

A new separable moments based on Tchebichef-Krawtchouk polynomials

ABSTRACT

Orthogonal moments are beneficial tools for analyzing and representing images and objects. Different hybrid forms, which are first and second levels of combination, have been created from the Tchebichef and Krawtchouk polynomials. In this study, all the hybrid forms, including the first and second levels of combination that satisfy the localization and energy compaction (EC) properties, are investigated. A new hybrid polynomial termed as squared Tchebichef-Krawtchouk polynomial (STKP) is also proposed. The mathematical and theoretical expressions of STKP are introduced, and the performance of the STKP is evaluated and compared with other hybrid forms. Results show that the STKP outperforms the existing hybrid polynomials in terms of EC and localization properties. Image reconstruction analysis is performed to demonstrate the ability of STKP in actual images; a comparative evaluation is also applied with Charlier and Meixner polynomials in terms of normalized mean square error. Moreover, an object recognition task is performed to verify the promising abilities of STKP as a feature extraction tool. A correct recognition percentage shows the robustness of the proposed polynomial in object recognition by providing a reliable feature vector for the classification process.

Keyword: Orthogonal polynomial; Orthogonal moments; Energy compaction; Localization property; Object recognition