCTURAL MODELLING

KABUUNGA HAMIDU 15/U/5389/PS
MUSINGUZI WILLIAM 14/U/10056/PS
WAMALA EMMANUEL 15/U/13659/PS
BADAZA PROTUS WAISWA 14/U/3832/EVE

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0.1 Introduction

Stochastic structural optimization avoids highly specialized designs and therefore reduces imperfection sensitivity. It naturally includes statistical uncertainties into the design optimization process. Furthermore, it allows the inclusion of quality control measures (manufacturing, maintenance) into the design process. It is, however, computationally very expensive unless based on approximations such as response surface models.

0.2 Background to the problem

In many engineering application there is an increasing demand on the availability of tools to incorporate unavoidable random variability of loads and system properties into the work- ow of structural analysis. This requires a close relation between the data structures as required for traditional Finite Element analyses and the stochastic tool to obtain a suitable statistical description of the relevant responses. This is readily achievable by using established software development environments such as e.g. C++. Due to the required compilation process and the possibly code optimization associated with it, the computational perfor- mance can be quite impressive. On the other hand, the compile-link-cycles do not allow for quick checks how minor algorithmic modi cations or extensions af- fect the quality of desired results. This is particu- larly annoying when developing larger software projects in a distributed system.

Abstract