ISSN:0975-9646

Ravi Kumar A.V et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 3 (2) , 2012,3808-3811

Morphological Real Time Video Edge Detection in Labview

Ravi Kumar A.V, Dr. Nataraj K.R, Dr.Rekha K.R

Electronics Communication Engineering Department, V T U
SJBIT Bangalore, Karnataka, India

***Abstract*— Video Edge is one of the most fundamental and significance features. Edge detection is always one of the classical studying projects of computer vision and image processing field. The first step is video analysis and understanding. The purpose of edge detection [1] is to discover the information about the edge and hiding the background of the video. The correctness and reliability of its results affect directly the comprehension machine system made for objective world. Reading the AVI and some pre-process work done on that AVI file. Taking frames each time and doing normal edge detection in LabVIEW, and is made to display on the screen. The frames are continuously read and again the same steps are repeated until frames are finished. This paper describes the characteristics of edges, the properties of traditional detectors. Finally, this paper analyzed their advantages, disadvantages and presents some recommendations for future work. The LabVIEW is to build virtual instrumentation and take an effective graphical system design approach that can be effectively leverage the opportunities and take on the challenges of modern academic research and development.**

***Keywords*— LabVIEW, Morphological process, Sobel algorithm, Front panel, Edge detection.**

I. INTRODUCTION

Edge detection is a fundamental tool used in most image processing applications to obtain information from the video frames in which feature extraction and object segmentation is done In the ideal case, the result of applying an edge detector to an image may lead to a set of connected curves that indicate the boundaries of objects, the boundaries of surface markings as well as curves that correspond to discontinuities in surface orientation. Thus, applying an edge detection algorithm [2] to an image may significantly reduce the amount of data to be processed and may therefore filter out information that may be regarded as less relevant, while preserving the important structural properties of an image. If the edge detection step is successful, the subsequent task of interpreting the information contents in the original image may therefore be substantially simplified. However, it is not always possible to obtain such ideal edges from real life images of moderate complexity. There is an extremely large number of edge detection operators available, each designed to be sensitive to certain types of edges. Variables involved in the selection of an edge detection operator include:

Extracts the contours (detects edges) in gray-level values. The image type connected to the input Image Mask must be an 8-bit image. The connected source image must have been created with a border capable of supporting the size of the processing matrix. For example, a 3 × 3 matrix has a minimum border size of 1. The border size of the destination image is not important.

Noise environment: Edge detection is difficult in noisy images, since both the noise and the edges contain high-frequency content. Attempts to reduce the noise result in blurred and distorted edges. Morphology VI does perform basic morphological operations, such as dilation and erosion, on grayscale and binary images. Other VI improve the quality of binary images by filling holes in particles, removing particles that touch the border of an image, removing noisy particles, and removing unwanted particles based on different characteristics of the particle.

Edge structure: Not all edges involve a step change in intensity. Effects such as refraction or poor focus can result in objects with boundaries defined by a gradual change in intensity. The operator needs to be chosen to be responsive to such a gradual change in those cases. Sobel algorithm techniques actually characterize the nature of the transition for each edge in order to distinguish, for example, edges associated with hair from edges associated with a face.

II. MODELLING OF VIDEO EDGE DETECTION

Edge detection is very basic research field in process of image analysis and measurement, the latter must rely on processing the information it provides and edge extraction directly affects the follow-up to the accuracy and ease of handling. The edge of the video is a set of frames which spatial image intensity or brightness of the direction of mutation or mutation carrier’s degree. It is a vector which includes magnitude and direction, in the image it shows the mutation of gray scale. [3] Edge detection is to detect non continuity of a gray image of and to determine their exact position in the video. Use the Morphology VIs to perform morphological operations on an image. Some of these VIs perform basic morphological operations, such as dilation and erosion, on grayscale and binary images. Other VIs improve the quality of binary images by filling holes in particles, removing particles that touch the border of an image, removing noisy particles, and removing unwanted particles based on different characteristics of the particle. The Sobel operator is used in image processing, particularly within edge detection algorithms. At each point in the image, the result of the Sobel operator is either the corresponding gradient vector or the norm of this vector. The Sobel operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations. On the other hand, the gradient approximation which it produces is relatively crude, in particular for high frequency variations in the image.

