Correction to: A hybrid parallel Harris hawks optimization algorithm for reusable launch vehicle reentry trajectory optimization with no-fly zones

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Correction to: Soft Computing

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There are some errors in the layout of the paper, the correct ones are as follows:

1. “[1,1]” should be “[− 1,1]” (Line 353)
2. “ $X(t+1) = \Delta X(t) - E|JIX_{\text{rabbit}}(t) - X(t)|$ ” should be “ $X(t+1) = \Delta X(t) - E|JX_{\text{rabbit}}(t) - X(t)|$ ” (Line 376)
3. “ $V_i = X_i + F(X_{\text{best}} - X_{r1}) + F(X_{r2} - X_{r3})$ ” should be “ $V_i = X_i + F(X_{\text{best}} - X_{r1}) + F(X_{r2} - X_{r3})$ ” (Line 450)
4. “ $\bar{u}_k = \begin{cases} \lambda u_{k-1} + (1-\lambda), & \text{if } \text{sign}(u_k - u_{k-1})\text{sign}(u_{k+1} - u_k) < 0 \\ u_k, & \text{else} \end{cases}$ ”

” should be “

$$\bar{u}_k = \begin{cases} \lambda u_{k-1} + (1-\lambda)u_{k+1}, & \text{if } \text{sign}(u_k - u_{k-1})\text{sign}(u_{k+1} - u_k) < 0 \\ u_k, & \text{else} \end{cases}$$

” (Line 541)

5. “ $X_i(t+1) =$

$$\begin{cases} X_i(t) + F(X_{\text{rabbit}}(t) - X_{r1}(t)) + F(X_{r2}(t) - X_{r3}(t)) & q \geq 0.5 \\ (X_{\text{rabbit}}(t) - X_m(t)) - r_4(LB + r_5(UB - LB)) & q < 0.5 \end{cases}$$

” should be “

$$X_i(t+1) = \begin{cases} X_i(t) + F(X_{\text{rabbit}}(t) - X_{r1}(t)) + F(X_{r2}(t) - X_{r3}(t)) & q \geq 0.5 \\ (X_{\text{rabbit}}(t) - X_m(t)) - r_4(LB + r_5(UB - LB)) & q < 0.5 \end{cases}$$

” (Line 551)

6. “ $\underline{u}=-5$ ” should be “ $u = -5$ ” (Line 661)

7. The last three rows of Tables 3 and 4 should be right aligned.

The correct format is below (Table 4 is the same):

8. “Figs. 8a–c” should be “Figs. 8 (a)–(c)”; “Figs. 8 c” should be “Figs. 8 (c)” (Line 799 and Line 803)

9. “ φ ” should be “ ϕ ” (Line 823, Line 829, Line 895 and Table 5)

10. “ $[\dot{Q}_{\text{max}}, q_{\text{max}}, n_{z\text{max}}] = [200 \text{ Btu/ft}^2/\text{s}, 13406 \text{ Pa}, 2.5 \text{ g}_0]$ ” should be “ $[\dot{Q}_{\text{max}}, q_{\text{max}}, n_{z\text{max}}] = [200 \text{ Btu/ft}^2/\text{s}, 13406 \text{ Pa}, 2.5 \text{ g}_0]$ ” (Lines 869–870)

11. “0.59” should be “−0.59” (Line 922)

12. The figure notes for Figures 10 and 11 should be in **black** font.

13. “dos Coelho LS” should be “Coelho L dos S” (Line 1075)

14. “Grey Wolf Optimizer” should be “Grey wolf optimizer” (Line 1151)

15. The order of the two references corresponding to lines 1151–1157 is wrong, and the correct format is

Mirjalili S, Mirjalili SM, Hatamlou A (2016) Multi-verse optimizer: a nature-inspired algorithm for global optimization. *Neural Comput Appl* 27:495–513. <https://doi.org/10.1007/s00521-015-1870-7>

Mirjalili S, Mirjalili SM, Lewis A (2014) Grey wolf optimizer. *Adv Eng Softw* 69:46–61. <https://doi.org/10.1016/j.advengsoft.2013.12.007>

16. The order of the two references corresponding to lines 1207–1214 is wrong, and the correct format is

Zhang DN, Liu Y (2011) RLV reentry trajectory optimization through hybridization of an improved GA and a SQP algorithm. In: *AIAA Guidance, Navigation, and Control Conference*. <https://doi.org/10.2514/6.2011-6658>

The original article can be found online at <https://doi.org/10.1007/s00500-021-06039-y>.

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Table 3 Comparison of the results of HHO variants

F	Metric	OPHHODE	PHHCDE	PHHLDE	OPHHCLDE	HPHHO
F1	AVG	2.3491e−313	1.6712e−55	9.9909e−55	2.4752e−125	0.00e+00
	STD	0.00e+00	9.1503e−55	5.4462e−54	1.3556e−124	0.00e+00
F2	AVG	0.086026	9.4422	1.8788	0.008728	0.00019157
	STD	0.1468	11.9705	6.6536	0.017189	0.00038651
F3	AVG	8.8818e−16	8.8818e−16	8.8818e−16	8.8818e−16	8.8818e−16
	STD	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
F4	AVG	− 10.1532	− 5.5612	− 5.994	− 10.1532	− 10.1532
	STD	0.0026908	1.5568	2.1606	1.2411e−09	3.6193e−07
+/=/−	2/2/0	3/1/0	3/1/0	2/2/0	~	
ARV	2.88	3.88	3.63	2.38	2.25	
Overall Rank	3	5	4	2	1	

Zhang HP, Wang HL, Li N et al (2020) Time-optimal memetic whale optimization algorithm for hypersonic vehicle reentry trajectory optimization with no-fly zones. *Neural Comput Appl* 32:2735–2749. <https://doi.org/10.1007/s00521-018-3764-y>

The original article has been corrected.

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