



An Edge Detection Scheme with Legendre Multiwavelets

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Abstract

Many edge detection methods which based on wavelet transform, use this transform to approximate the gradient of image and detect edges by searching the modulus maximum of gradient vectors. In this paper we present an edge detection scheme based on Legendre multiwavelets. The results of this algorithm are compared with Sobel edge detector.

Keywords: Wavelet transform, Edge detection, Legendre multiwavelets

Mathematics Subject Classification [2010]: 65T60, 68U10, 94A08

1 Introduction

Edge is the important characteristic of image. Edges are among objects, regions, between objects and backgrounds. If all edges in an image identify accurately, all the objects can be located. Edge detection plays an important role in medical imaging [1], computer vision and machine vision [2] and recognition Persian characters [3]. The large class of edge detectors look up points where the gradient of the image has local maximum.

In recent decades, wavelet analysis fostered as a useful research method. Wavelet analysis is a new development in the area of applied mathematics [5]. Parallely, the theory of wavelets got more demystified and has become an important tool for image processing like edge detection [4]. Some edge detector such as Canny edge detector use wavelet transform. However, multiwavelet system can simultaneously provide perfect reconstruction while preserving length due to orthogonality of filters, good performance at the boundaries, and a high order of approximation (vanishing moments). In this paper we used Legendre multiwavelets to introduce an edge detection scheme.

2 Multiwavelet Transform

Like wavelets, multiwavelets were also based upon multiresolution analyses (MRA). MRA using wavelets comprises of one scaling function $\phi(x)$ and one wavelet function $\psi(x)$, where as multiwavelets possess many number of scaling functions under one vector denoted as

$$\Phi(x) = [\phi_0(x), \phi_1(x), \dots, \phi_N(x)]^T, \quad (1)$$

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