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A Comparative Study and Survey on Different Types of Methods in Edge Detection Algorithms

A.Bhuvaneshwari [1], Dr. S.Britto Ramesh Kumar [2]

[1]Research Scholar, Department of Computer Science, St. Joseph's College (Autonomous), Affiliated to Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

[2]Assistant Professor, Department of Computer Science, St. Joseph's College (Autonomous), Affiliated to Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

Abstract: Digital image processing uses edge detection to detect edges. Essentially, it refers to a set of tools and algorithms that make use of mathematical models in order to enhance the edges of objects in an image. Most new televisions are equipped with edge detection. Edges are a series of curved lines that organise these spots. In the discipline of feature extraction, edge detection plays a critical role in image processing. Edge detection's major feature is that it can extract an object's exact edges and outlines from among other objects and images in the background. Before the final features of an edge are recovered, the process of edge detection goes through numerous steps. The edge detection algorithm briefly explains these operations.

Key Words: Edge Detection Algorithms, Image Processing, Object Detection

INTRODUCTION:

Computer object detection is comparable to how people recognise items. As humans, we can recognise a dog's image based on traits that distinguish a dog. The tail, shape, nose, tongue, and other features all work together to distinguish a dog from a cow. Similarly, a computer can identify an item by recognising features that are significant to estimating the object's structure and qualities. Edges are one of these traits.

An edge is a mathematical term for a line that connects two corners or surfaces. Edge detection is based on the premise that areas with large variances in pixel brightness indicate an edge. As a result, edge detection is a measure of image intensity discontinuity.

2. RELATED WORKS:

The study describes a technique for detecting edges in brain MRI data that was developed expressly for that purpose. The modified canny algorithm began with the introduction of the log filer. Edge identification in MRI images was enhanced by adjusting both the gradient magnitude and kernel gradient [1].

A technique for detecting tumour borders on MRI scans of a patient's brain is described. The first stage in eliminating noise from medical pictures in order to give reliable diagnosis and improve the characteristics in medical images is to use the Balance Contrast Enhancement Technique (BCET) [2].The suggested method detects edges even in noisy settings utilising GTIKF, a Gabor transform integrated with K means and Fuzzy C means [3]. The suggested technique may considerably reduce edge detection issues such as fragmentation, displacement of position, and loss of thinness. The detector is noise-free and capable of reliably extracting crucial edge information. The WL operator is the name of the new operator (Wang and Lin). The WL operator was compared to other edge detectors using Pratt's figure of merit [4]. The healthcare cloud server is being created using the symmetric encryption approach. The encryption algorithm is used by the healthcare information administrator to encrypt the healthcare information and the encryption key. Following that, after encrypted medical outsourcing, it sends that data out. Once the health personnel or patient user obtains the encryption text, the decryption technique must be used [5]. To recognise additional edge pixel values, the proposed approaches make use of a pre-trained neural network. The edge of an image patch is calculated using a CNN. As a result, the canny approach and the SUSAN filter become more efficient while preserving image quality when employing such systems. As additional edges are recognised, edge accuracy and efficiency improve [6].In this study, which looks at the canny edge approach, the smoothing filter, pixel identifier, and feature selection are all enhanced. Using the SUSAN Filter, the Tabu Search Heuristic Pattern Identifier (TSHPI), a Britwari technique, enhanced edge identification. Feature selection was utilised to improve the canny edge approach. A Deep Learning approach is used to classify pre-trained neural networks in order to locate additional edge pixels. According to the findings, the Britwari

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approach outperformed traditional Canny Edge Detection algorithms. Edge identification in MRI images enhanced based feature selection, according to the findings [7]. Edge detection uses the structure information from the image surrounded by edges to remove unnecessary information from a picture while maintaining its structure. The purpose of this paper was to explain the CNN classification model and how it affects edge detection. In addition, a number of previously proposed techniques for resolving edge detection issues were investigated [8].

3. EDGE DETECTION:

1. Fill in the blanks with a colour image.
2. Refining: Refining is used to remove as much noise as possible while preserving the image's real edges.
3. Intensification: To improve the quality of edges, use differentiation.
4. Threshold: The Edge magnitude threshold is used to reduce noisy edge pixels.
5. Localization: Find the boundaries and space between the pixels as closely as possible.
6. Get the image with the edge features extracted.

