

ABSTRACT

Biometric recognition is the automatic recognition of individuals based on their physiological or behavioral characteristics. A variety of systems require reliable personal recognition schemes to confirm or determine the identity of a person requesting access or service. IRIS recognition refers to biometric systems used to recognize individuals based on their IRIS patterns. In the absence of a robust denoising method, these systems are vulnerable to the inaccurate interpretation of the patterns and granting access or service to illegitimate users.

The classical Perona-Malik model has attracted wide attention of scholars for its ability to restore corrupted images while preserving useful details (edges and contours). Despite its notable achievements, this model requires manual tuning of the shape-defining diffusion coefficient to generate optimal results. Consequently, the tuning process, which suffers from inconvenience and time-ineffectiveness, limits the model in time-sensitive applications like interpreting the IRIS patterns. Therefore, this work presents a method to adaptively update the value of the shape-defining diffusion coefficient in relation to the noise statistics in the IRIS image.

Through a series of experiments, it was observed that the coefficient strongly correlates with the noise statistics in the IRIS image. Therefore, a relationship to describe the correlation was established and encapsulated into the evolutionary polynomial of order two. The polynomial was fitted from running 39 million iterations to generate two-dimensional space $\mathbb{R}^{K \times \sigma}$ that contains K and σ variables. Least Absolute Residuals (LAR) is used to approximate the constants. The constants were $\alpha = 0.00473$, $\beta = 2.134$, and $\gamma = -0.3696$ with 95% confidence boundary. The proposed diffusion function was further tested in removing noise in the IRIS images. It generated visually appealing denoised images with higher information content. It sharpens the edges and distinguishes them clearly from homogeneous image regions which are crucial in identification of texture patterns in IRIS images.