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| Journal Name: | [**Asian Research Journal of Mathematics**](https://journalarjom.com/index.php/ARJOM) |
| Manuscript Number: | **Ms\_ARJOM\_134087** |
| Title of the Manuscript:  | **On the Rate Convergence of two Particle Swarm Optimization Algorithms: Gradient-Perturbation and Dual-Binary** |
| Type of the Article |  |

**General guidelines for the Peer Review process:**

**Artificial Intelligence (AI) generated or assisted review comments are strictly prohibited during peer review.**

This journal’s peer review policy states that **NO** manuscript should be rejected only on the basis of ‘**lack of Novelty’**, provided the manuscript is scientifically robust and technically sound.

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| PART 1: Comments |
|  | Reviewer’s comment**Artificial Intelligence (AI) generated or assisted review comments are strictly prohibited during peer review.** | Author’s Feedback *(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)* |
| **Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.** | This manuscript addresses the fundamental problem of convergence rate in Particle Swarm Optimization (PSO) algorithms—a topic of significant theoretical and practical interest in computational intelligence. By introducing rigorous convergence bounds for two PSO variants (Gradient-Perturbation and Dual-Binary), the authors contribute to a deeper mathematical understanding of PSO dynamics in Hilbert and Banach spaces. The proposed framework also bridges the gap between theoretical guarantees and algorithmic efficiency, making it a relevant contribution to both optimization theory and real-world applications such as machine learning and engineering optimization. |  |
| **Is the title of the article suitable?****(If not please suggest an alternative title)** | Yes, the title is appropriate and clearly reflects the manuscript’s core theme, methodology, and comparative focus on two PSO variants. |  |
| Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here. | The abstract is generally well-written and informative. However, it would benefit from a brief explanation of how the proposed convergence criterion translates into improved performance in practical scenarios. Including a one-sentence summary of empirical findings could also increase clarity for a broader audience. |  |
| Is the manuscript scientifically, correct? Please write here. | Yes, the manuscript is mathematically sound and presents a detailed theoretical analysis. The convergence analysis is rigorous and logically structured. Some of the derivations, particularly in Lemma 2 and Theorem 1, may benefit from further clarification or step-by-step guidance to enhance accessibility for a broader research audience. |  |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.** | The references are largely appropriate and include both foundational and recent studies (up to 2024). To enhance the practical relevance, the authors could consider adding one or two citations related to real-world PSO implementations or applications in machine learning and engineering. |  |
| Is the language/English quality of the article suitable for scholarly communications? | The manuscript is generally understandable. However, several sections—particularly the introduction and theoretical proofs—would benefit from improved grammar and sentence structure. Careful proofreading and slight restructuring of long, complex sentences will improve readability. |  |
| Optional/General comments | The manuscript is a valuable addition to the literature on convergence analysis in metaheuristics. The theoretical sections are well-developed and the inclusion of benchmark functions provides practical context. It is suggested that the authors elaborate further on how the theoretical error bounds relate to the performance observed in numerical simulations. |  |

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| **PART 2:**  |
|  | Reviewer’s comment | Author’s comment *(if agreed with the reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)* |
| **Are there ethical issues in this manuscript?**  | No ethical issues were identified. |  |
| **Are there competing interest issues in this manuscript?** | No competing interests are evident. |  |
| **If plagiarism is suspected, please provide related proofs or web links.** | No plagiarism was detected. The manuscript appears original and well-referenced. |  |

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| **PART 3: Declaration of Competing Interest of the Reviewer:** |
| Here reviewer should declare his/her competing interest. If nothing to declare he/she can write “I declare that I have no competing interest as a reviewer”I declare that I have no competing interest as a reviewer. |

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| **PART 4: Objective Evaluation:** |
| Guideline | MARKS of this manuscript |
| Give OVERALL MARKS you want to give to this manuscript ( Highest: 10 Lowest: 0 )**Guideline:** Accept As It Is: (>9-10)Minor Revision: (>8-9)Major Revision: (>7-8)Serious Major revision: (>5-7)Rejected (with repairable deficiencies and may be reconsidered): (>3-5)Strongly rejected (with irreparable deficiencies.): (>0-3) | **8.5** |

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| **Editorial Comments (This section is reserved for the comments from journal editorial office and editors):** |
|  | Author’s Feedback |
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| Department of Reviewer | Department of Artificial Intelligence |
| University or Institution of Reviewer | Islamic Azad University, Karaj Branch |
| Country of Reviewer | Iran |
| Position: (Professor/lecturer, etc.) of Reviewer | MSc Student in Artificial Intelligence |
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| Write 5-8 Keywords regarding expertise of Reviewer | Reinforcement Learning, Swarm Optimization, AI, Deep Learning, PSO, Stochastic Methods |