

# STOCHASTIC SHAPE OPTIMISATION

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**Abstract** We present a constrained shape optimisation problem solved via metaheuristic stochastic techniques. Genetic Algorithms are briefly reviewed and their adaptation to surface topography optimisation is studied. An application to flow optimisation issues is presented.

**Keywords:** Shape, Topography, Stochastic Optimisation, Genetic Algorithms

## Introduction

Geometrical shape or surface topography optimisations are quite numerous among the optimisation problems, since they are encountered and play often an important role in most technical domains. Traditionally, deterministic models or expensive experimental tests are employed to solve these issues.

Computing power has grown considerably in the past years, dramatically promoting the interest in numerical techniques. Numerical simulations and models become issues for problems in many domains. They opened the path, serving as objective functions, to a large number of stochastic optimisation techniques working on discretised search spaces.

We will focus here on *Genetic Algorithms* (GA) [1, 4]. The main advantage of this numerical optimisation approach, compared to deterministic ones, is its extended search space and its robustness. In return, it requires complex and onerous computations, and its convergence rate is particularly slow, which represents its main weakness.

We will first describe (Section 1) the precise problem that led us to this study. Section 2 gives a tutorial introduction to stochastic optimisation and in Section 3 we describe the GAs' adaptation to our specific problem. Section 4