3.1 Edge Detection Techniques:

There are a variety of approaches, and the following are a few of the more popular
Canny edge detection
Sobel edge detection
Prewitt edge detection
Laplacian edge detection
Kirsch edge detection

i. Canny edge detection: Canny edge detection technique is one of the classic edge detection techniques, created by John Canny in 1983. This method still outperforms some of the newly developed techniques. Canny plays an important role in separating noise from the image before finding the edges of the image.

ii. Sobel edge detection: Sobel edge detection is based on image convolution with two integer-valued filters, one in the horizontal direction and one in the vertical direction, as proposed by Sobel (1970). It begins the edges at the highest point of the gradient. Sobel does both differentiation and smoothing at the same time.

iii. Robert's edge detection: Lawrence Robert (1965) introduced Robert's edge detection, which conducts a 2-D spatial gradient on an image. The high spatial frequency zones that correlate to edges are the focus of this strategy. For this procedure, a grayscale image is input into the application. The magnitude of the spatial gradient of the input image is represented by the pixel value at each location in the output.

iv. Prewitt edge detection: Prewitt edge detection calculates the magnitude and orientation of an edge, as presented by Prewitt (1970). Despite the fact that unusual slope edge placement necessitates a lengthy count to get the bearing from the sizes in the x and y directions, compass edge recognition correctly determines the bearing from the kernel with the highest response. It's limited to eight directions; nonetheless, experience shows that most immediate heading gauges aren't completely accurate over time. For eight bearings, this inclination-based edge finder is assessed in the 3x3 neighbourhood. The identities of all eight convolution veils have been established. It detects horizontal and vertical edges in the same way as Sobel does.

v. Laplacian edge detection: Unlike Sobel and Prewitt approaches, Laplacian edge detection only utilises one kernel. These are the two most widely used kernels. These coverings are sensitive to clamour because they approximate a second subordinate evaluation on the picture. To remedy this, the image is Gaussian smoothed on a regular basis before applying the Laplacian channel.

vi. Kirsch edge detection: Kirsch edge detection is a technique developed by Kirsch (1971). A single mask was employed in this approach, which was rotated to eight different compass directions: North, Northwest, West, Southwest, South, Southeast, East, and Northeast.

vii. Robinson edge detection: Robinson (1977) developed a technique that is similar to Kirsch's but is easier to apply because it uses co-efficients of 0, 1, and 2. Because the masks are symmetrical along their directional axis, the answer for the other four may be derived by negating the result for the first four. The angle of the inclination can be approximated as the edge of the line of zeroes in the veil giving the largest reaction, and the extent of the inclination is the most extreme esteem picked up from applying every one of the eight covers to the pixel neighbourhood.

viii. Maar Hildreth edge detection: Maar Hildreth (1980) uses a computer programme to detect edges in digital photographs. In all regions where well-built and quick variations in image brightness are evident. It works by using the LoG function to convolve the image. Zero crossings in the filtered result are detected to find the edges. Because of its shape when turned upside down, the LoG technique is also known as the Mexican hat wavelet.

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4. CONCLUSION:

The method of determining which pixels are the edge pixels is known as edge detection. The edge detection procedure usually produces an edge map, which is a new image that describes each original pixel's edge categorization as well as maybe extra edge parameters like magnitude and direction.

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BİOGRAPHY

A. Bhuvaneshwari has completed her Master Degree in Computer Science, Masters Philosophy in Computer Science, and is currently pursuing her Ph.D in Computer Science, in the Field of Artificial Intelligence. She currentlydoing as an Ph.D research scholar in the Department of Computer Science, St.Joseph's College (Autonomous),, Tiruchirappalli -2, Tamil Nadu, India.

Dr. S. Britto Ramesh Kumar is an Assistant Professor of Computer Science at St. Joseph's College (Autonomous), Tiruchirappalli-2. His research interests include software architecture, wireless and mobile technologies, information security and Web Services. He has published many journal articles and book chapters on the topics of Mobile payment and Data structure and algorithms. His work has been published in the International journals and conference proceedings, like JNIT, IJIPM, IEEE, ACM, Springer and Journal of Algorithms and Computational Technology, UK. He was awarded as the best researcher for the year 2008 in Bishop Heber College, Tiruchirappalli. He has completed a minor research project. He has visited countries like China, South Korea and Singapore.