Target Performance Optimization of Dynamical Systems Considering Uncertainties

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ABSTRACT

This paper analyzes a simple stochastic dynamical system [1] where a target performance is to be achieved, in other words, the optimization algorithm seeks the optimal parameter values to achieve a pre-defined performance. However, some parameters of the system are modeled as random variables, thus, requiring the use of stochastic optimization. To model the uncertainties of the system, the parametric approach is used and the probability density functions are derived using the Maximum Entropy Principle [2].

A methodology based on stochastic approximation techniques is presented to pursue the optimization of the structure [3]. Such methodology, first, finds the most promising region of the search space and, then, gradient based algorithms are used to obtain the final result.

In the analysis, the influence of the dispersion of the random variables on the response is investigated. Two different performance functions are analyzed and the main conclusions are: (i) depending on the type of performance function chosen, the uncertainties cause different effects in its surface and, (ii) the optimization algorithm is able to find a robust optimum point.

References

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