

Evaluating the economic viability of a technical system

Introduction

In this thesis the economic viability of a technical system was examined. Furthermore, a scenario of the system should be created that is as ideal as possible, i.e. has the highest possible net present value. The technical system is mapped in a Matlab code and is fed with different Excel input files. These Excel input files contain various input parameters that the Matlab code requires to calculate the net present value of the system.

Methodology

In a first step, a sensitivity analysis is used to determine the influence of the individual parameters on the economic target value, the net present value. The sensitivity analysis was performed using the Monte Carlo simulation and the One Factor at A Time method. The Monte Carlo simulation is a method in which all input parameters are simultaneously and randomly changed. Using multiple linear regression, it was then possible to evaluate the results of the Monte Carlo simulation and determine influence of the individual parameters.

In order to verify the results of the Monte Carlo simulation, a sensitivity analysis was also carried out using the One Factor At a Time method. In the One Factor At a Time method, as the name suggests, one parameter is changed after the other.

In order to be able to create an ideal scenario, an experimental design was created. In the design of experiment, the various parameters that have a positive influence on the net present value were changed simultaneously. The aim of the design of experiments is to investigate the interactions of the input parameters.

Results

An ideal scenario with a high net present value could be created.

The One Factor At a Time method, the Monte Carlo Simulation and the Design of Experiments were ideal complementary methods to evaluate the economic viability of the technical system. By writing a Python code that automatically generates the different Excel input files with the changed values, the evaluation process could be made more efficient.

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Results Monte Carlo Simulation

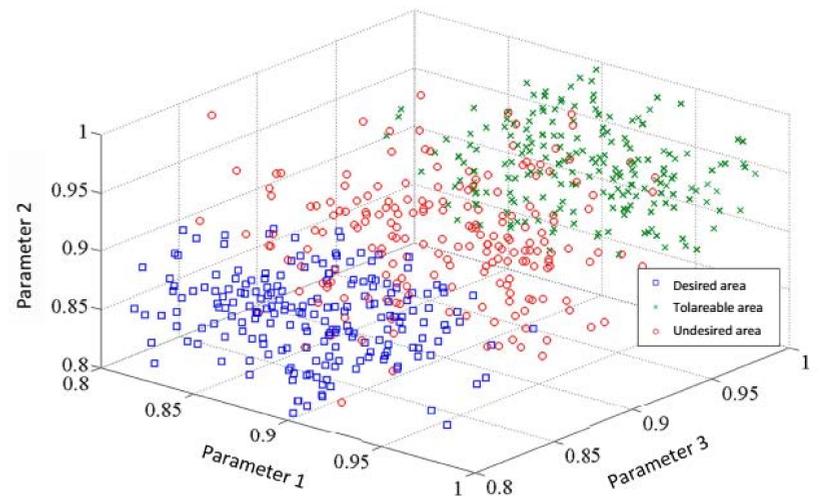


Figure 1: Shows the results of a Monte Carlo simulation, some results are in the desired range, some in the tolerable range and some in the undesired range (<https://www.mdpi.com/2071-1050/9/4/539/htm>)

Description of the procedure for the One Factor At a Time method

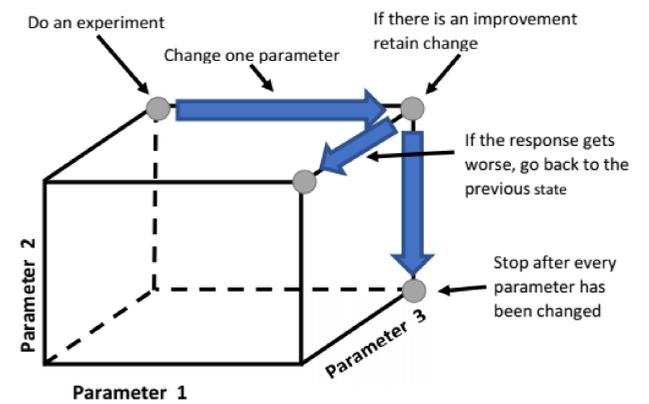


Figure 2: Shows the procedure for the One Factor At a Time Methode (<https://pdfs.semanticscholar.org/12c8/6c38aba59bb4bd7fcc10f99deefc76f56608.pdf>)

Description of the procedure for the Design of Experiments

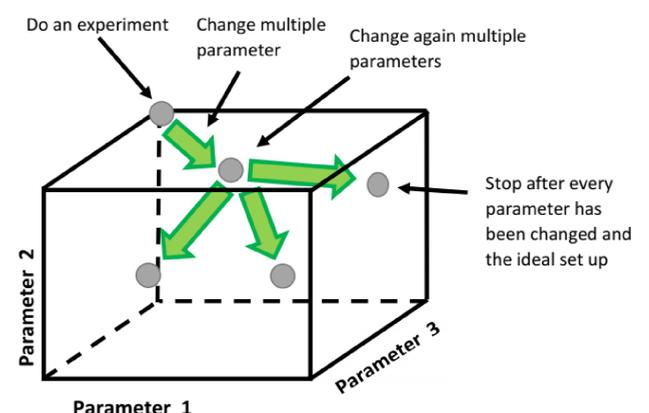


Figure 3: Shows the procedure for the Design of Experiments Methode