A Survey On Fuzzy Logic Based Approaches for Edge Detection

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Abstract— A digital picture is a distribution of gray values over a predefined grid of specified image size. Digital image processing may also be said as a subset as a branch of science, where any given image can be transformed to arrays of small integers called pixels or snapshots representing a physical number such as scene radians and the digital photograph processing ways stems from two most important utility areas: growth of pictorial expertise for human figuring out and processing of photograph information for storage, transmission and representation for independent computing device belief .Edges symbolize boundaries and side detection can be stated as some of the complicated assignment in photo processing. Aspect detection is a procedure which significantly reduces the amount of knowledge and filters out vain understanding while retaining the foremost structural homes in an photograph. Area detection has many functions in snapshot processing and laptop imaginative and prescient and will probably be an foremost method in each biological and robotic vision.

Keywords— Edge detection,sobel operator, fuzzy logic,

I. INTRODUCTION

The computer vision system is mostly application dependent other hand some other systems are stand alone application which solve a specific detection or measurement problems. It is important to understand the different techniques of storage, transmission, processing, recognition and then interpretation of such visual image. The computured two dimensional signals are quantized and sample to digital images. Some basic operations which are processed in digital image processing are such as restoration, enhancement, compression, segmentation[7].

Image processing operations divided into four major categories[9]:

A. Image Restoration

B. Image Enhancement

C. Image Compression

D. Image Segmentation

Edge detection is one of the most generally used operations in image analysis. Edges are enormous neighborhood alterations of intensity in an photograph and happens on the boundary between two one of a kind areas in an snapshot. We will comprehend it in a greater way as an side will not be a physical entity[11]. It's the place the pics ends and partitions begin, the place the vertical and the horizontal surfaces of an object meets. If there have been sensors with infinitely small footprints, an edge would be recorded between pixels with an photo[13]. Oftentimes we see a facet from the gap and it appears as a single part but it'll include different edges if see from close. For illustration the threshold between a forest and a street in an aeria[10]; snapshot won't seem like an edge any further in a image taken on the bottom. Within the ground picture, edges could also be observed around each person or tree[9]. If we seemed few inches faraway from a tree, edges could also be located inside the texture on the bark of the tree. Edges are scale-based and an facet may just include different edged, however at a particular scale, an side still has no width[8]. For that reason edges is also used for boundary estimation and segmentation in the scene. Accordingly we will say that area detection is very valuable in quantity of contexts and can be used for segmentation, registration and identification of object in a scene. An instance has been proven .Within the normal image we see a uniform gray history. The edge more desirable variant of the identical picture has darkish strains time out the objects. Notice that there is no way to tell which a part of the image are heritage and which are object, handiest the boundaries between the areas are recognized[2].

Fig.1:- Synthetic image with a grey background

Fig.2:- Edge enhanced image showing only the outlines of the objects.

Segmentation of an image means to the process of dividing a digital image into multiple set of pixels. The main purpose of segmentation is to simplify and convert the representation of image into which is meaningful, easy to analyze and perform. Segmentation is the process of segment of an image into homogeneous regions which is the constituent part of an image . Segmentation process mainly focused to locate boundaries like curves and lines etc. and locate objects in an image. In this research the various types of fuzzy techniques are studied for image segmentation. In image segmentation areas different segmentation algorithms and techniques are developed or introduced. Algorithms developed are meant for online and real time applications television, camera phone, etc.

II. A SURVEY OF PRIOR ARTS

In this section, we reviewed and focused work done on edge detection of the digital images in past. Many of the researches are discussed in this section of the edge detection areas.. This researches are based on the image analysis where different type of approaches are introduced by many developers. This thesis also based on the edge detection where a different approaches used to detect edges sharply. Edge detection have fundamental importance in image analysis. Edges are basically define as boundaries of the object in image. And widely used for segmentation, registration, and identification purpose of object in image. This process decreases the amount of information which are less relevant. Here in edge detection process, fuzzy logic based approaches is used to image segmentation. A chronological review is listed below for major contributed arts:-

1) **Chan Khue Hinag**, develop a approaches for neural network based edge detection in 1997[6]. Chan used neural network because it have many processing elements which are joined together into groups. Theory is given to force network to yield particular output ot specific input in supervised and unsupervised mode.

2) **In 1998** again **M.Y.Siyal** develop other approach in edge detection area based on neural network. Siyal describe three layer neural network to classify elements of edges in binary images. In this approach,

the edges must be detected by converting the image into binary form basis on thresholdig values by some optimal criteria. And edge pattern must be classified into different predefined categories.

3) Then neural network is designed that recognize input pattern. This approach detect straight lines, corners and arces. **Liu Yi,** Chen Xue- quan proposed the edge detection algorithm based on remote sensing images. This approaches based on fuzzy logic theory. In this approach membership function is reconstruct and edge evaluation used as controlling procedure of iteration automatically[7].

4) In **2005**, **Tania Stathaki**, develop a approach which permit the combination of techniques of different detection operators to produce improved output in an image. The approach features are to produce noise free and improved accurate output. This approach concern in selection of detectors to be combined together[5].

5) In **2006**, **Rohan Raj Kalra**, proposed a approach which used fuzzy technique. This approach is based on USAN (Univalve Segment Assimilating Nucleus). It define structure of the edge in image and considered as unique characteristic of pixels and fuzzified. This is widely used for fingerprints identification and face recognition. It retained all important edges in image[6].

6) In image processing areas, the fuzzy techniques are also used to detect edges in image clearly and it make easier to develop and accurate image segments.[7,13].

7) **Lior Shamir** propose an approach which describe human perception based method. Which define a way to pixel color segmentation. Fuzzy sets provide a logic based model which have goal to observe human intuition of classified colors. The calculated complexity make suitable this approach for those applications where efficiency required[8].

8) **Borji and M. Hamidi** introduced a new approach based on color image segmentation. In color image segmentation fuzzy logic theory is used to construct an system defining a number of rules and low error rate for classification color and image segmentation. This method required less computational load[5].

9) **Estevez Pablo A, Flores Rodrigo J. et al**.[11] proposed an approaches of fuzzy min mas neural network for image segmentation. This method is used for fast processing and applied to real time segmentation tasks.

10) **N. A. Mohamed and M. N. Ahmed et al** proposed method for medical imaging. They also used fuzzy set theory to obtain cluster. In this approach/ method, modified fuzzy c means classification algorithm used

to fuzzy clustering. This method filters image when clustering it. It is less sensitive with noise[14].

11) **S.R. Kannan** proposed a new approach in reference of Magnetic Resonance Images, is fuzzy membership c means. This method is used develop to construct initial membership matrix for improving clustering strength of the image[12].

12) **K. Nirulata** proposed an theory as development of novel fuzzy image segmentation techniques. This theory proposed development of a better efficient improved fuzzy c means algorithm for segmentation under uneven illumination of objects in image. This approach also describe the steps for segmentation by incorporating spatial relationship of neighboring pixels into FCM in fuzzy clustering[9].

III. CONCLUSION

In this paper we discuss various state of arts carried in direction of edge detection using fuzzy approaches. Various approaches in this direction includes SVM, Neural Network, Fuzzy C-means, K means, Region growing, N-cut etc. And the enhancement of the performance of classical edge detectors is discusses in literatures a lot. The discussion of various arts presented here prove to be a milestone study for various scholars researching in this direction.

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