III. THRESHOLDING AND LINKING

Once we have computed a measure of edge strength (typically the gradient magnitude), the next stage is to apply a threshold, to decide whether edges are present or not at an image point. The lower the threshold, the more edges will be detected, and the result will be increasingly susceptible to noise and detecting edges of irrelevant features in the image. Conversely a high threshold may miss subtle edges, or result in fragmented edges. Once we have a start point, we then trace the path of the edge through the image pixel by pixel, marking an edge whenever we are above the lower threshold. We stop marking our edge only when the value falls below our lower threshold. This approach makes the assumption that edges are likely to be in continuous curves, and allows us to follow a faint section of an edge we have previously seen, without meaning that every noisy pixel in the image is marked down as an edge. This process is applied to very frames in each cycle.

IV. MORPHOLOGICAL PROCESS.

Mathematical morphology is a new subject building on strict mathematics theory. It has developed from binary morphology to grayscale morphology, and it is a new method of image process. Its basic idea is to measure or distill corresponding shape in image using structure element with certain shape to analyze image and recognize object [14].The basic operations included in mathematical morphology are dilation, erosion, opening, and closing. Based on these four kinds of operations various morphologic algorithms could be deduced. [15].

Mathematical morphology of omni directional multi-scale element is defined in order to suppress noise and adapt to different edge in the image. An approach of image edge detection based on morphology of omni directional multi-scale element is constructed by power adding combination of morphological operation. The results of simulation in medical image demonstrate that the method performs better not only in edge detection but also in noise-suppression than classical edge detection operator.

V. DETECTION METHODS

Here we explained video edge detection by using LabVIEW [11]. At the beginning AVI file is read and is divided into a number of frames. These frames are applied to edge detection block one by one and displayed on the screen [10].

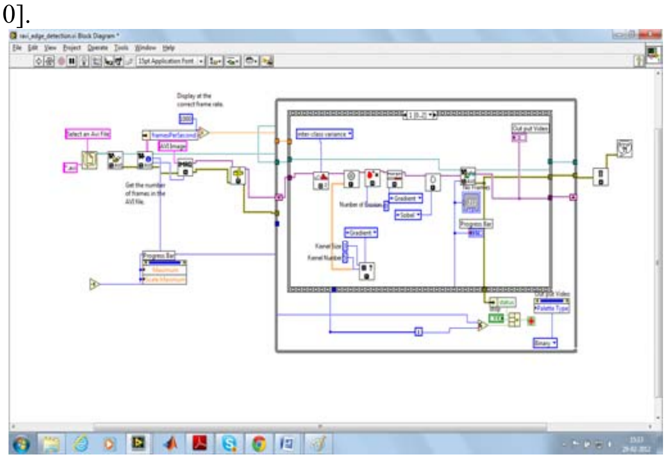
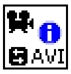


Fig.1. Block diagram of video edge detection

A. AVI Path

It is the complete pathname, including drive, directory, and filename for the AVI file. This path can be supplied by either the user or the File Dialog VI from LabVIEW.

B. IMAQ AVI Get Info

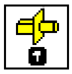


Obtains information about the AVI file associated with AVI reference. Frame Data is a cluster containing the width and height of the images, frames per second of the AVI file, and weather the AVI file has data associated with each image. AVI reference is the reference to the AVI file. Image type specifies the image used in the AVI file.

C. IMAQ Create

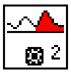
This creates a temporary memory location for an image. Use IMAQ Create in conjunction with the IMAQ Dispose VI to create or dispose of NI Vision images in Lab VIEW. New Image is the reference that is supplied as input to all subsequent functions used by NI Vision. Multiple images can be created in LabVIEW application.

D. IMAQ Cast Image



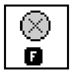
Converts the current image type to the image type specified by Image type. If we specify the lookup table, the IMAQ Cast Image converts the image using a lookup table.

E. IMAQ AutobThreshold



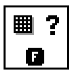
Computes the optimal threshold value for an image or Region of interest and applies the computed threshold.The Interclass variance method determines an optimal threshold By maximizing the between-class variation with respect to the threshold.

F. IMAQ Convolute



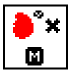
Filters an image using a linear filter. The calculations are performed with either integers or floating points, depending on the image type using the IMAQ Copy before using this VI. Kernel is 2D array that contains the convolution matrix to apply the image. The size of the convolution is fixed by the size of this array.

