ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
April 23-24-25, 2026 | Marrakech, Morocco

A New Sobolev Orthogonal Polynomial Algorithm for Image Encryption Based on Sobolev Moments and Chaotic Maps

Communication Info

Authors:
Mohammed TANJAOUI [1,2]
Hicham KARMOUNI [3]
Mhamed SAYYOURI [1]
Mohammed KARMOUNI [2]

[1] *Faculty of Multidisciplinary Studies, Saf, Morocco.*

[2] *National School of Applied Sciences, Fez, Morocco.*

[3] *Higher School of Technology, Casablanca, Morocco.*

Keywords:
(1) Image encryption;
(2) Sobolev orthogonal polynomials ;
(3) Sobolev moments.

Abstract

In this work, we propose new algorithm based on three-term relation recurrence to generate Sobolev orthogonal polynomials [1] associated with a Sobolev inner product defined by :

$$\langle p, q\rangle_S = \langle p, q\rangle_C + \lambda p'(c)q'(c).$$

where $\lambda > 0$, $c \in \mathbb{R}$, and $\langle\cdot,\cdot\rangle_C$ denotes inner product satisfying the symmetry property $\langle xp, q\rangle_C = \langle p, xq\rangle_C$. In addition, Sobolev moments associated with this inner product are incorporated into the image encryption framework [2]. The proposed scheme combines Sobolev moments to ensure diffusion with a modified logistic map to achieve confusion.

© ICRAMCS 2026 Proceedings ISSN: 2605-7700

References

[1] Marcellán, Francisco, and Yuan Xu. "On Sobolev orthogonal polynomials." *Expositiones Mathematicae* 33.3 (2015): 308-352.

[2] Hosny, Khalid M., Sara T. Kamal, and Mohamed M. Darwish. "A novel color image encryption based on fractional shifted Gegenbauer moments and 2D logistic-sine map." *The Visual Computer* 39.3 (2023): 1027-1044.