Image Processing with New Method in Edge Detection

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Abstract:
The main feature of the image is the edge where the definition of the edge is that there are two areas in the image. The edge is the border between these two regions. The process of detecting the edges is the identification of sharp intersections in the image where the unhelpful information is removed which leads to a significant reduction in data without losing the attributes of the original image. The Edge Detection tool is a vital tool due to the computer's vision that has the ability to recognize and classify objects in image. Definition of an edge in an image is a path to track the change in image density, where the edge is related to image objects and edge detection is used to define the edges of the image. The function used is to find the position of the object based on the previous value using a Discrete Laguerre Wavelet Transformation (DLWT) filter. A filter DLWT that allows dynamic estimation of a series of noisy measurements and has wide applications in the fields of signal, images and calculations.

Key words: Edge detection, canny method, Discrete Laguerre Wavelet, Transformation (DLWT) filter.

1. INTRODUCTION:

Image interpretation and processing in computer systems is the crucial step to separate the image into the background and target. To facilitate the analysis of the image into gray scale, density, texture, or color levels, there are many ways in literature to divide images, where the process is resolved due to the output of image segmentation in the form of an algorithm to divide the image to be an entry for processing to a higher level [1-5]. The digital image contains different areas in density from one pixel to another, which leads to a difference in image quality and fragmentation. Edge detection is the extraction of digital image boundaries, including Sobel, Roberts, Prewitt, LoG, and canny. When the image is fragmented, it creates noise, affecting the image, including Gaussian noise, Rayleigh noise, burst noise, and spot noise that are the main factor for edge detection [6]. The function used is to find the position of the object based on the previous value using a Discrete Laguerre Wavelet Transformation (DLWT) filter [7,8]. A filter DLWT that allows dynamic estimation of a series of noisy measurements and has wide applications in the fields of signal, images and calculations [9,10].

2. EDGE DETECTION

The edge is a curve that represents the variation in image density to determine the edges in the image by discovering the edge in which the edge function searches for the intensity change. The two important criteria that are used to detect the edges are the places whose value is close to the threshold, the second is the intensity close to zero. Canny method is one of the powerful methods for detecting edges is that when detecting strong and weak edges, two different thresholds are used. One of the advantages of this method is that weak edges are not exposed unless they are connected to strong edges so that as a result, they are not affected by noise and weak e by MATLAB.

I = imread('coins.png');
imshow(I)
dges are revealed.

Edge detection is applied to the image in two ways, Sobel and Canny edge detectors. Figure 1 original image and figure 2 edge detection the original image.

Figure 1. original image

Figure 2. edge detection by canny method

3. THE THEORETICAL ASPECT OF THE IDEA OF EDGE DETECTION

It is usual to reveal the edge in two groups
1. Non-directed filters
2. Guided filters
The first is not focused on a specific point in the image, so the second is useful because it is its mission to highlight the features of the image. To reveal the edge in this work, a filter is presented to reduce the noise from the color image after converting it to a gray image, where the gray values are increased. The filter was used from Laguerre wavelet is an important type of wavelets and has used for solving diverse differential equation and integral equation as well as fractional differential equation. Laguerre wavelet $\psi_{n,m}(t) = \psi_{t,n,m,k}$ have four arguments; $k = 1,2, ..., n = 1,2, ..., 2^k$, $m$ is order for Laguerre polynomials and $t$

$$
\psi_{n,m}(t) = \begin{cases} 
2^{k+1/2}I_m(2^kt - 2n + 1) & \frac{n-1}{2^k-1} \leq t < \frac{n}{2^k-1} \\
0 & \text{o.w.}
\end{cases}
$$

(1)

Where $I_m = \frac{1}{m!}L_m$ for $k=2$

$$
\begin{align*}
\psi_{10}(t) &= 2\sqrt{2} \\
\psi_{11}(t) &= 2\sqrt{2} (2 - 4t) \\
\psi_{12}(t) &= \sqrt{2} (16t^2 - 24t + 7)
\end{align*}
$$

$$
\begin{align*}
\psi_{20}(t) &= 2\sqrt{2} \\
\psi_{21}(t) &= 2\sqrt{2} (4 - 4t) \\
\psi_{22}(t) &= \sqrt{2} (16t^2 - 40t + 23)
\end{align*}
$$

(2)

We known $L_m$ is orthogonal with respect to the weight function $w(t) = e^{-t}$ the set of Laguerre wavelets are orthogonal with respect to weight function $w_0(t) = w(2^kt - 2n + 1)$

A function approximation $f(t) \in L^2(0,1)$ may be expanded as:

$$
\begin{align*}
f(t) &= \sum_{n=1}^{\infty} \sum_{m=0}^{\infty} C_{nm} \psi_{n,m}(t) \\
C_{nm} &= (f(t), \psi_{n,m}(t))
\end{align*}
$$

(3)

by use the above equations the coefficients the approximate and details coefficients will be obtained the high pass filter and low pass filter

high pass filter: $\begin{bmatrix} 1 & 0 \end{bmatrix}$

low pass filter: $\begin{bmatrix} 0 & 1 \end{bmatrix}$

algorithm 1 will be illustrated the efficiency of the filter used to detect the edges of the image.

4. EDGE DETECTION FILTER ALGORITHM USING MATLAB

In this section, a new algorithm is created that is designed with the help of the Matlab program. It is possible to add a new filter derived from the wavelet Discrete Laguerre Wavelet Transformation (DLWT) filter. The algorithm explains how to build a program to incorporate the new filter into the MATLAB program to deal with images to reveal the edge and use a function MEX in the MATLAB program to achieve the algorithm and its speed

Algorithm: Edge detection with Discrete Laguerre Wavelet Transformation (DLWT) filter.

Input image

Step 1: Load Image

Step 2: Using the edge function to calculate the binary image and return the image

Step 3: Using transformation DLWT to align with the peaks in the original image

Step 4: This step displays the result after using DLWT The strongest peak in $R$ corresponds to $\theta=1$ degree and $x' = -80$ pixels from center figure 3 shows the edge detection by DLWT.

Step 5: In this step, the center of the image is searched for in the figure (4) the blue cross and the red line is the one that works at an angle of 1 degree up to a line of 80 pixels going from left to center so that the red line with the signal to convertDLWT figure 3 shows the steps algorithm

The results of the algorithm

1. At the angle $\theta=1$, the peak force in $R$ is the offset of 84 for each pixel
2. Near the center $R$ the strong peaks are at the angle 90 at pixels 44
3. Weak lines are connected to the peaks figure 5 shows the results of algorithm

Figure.3 the edge detection by DLWT
Figure 4. The strongest peak in R corresponds to $\theta=1$ degree and $x' = -80$ pixels from center.

Figure 5. shows the results of algorithm

5. CONCLUSION:

The main feature of the image is the edge where the definition of the edge is that there are two areas in the image. The edge is the border between these two regions. The process of detecting the edges is the identification of sharp intersections in the image where the unhelpful information is removed which leads to a significant reduction in data without losing the attributes Basic to the original image. The Edge Detection tool is a vital tool due to the computer’s vision that has the ability to recognize and classify objects in image. Definition of an edge in an image is a path to track the change in image density, where the edge is related to image objects and edge detection is used to define the edges of the image. The function used is to find the position of the object based on the previous value using a Discrete Laguerre Wavelet Transformation (DLWT) filter. A filter DLWT that allows dynamic estimation of a series of noisy measurements and has wide applications in the fields of signal, images and calculations.

6. REFERENCES


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