G. IMAQ Get Kernel VI



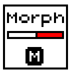
Kernel Size (3, 5...) determines the horizontal and vertical matrix size. The values are 3, 5, and 7, corresponding to the convolutions 3 × 3, 5 × 5, and 7 × 7 supplied in the matrix catalog. This value corresponds to the hundredth unit in the researched code.

H. IMAQ Remove Particle VI



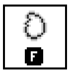
Eliminates or keeps particles resistant to a specified number of 3 x 3 erosions. The particles that are kept are exactly the same shape as those found in the original source image. Number of Erosion specifies the number of 3 x 3 erosions to apply to the image. The default is 2.

I. IMAQ Morphology VI



Performs primary morphological transformations. All source and destination images must be 8-bit binary images. The connected source image for a morphological transformation must have been created with a border capable of supporting the size of the structuring element.a3 × 3 structuring element requires a minimal border of 1, a 5 × 5 structuring element requires a minimal border of 2, and so on.

J. IMAQ Edge Detection VI



Extracts the contours (detects edges) in gray-level values. Any image connected to the input Image Dst must be the same image type connected to Image Src. The image type connected to the input Image Mask must be an 8-bit image. The connected source image must have been created with a border capable of supporting the size of the processing matrix. For example, a 3 × 3 matrix has a minimum border size of 1. The border size of the destination image is not important. Method specifies the type of edge-detection filter to use. The default is Differentiation. The following filters are valid:

TABLE 1. LIST OF FILTERS FOR EDGE DETECTION

Differentiation (0)	Processing with a 2 × 2 matrix
Gradient (1)	Processing with a 2 × 2 matrix
Prewitt (2)	Processing with a 3 × 3 matrix
Roberts (3)	Processing with a 2 × 2 matrix
Sigma (4)	Processing with a 3 × 3 matrix
Sobel (5)	Processing with a 3 × 3 matrix

K. IMAQ AVI Read Frame VI

Reads an image from the AVI file specified by AVI reference. Image Out is a reference to the destination image. If Image Dst is connected, Image Dst Out is the same as Image Dst. Otherwise, Image Dst Out refers to the image referenced by Image Src.

L. Sobel Algorithm

The Sobel operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations. Mathematically, the operator uses two 3×3 kernels which are convolved with the original image to calculate approximations of the derivatives - one for horizontal changes, and one for vertical. If we define A as the source image, and Gx and Gy are two images which at each point contain the horizontal and vertical derivative approximations, the computations are as follows

$$G_x = \begin{bmatrix} -1 & 0 & +1 \\ -2 & 0 & +2 \\ -1 & 0 & +1 \end{bmatrix}$$

G_x*A and

$$G_y = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ +1 & +2 & +1 \end{bmatrix} * A$$

Where * here denotes the 2-dimensional convolution operation.

The x-coordinate is here defined as increasing in the "right"-direction, and the y-coordinate is defined as increasing in the "down"-direction. At each point in the image, the resulting gradient approximations can be combined to give the gradient magnitude, using:

$$G = \sqrt{G_x^2 + G_y^2}$$

Using this information, we can also calculate the gradient's direction:

$$\theta = atan2(G_y, G_x)$$

where, for example, θ is 0 for a vertical edge which is darker on the right side.

VI. EXPERIMENTAL RESULT

Image edge detection is a kind of developing technology from the classical differential operators to updating edge detection algorithms associated with the new technologies. This paper just introduced new representative video edge detection technologies. the figure shows the source video input reading it shows the frame no with estimation time to complete to read the video file.

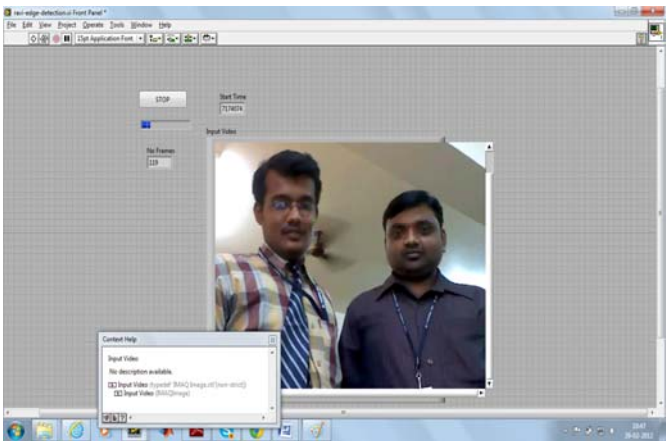


Fig.2.Front panel of video input

The edge detected video is as shown in figure. The edge appearance of this video indicated mankind look for a general and effective edge detection algorithm all the time.

