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SYMMETRY CLASSIFICATION OF REGULAR TEXTURES USING CONVOLUTIONAL NEURAL NETWORKS AND MACHINE LEARNING TECHNIQUES



Author(s): Ayoub Aoulalay¹, Abderrahim El Mhouti², Mohammed Massar Assar³

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Abstract:

In the context of texture analysis and classification, the classification of regular textures into 17 distinctive wallpaper patterns represents a significant advance. This field is particularly relevant in areas such as art and decoration. This research uses advanced computer vision techniques to automate the classification process, using a compiled dataset of 1,700 images divided into the 17 classes. To address the challenge, two innovative approaches designed to exploit the texture representation of convolutional neural networks (CNNs) are proposed. These approaches are based on transfer learning. The first approach features a shallow CNN with four convolutional layers with the aim to capture texture patterns from middle layers. The second strategy is a hybrid approach that combines traditional texture descriptors (GLCM, LBP, and Gabor filters) with deep features extracted from the ninth layer of the VGG19 model. These methodologies have demonstrated considerable success, achieving accuracies of 78% and 80%, respectively.

Keywords: Wallpaper Geometric Groups, Regular Texture Classification, Deep Convolutional Neural Network, Texture Classification, Symmetric Groups

¹ PhD candidate, ISISA Lab, Faculty of Sciences, Abdelmalek Essaâdi University, Tétouan, Morocco, Email: aoulalayayoub@gmail.com

² Professor, Faculty of Sciences, Abdelmalek Essaâdi University, Tétouan, Morocco, Email: abderrahim.elmhouti@gmail.com

³ Professor, Mathematics Department, Faculty of Polydisciplinary, Université Sultan Moulay Slimane, Khouribga Campus, Morocco, Email: massarmed@hotmail.com

For full paper, contact:

Prof Muhammad Imran Aslam

Editor-in-Chief, NED University Journal of Research

Ph: +92 (21) 99261261-8 Ext:2670; Fax: +92 (21) 99261255

Email: NED-Journal@neduet.edu.pk

Website: <http://www.neduet.edu.pk/NED-Journal>