



Correction to: A performance measure approach for risk optimization

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Correction to: Structural and Multidisciplinary Optimization <https://doi.org/10.1007/s00158-019-02243-5>

The original article unfortunately contains error in one of the equations and the results of the last example. This is also to emphasize that these corrections do not affect the conclusions of the paper.

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The online version of the original article can be found at <https://doi.org/10.1007/s00158-019-02243-5>.

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Equation (46) in Section 5.4, concerning the cantilever beam, should be corrected to

$$C = \frac{1}{3}hb^2G. \quad (46)$$

The numerical results are correct, since this was just a typing error.

In Section 5.5, concerning the reinforced concrete arch, the computational routines for evaluation of the volume of the structure were incorrect. Thus, the correct optimal designs are slightly different, even though the conclusions remain the same. The correct deterministic design is

$$\mathbf{d} = \{66.99, 0.28, 0.66, 1.35, 1.44, 0.94, 1.63, 3.21\}.$$

The correct risk optimization design is

$$\mathbf{d} = \{81.91, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21\}.$$

The critical buckling load factor and the critical resistance factor are $\lambda_{cr} = 1.7954$ and $r_{cr} = \mu/\mu_r = 0.5673$, respectively. Equation (59) should be corrected to

$$\mathbf{d}^{(0)} = \kappa \times \{81.91, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21\}. \quad (59)$$

Figures 8, 9, 10 and 11 should be corrected to Figs. 8–11 presented below. Tables 15, 16 and 17 should be corrected to Tables 15–17 presented below.

Fig. 8 Example 5: Deterministic design

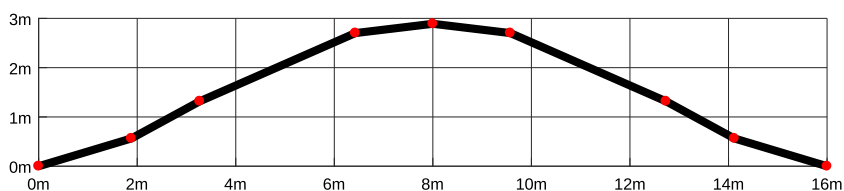


Fig. 9 Example 5: Risk Optimization design

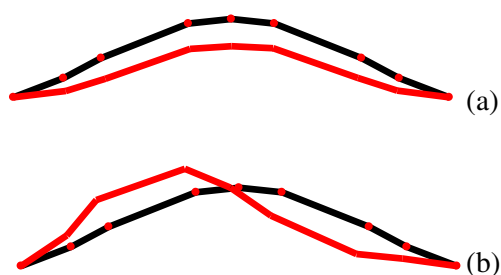
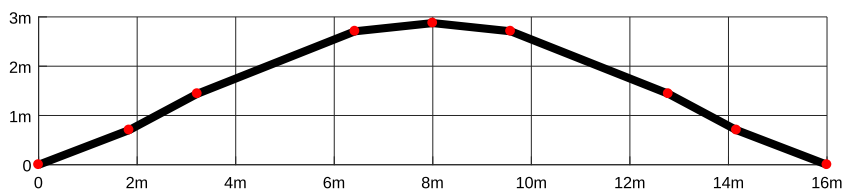


Fig. 10 Example 5: **a** displacements and **b** critical buckling mode of the optimum design

Fig. 11 Example 5: evolution of the total cost obtained with PMA-SORA

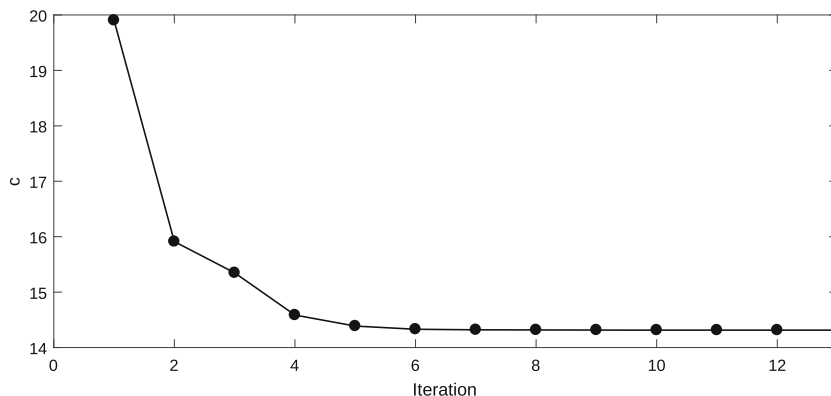


Table 15 Example 5: comparison of the results

Approaches	Initial solution	c	NFE*	β
PMA-SORA	Parabolic	14.3483	2,780 (52,820)	{3.0121, 3.4879}
PMA-SORA	Deterministic	14.3483	2,759 (52,421)	{3.0156, 3.4597}
RO-IP	Parabolic	Fails to converge at the first iteration		
RO-IP	Deterministic	Fails to converge at the first iteration		
RO-HLRF	Parabolic	Fails to converge at the first iteration		
RO-HLRF	Deterministic	Fails to converge at the first iteration		

*NFE in parenthesis consider gradient evaluation with forward finite differences

Table 16 Example 5: results obtained with PMA-SORA

Iteration	c	\mathbf{d}	β
1	19.9035	{76.33, 0.31, 0.69, 1.35, 1.44, 0.93, 1.62, 3.21}	{2.00, 2.00}
2	15.9118	{78.81, 0.31, 0.68, 1.35, 1.43, 0.93, 1.62, 3.21}	{2.50, 2.26}
3	15.3487	{78.59, 0.34, 0.71, 1.35, 1.44, 0.92, 1.61, 3.21}	{2.41, 2.77}
4	14.5862	{80.08, 0.34, 0.71, 1.35, 1.44, 0.92, 1.61, 3.21}	{2.70, 2.91}
5	14.3882	{80.98, 0.34, 0.71, 1.35, 1.44, 0.92, 1.61, 3.21}	{2.87, 3.07}
6	14.3306	{81.62, 0.34, 0.71, 1.35, 1.44, 0.92, 1.61, 3.21}	{2.98, 3.21}
7	14.3208	{81.90, 0.35, 0.71, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.03, 3.30}
8	14.3184	{82.00, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.04, 3.35}
9	14.3167	{82.02, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.04, 3.40}
10	14.3154	{81.99, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.03, 3.45}
11	14.3151	{81.93, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.02, 3.46}
12	14.3151	{81.91, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.02, 3.46}
13	14.3151	{81.91, 0.35, 0.72, 1.35, 1.44, 0.92, 1.61, 3.21}	{3.02, 3.46}

Table 17 Example 5: NFE* for different values of κ

Approaches	$\kappa = 0.9$	$\kappa = 1.1$
PMA-SORA	2,621 (49,799)	2,583 (49,077)
RO-IP	failed	1,782 (36,100)
RO-HLRF	failed	867 (18,981)

*NFE in parenthesis consider gradient evaluation with forward finite differences

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