South East Asian J. of Mathematics and Mathematical Sciences
Vol. 22, No. 1 (2026), pp. 177-196

DOI: 10.56827/SEAJMMS.2026.2201.13 **ISSN (Online): 2582-0850**

ISSN (Print): 0972-7752

ON $\Psi_{\alpha,\beta}$–EXPANSIVE MAPPINGS WITH DISPLACEMENT CONTROL AND FIXED POINT CONSEQUENCES

Manoj Ughade, Ranjana Maravi and S. S. Shrivastava

Department of Mathematics,
Institute for Excellence in Higher Education (IEHE),
Bhopal, Madhya Pradesh, INDIA

E-mail : manojhelpyou@gmail.com, ranjanamaravi026@gmail.com,
sss.math@yahoo.co.in

(**Received:** *Feb. 01, 2026* **Accepted:** *Apr. 14, 2026* **Published:** *Apr. 30, 2026)*

Abstract: In this paper, we introduce a new class of nonlinear expansive mappings governed by a rational displacement–distance gauge $\Psi_{\alpha,\beta}$, which simultaneously depends on the interpoint distance and the individual self–displacements of the operator. This framework extends classical Wang–type expansive models that are based solely on interpoint distances. Under a natural domination condition linking displacement and distance, we establish the existence, uniqueness, and global convergence of fixed points for $\Psi_{\alpha,\beta}$–expansive mappings in complete metric spaces. The proposed approach yields a displacement–sensitive expansive mechanism that enables the treatment of operators not covered by classical expansive conditions, thereby overcoming limitations of existing theories and providing a more flexible framework for applications in nonlinear analysis. Several nontrivial examples are presented to illustrate the applicability, strength, and novelty of the proposed theory.

Keywords and Phrases: Expansive mappings; fixed points; displacement control; rational gauge; backward iteration; metric spaces.

2020 Mathematics Subject Classification: 47H10, 54H25, 54E50.