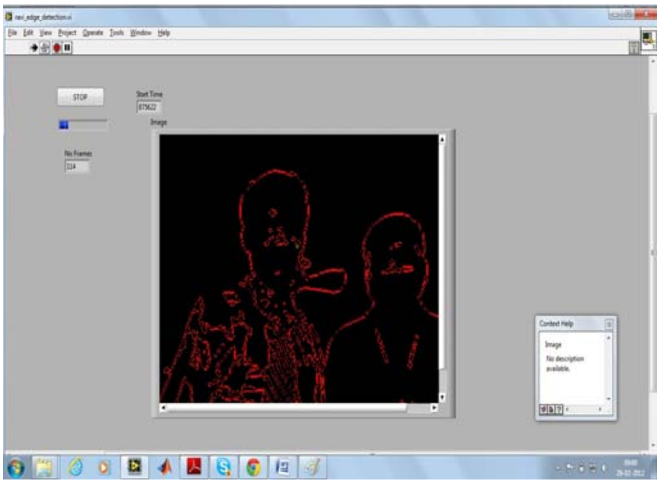


Fig.3 Front panel of video edge detection output.

Morphology based edge detection algorithm has a lot of advantages like these below:

- not sensitive to noise,
- smoother extracted edges,
- easy to realize parallel processing and
- hardware construction, so raised processing speed

VII. CONCLUSION

From the results, it is concluded that the edge detection using mathematical morphology is more efficient than the traditional methods. The main advantages of mathematical morphology are that it is easy to implant in LabVIEW, give better results, less noise. And mathematical morphological operators can be implemented by using different morphological operators with different shapes and sizes of structuring elements as per requirement.

REFERENCES

[1] R. Deriche. “Fast algorithms for low-level vision”, IEEE Trans,PAMI, 12(A),1990,pp. 78-87..

[2] D. Ziou and S. Tabbone, “Edge Detection Techniques –An Overview” TR-195, Département de Math et Informatique,Université de Sherbrooke, Québec, Canada,1997, pp. 1-41.

[3] H. Yang and J.W. Zhang, “Research on the application of mathematical morphology in image edge detection”, Journal of Liaoning University(Natural Science Edition)2005,1, pp.50-53.

[4] Xiangzhi Bai and Fugen Zhou, “Edge detection based on mathematical morphology and iterative thresholding”, Computational Interlligence and Security, Springger-Verlag Berlin, 2007,4456,pp.953-962.

[5] J.A Jiang, C.L Chuang, Y.L Lu, et al. “Mathematical-morphology-based edge detectors for detection of thin edges in low-contrast regions”, IET Image Processing, INST Engineering Technology-IET, England, 2007,1(3),pp.269-277.

[6] M Rama Bai, "A new approach for border extraction using morphological methods", International Journal of Engineering Science and Technology Vol.2(8),2010.

[7] Rahul Gaurav, "A Mathematical Morphological Perspective in World of images", Seminar on spatial Information Retrieval Analysis ,Reasoning and Modelling 18th – 20th March 2009,ISI-DRTC, Bangalore ,India

[8] Rui Guo,Daoliang Li, "Road Detection Method for Land Consolidation Using Mathematical Morphology from High Resolution Image", Proceedings of the 13th WSEAS International Conference on Applied Mathematics(MATH’08)

[9] Yu Lei, Nie jiafa,"Subpixel EdgevDetection Based on Morphological Theory",Proceedings of the world Congress on Engineering and Computer Science 2008 WCECS 2008 Berry M. W., Dumais S. T., O’Brien G. W. (1995): Using linear algebra for intelligent information retrieval, SIAM Review, 37, pp. 573-595.

[10] M. G .. P. Hou, LabVIEW7.1 Programming &Virtual Instruments Designing, Tsinghua University Press,Beijing:2005

[11] IMAQ Vision for LabVIEW User manual