Response to referee 1's comments

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The authors thank the reviewers for the constructive comments and suggested improvements. A revised version of the paper has been prepared considering the reviewers' comments. A list of replies to the reviewers' comments is reported below.

RC1

RC1 a)

The authors proposed a surrogate-based optimization framework. However, there is nothing new in the framework. All the strategies used in the frame are already available. So, it seems to the reviewer that there is no academic novelty in the manuscript at least regarding the surrogate aspect.

A) Novelties of our paper:

The authors acknowledge that there is a limited novelty from the point of developing an Surrogate-Based Optimization (SBO) strategy itself such as a new surrogate model, or optimization methods as that is not the scope of this work. But it is the view of the authors that designing an SBO framework using different existing strategies and applying it to the Stall-Induced Vibration (SIV) problem is a new work (to the best of the authors' knowledge).

This point are now mentioned in the last paragraph of the Introduction which has been edited to read, "To the authors' best knowledge, the problem of effectively exploring the behaviour of SIV using an SBO framework has not been attempted before and in this paper, we propose an SBO type framework to study SIV effectively. The proposed SBO framework is independent of the surrogate type, and in addition to identifying the most critical vibrations, has a wider scope to additionally identify regions in the domain where the target function can take critical values (below a certain threshold) with good confidence."

B) Differences with respect to existing strategies

Delaunay Triangulation has been used previously in SBO applications for adaptive sampling,

for ex. in [1],[2],[3],[4]. The authors acknowledge and mention in section 4.3.1 that most of the ideas used in this paper are available in the existing literature, especially [1] & [2].

To elucidate the key differences between these (and other similar works) and this paper, the following line has been removed from section 4.3.1

"~~The method of selecting samples using Delaunay triangulation and a measure of complexity is similar to the algorithm proposed by~~ [1]"

And the following lines that explain the differences with respect to existing strategies are now added after explaining the framework, at the end of section 4.3.3.

"The method of selecting samples using Delaunay triangulation and a measure of complexity is similar to the algorithm proposed by [1], and the method of iteratively minimizing the surrogate model in the exploitation phase is similar to the method used in [2]. The key differences between these (and other similar works) and this work are:

1. In the exploration phase, we use a R^2 metric after every iteration as a measure of the quality of the surrogate and to decide when to stop the exploration phase, while this metric has not been proposed in the works that have used Delaunay triangulation for adaptive sampling. This metric serves two purposes - a) Track the progress of the exploration phase and b) To decide the termination of the exploration phase.

2. In the exploitation phase, if the minima cannot be found after a specified number of iterations, we propose a scheme based on the properties of the Delaunay simplexes to eliminate false predicted minima and conclude the process to a respectable minima using the information available (section 4.3.3). The previous studies that have used the method of iterative minimization of the surrogate model to identify the minimum have not used such a method to eliminate false minima in case convergence is not reached."

RC1 b)

The manuscript title implies that the authors applied the framework for optimization. However, I can't find much about the optimization results obtained applying the proposed framework

The authors thank the reviewer for providing the perspective of the optimization part from a neutral reader's perspective. The authors would like to convey that sections 4.3.2, 4.3.3, and 4.4 are related to the optimization of the surrogate model, and figure 8b shows the results of the minimum damping after each iteration. To emphasize the optimization used in this work, section 4.3.2 has been rewritten to mention the multi-start minimize method that has been used in the optimization process

RC1 c)

It is not well explained why the surrogate approach is necessary for the given problem. At least, the authors should explain the computer simulation time and

compare the total computation time with and without using the surrogate model for the given problem

The authors thank the reviewer for pointing out that the paper lacks a mention about the usefulness of surrogate models. To address this lack, the following lines are added towards the end of section 5.

The effectiveness of the surrogate-based framework can be seen in the number of simulations necessary to study SIV in this domain with and without the surrogate based approach. Without the surrogate based framework, to generate the information presented in this section, simulations need to be conducted at atleast 10 levels each for wind speed, yaw angle and temperature, and 5 levels for shear and veer each. Assuming a full factorial design to study SIV in the domain, this leads to a total number of $10^3 \cdot 5^2 = 25000$ necessary simulations. With the surrogate based framework, however, the behaviour of SIV in the domain is analysed with just a few hundred simulations. The trade-off is the uncertainty introduced by the surrogate model but as it can be seen, the computational benefit is huge.

References

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