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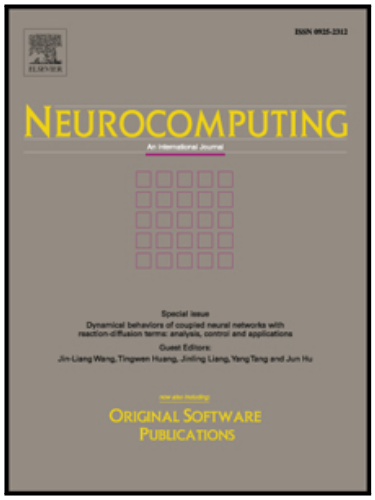

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Ordinal Pyramid Coding for Rotation Invariant Feature Extraction

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Abstract

This paper proposes a novel rotation invariant feature for object recognition. Firstly, the local Fourier transform features of pixels in the described region are encoded by Fisher Vectors. Then, the encoded vectors are aggregated into a final representation by ordinal pyramid pooling, which hierarchically partitions the described region into sub-regions based on the orders of its pixels' rotation invariants. Since both the encoded Fisher Vectors and the ordinal pyramid pooling strategy are rotation invariant, the extracted feature is rotation invariant by nature. Two kinds of rotation invariants are investigated in this framework, one is the Radial Gradient Orientation and the other is the Radial Gradient Angle. Experiments on handwritten digit recognition and airplane/car detection in aerial images demonstrate the effectiveness of the proposed method, which outperforms the state of the art.

Keywords: Rotation Invariant, Ordinal Pyramid Pooling, Fisher Vector, Feature Extraction

1. Introduction

Feature extraction plays a fundamental role in various tasks, such as human action recognition [1, 2], objection detection [3, 4], scene classification [5, 6], image copy detection [7, 8], and so on [9, 10]. A good feature should have strong discriminative ability while simultaneously being robust to illumination changes, background clusters, partial occlusions, etc.