

REPLY TO REVIEWER # 1

We thank the reviewer for his valuable comments that greatly helped us to improve the contents of this paper. In what follows, we will use boldface to indicate the comment from the reviewer, and italics for our reply.

REVIEWER # 1

Comments for authors:

This is a well written paper and with a topic of interest. Although the test problems are toy ones that are far removed from real engineering design problems, there are enough of them to provide some evidence of relevance. However, the paper lacks clarity in important areas and some computational experiments seem oddly chosen. Details are below.

1) p. 2. The Gaussian mutation is found in ES but is not the norm in other EAs.

REPLY:

The comment was modified in Section 1 and now it is remarked that Gaussian mutation is found in ES, but not in all EAs (page 2, second paragraph)

2) p. 2. You say your method is better because it maintains promising infeasible regions – well, many penalty methods also do this.

REPLY:

The motivation of the constraint-handling mechanism was re-written in Section 1 as to highlight the features which made him different from penalty functions (page 2, third paragraph).

3) p. 3. He et al – there is no diversity mechanism. What does this mean? What does that have to do with feasibility?

REPLY:

A explanation about the concept of diversity in evolutionary constrained optimization is now provided in Section 2 (page 4, second paragraph). Furthermore, the description of He's approach was modified in Section 2 for sake of clarity (page 3, last paragraph).

4) p. 3 – 4. I do not find the last 2 papers cited (Tessema and Yen and Mezura and Coello) to be relevant to the current paper.

REPLY:

The reviewer's observation is correct. Both descriptions were moved from the Related Work section, to section 4 (Experiments and discussion), where they are used in the comparison (page 7 third paragraph). These methods were included because they are representative of the state-of-the-art in evolutionary constrained optimization and a comparison against them provides confidence about how competitive is our proposed approach before using it to solve engineering design problems..

5) p. 4. Give a description in the text of your algorithm (besides Fig 1) especially how and when the mutation operator works.

REPLY:

A detailed description of the operators used in the approach and also a new Figure to show how operators work are now included in Section 3 (last paragraph in page 4, 5 and the first two paragraphs in page 6). Former Figure 1 (pseudocode) is now Figure 2 and the new Figure explaining the operators is now Figure 1 (both figures at the end of the paper).

6) p. 4. In (iii) you simply sum the constraint violations – this only works if all constraints have similar magnitude, which is rare. You need to address this in your method!

REPLY:

The observation made by the reviewer is correct. In previous experiments we tested our approach with a normalized sum of constraints. However, we did not find significant differences with respect with our not-normalized approach. It is kind or surprising that in our current work with other novel heuristics, the same behavior was found. Therefore, we decided to work with this current version of our approach (which also has the benefit to avoid the computational cost associated to the normalization process). We believe that the main reason for this particular behavior is due to the type of problems tackled. In future work other problems will be used in experiments.

7) p. 4. Are the 3 criteria chosen with equal probability (1/3 each)?

REPLY:

All 3 criteria are applied in a comparison of solutions, but only one will take effect and this depends on the feasibility of the solutions. This comment is now included in Section 3 (page 5, paragraph 4).

8) p. 5. What is CR, Sr, D (from Fig 1) – you must define these in the text.

REPLY:

The definition of each parameter is now included in Section 3 (pages 5 and 6). Also, they are included as user-defined parameters in the caption of Figure 2.

9) p. 5. I don't think your computational comparisons with ordinary DE are fair – if you generate 5 offspring while normal DE generates 1, you need to run only 1/5 as many generations as normal DE. Please equalize your computational effort here and later (p. 8) when you compare normal DE and your DE, and then compare results.

REPLY:

The experiments were conducted taking care of promoting a fair comparison, but, as the reviewer indicates, it was not clear in the paper. Now this information is included in the paper in Section 4 (page 7, in the paragraph after Table 2 location) and also is detailed in Table 2 (at the end of the paper) that both DE-based approaches performed the same number of evaluations.

10) p. 6. What distribution are you testing for normality?

REPLY:

The distributions tested are from the samples of 30 independent runs for each one of the 13 benchmark problems used in the first experiment. This comment is now included in Section 4 (page 8, second paragraph).

11) p. 7. I did not like this part of your computational tests. You say that you test against competing penalty approaches but in fact you use a badly constructed GA (Roulette wheel, single point CR, low CR probability) and compare it to your DE. It would be sounder to compare your penalty method (DE with 3 item feasibility list) against your DE (not the bad GA) that uses the other penalty approaches. Otherwise, your comparisons are not only unfair, they are not relevant.

REPLY:

The reviewer is right. We eliminated our GA version and we performed a comparison but now using DE with the penalty-based approaches in Section 4 (page 9, second and third paragraphs). Also, Table 5 was modified to eliminate the GA' results to now include the new results. An interesting discussion about this improved experiment is presented in Section 4 (page 9, last paragraph and page 10, first and second paragraph). The number of evaluations of each approach was the same as to promote a fair comparison (page 9 third paragraph).

12) p. 8. Again, you must equalize computational effort for your DE and the standard 1 child DE.

REPLY:

As mentioned in reply for comment No. 8, the experiments were conducted to promote a fair comparison but not correctly mentioned in the paper. It is now included in Section 4 (page 10, third paragraph).