Assessing the performance of stochastic optimization methods in structural modeling

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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 performance 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 particularly annoying when developing larger software projects in a distributed system.

0.3 Problem Statement

Due to the ever increasing demand on performance and cost-ecacy of structures, the need for numerical tools to optimize such structures in the design process has become very strong. The computational demand arising from optimization methods is quite heavy, and it is even more increasing since various stochastic uncertainties have to be taken into account in the design optimization process, because of this we came out with an aid for accessing the performance of stochastic optimization methods in structural modeling.

0.4 Objectives

1. Main Objective To access the performance of stochastic optimization methods in structural mod- eling. 2.Other Objective To collect data from the various sources about stochastic optimization meth- ods in structural modeling. To study and analyze the current exam entry veri

cation system and data col- lected with a clear aim of identifying weaknesses, strengths and requirements of the new system. To design and implement a prototype of access the performance of stochastic optimization methods in struc-

tural modeling. To test and validate the performance of stochastic optimization methods in structural modeling to ensure that it is error free .

0.5 Methodology

We intend to use observation, interviews, and review literation of the collected data from the various sources about stochastic optimization methods in structural modelling. The data collected will be subjected to analysis in order to ensure consistency in modelling the system. The data collected will be grouped into functional and non-functional requirements. Functional requirements will specify what the system will do while the non-functional requirements will be the overall constraints. Tools such as SPSS are to be used as they are automated and give quick results. The system will be designed by the use of use case diagrams and data ow diagrams that will help to explain how the actors will interact with the system. We intend to use visual studio and C++ to implement and access the performance of stochastic optimization methods in structural modeling in order to produce a prototype basing on the user requirements. The system will be tested to achieve the forth objective using unit testing and system testing. Thereafter the system will be taken to the users for validation to ensure that it operates to their satisfaction.

0.6 Outcomes

The proposed system is to access the performance of stochastic optimization methods in structural modelling since the architecture is intended to ease the accessing process Furthermore, the proposed system whose research is being carried out will be very useful to any other researchers who may wish to venture into still the same or nearly the same developments in the technology world.

0.7 References

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