Shape optimzation using Estimation of Distirbution Algorithms and the Gibbs sampler

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Abstract

The shape optimization problem consist in finding the best mechanical structure for some given conditions. The best structure is, usually, defined as the minimum weight structure which fulfill the service conditions. In this proposal we present an algorithm for finding the best structure by estimating and sampling a probability distribution. Each sampled instance is a binary vector which represents a candidate structure. The binary vector is used to determine if a finite element is present or not. Notice that simple random binary vectors could delivered sets of elements disconnected from each other, which represent unfeasible structures. In order to constraint the kind of sampled structures to connected ones, we use the Gibbs sampler. it allows to integrate information about the neighborhood of each element, favoring connected structures with highest probability. The candidate sampled structures are then evaluated by the finite element method, the resulting information is used to discriminate a selected set of the best structures. These structures are used to learn marginal probabilities which are used together with information about elements neighborhood in the Gibbs sampler. The results of the proposal are competitive with recent algorithms in the literature.