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INTRODUCTION

REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENTS

REFERENCES

APPENDIX/ANNEXURE

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- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

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- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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WEBSITES

- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

MORPHOLOGICAL BACKGROUND DETECTION AND ENHANCEMENT OF IMAGES WITH POOR LIGHTING USING CUMULATIVE HISTOGRAM ANALYSIS

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ABSTRACT

Morphological transformations [5] are used to enhance the background in images characterized by poor lighting. Contrast image enhancement has been carried out by transformation which utilizes the opening by reconstruction, which is employed to define the multibackground notion. The objective of contrast operators consists in normalizing the grey level of the input image with the purpose of avoiding abrupt changes in intensity among the different regions. Finally, the performance of the proposed operators is illustrated through the processing of images with different backgrounds, the majority of them with poor lighting conditions. Histogram equalization is a straightforward image-processing technique often used to achieve better quality images in black and white color scales in medical applications such as digital X-rays, MRIs, and CT scans. All these images require high definition and contrast of colors to determine the pathology that is being observed and reach a diagnosis. However, in some type of images histogram equalization can show noise hidden in the image after the processing is done. This is why it is often used with other imaging processing techniques.

KEYWORDS

Mathematical Morphology (MM), Magnetic Resonance Imaging (MRI), Computed Tomography (CT) scan, Cumulative Histogram, Morphological enhancement.

INTRODUCTION

The contrast enhancement problem in digital images can be approached from various methodologies, among which is Mathematical Morphology (MM)[1]. Initial studies on contrast enhancement in this area were carried out which introduced the contrast mappings notion. Such operators consist in accordance to some proximity criterion, in selecting for each point of the analyzed image, a new grey level between two patterns (primitives). With regard to MM, several studies based on contrast multiscale criterion have been carried out. A scheme is defined to enhance local contrast based on a morphological transformation.

Even though morphological contrast [6, 12] has been largely studied, there are no methodologies, from the point of view MM, capable of simultaneously normalizing and enhancing the contrast in images with poor lighting. On the other side, one of the most common techniques in image processing to enhance dark regions is the use of nonlinear functions, such as logarithm or power functions otherwise, a method that works in the frequency domain is the homomorphic filter.

In addition, there are techniques based on data statistical analysis, such as global and local histogram equalization. During the histogram equalization process, grey level intensities are reordered within the image to obtain a uniform distributed histogram. However the main disadvantage of histogram equalization is that the global properties of the image cannot be properly applied in a local context frequently producing a poor performance in detail preservation. A method to enhance contrast is proposed the methodology consists in solving an optimization problem that maximizes the average local contrast of an image. The optimization formulation includes a perceptual constraint derived directly from human super threshold contrast sensitivity function. The method applies the proposed operators to some images with poor lighting with good results. Morphology is a broad set of image processing operations that process images based on shapes. Morphological operations apply a structuring element to an input image, creating an output image of the same size.

LITERATURE SURVEY

Even though morphological contrast has been largely studied, there are no methodologies, from the point of view MM, capable of simultaneously normalizing and enhancing the contrast in images. The advent of digital age has destroyed the security and protection of digital multimedia information.

A. **DRAWBACKS OF EXISTING SYSTEM:**

a. Non-reputable.
c. Extra storage.
d. Poor performance in detail preservation.
e. There are no methodologies, from the point of view MM, capable of simultaneously normalizing and enhancing the contrast in images with poor lighting.
f. Contrast stretching cannot be applied for the images, which span the entire intensity range i.e. 0-255.

B. **MATHEMATICAL MORPHOLOGY**

The field of mathematical morphology contributes a wide range of operators to image processing, all based around a few simple mathematical concepts[4,5,7] from set theory. The operators are particularly useful for the analysis of binary images and common usages include edge detection, noise removal, image enhancement and image segmentation.

The two most basic operations in mathematical morphology are erosion and dilation. Both of these operators take two pieces of data as input an image to be eroded or dilated, and a structuring element (also known as a kernel). The two pieces of input data are each treated as representing sets of coordinates in a way that is slightly different for binary and grayscale images.

For a binary image, white pixels are normally taken to represent foreground regions, while black pixels denote background. (Note that in some implementations this convention is reversed, and so it is very important to set up input images with the correct polarity for the implementation being used). Then the set of coordinates corresponding to that image is simply the set of two-dimensional Euclidean coordinates of all the foreground pixels in the image, with an origin normally taken in one of the corners so that all coordinates have positive elements.

For a grayscale image, the intensity value is taken to represent height above a base plane, so that the grayscale image represents a surface in three-dimensional Euclidean space. Then the set of coordinates associated with this image surface is simply the set of three-dimensional Euclidean coordinates of all the points

within this surface and also all points below the surface, down to the base plane. Note that even when we are only considering points with integer coordinates, this is a lot of points, so usually algorithms are employed that do not need to consider all the points.
Morphology is a broad set of image processing operations that process images based on shapes. Morphological operations apply a structuring element to an input image, creating an output image of the same size. In a morphological operation [9, 12], the value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbors. By choosing the size and shape of the neighborhood, you can construct a morphological operation that is sensitive to specific shapes in the input image.
The most basic morphological operations[9,12] are dilation and erosion. Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries. The number of pixels added or removed from the objects in an image depends on the size and shape of the structuring element used to process the image. In the morphological dilation and erosion operations, the state of any given pixel in the output image is determined by applying a rule to the corresponding pixel and its neighbors in the input image. The rule used to process the pixels defines the operation as dilation or erosion.
Erosion is one of the two basic operators in the area of mathematical morphology[4,5], the other being dilation. It is typically applied to binary images, but there are versions that work on grayscale images. The basic effect of the operator on a binary image is to erode away the boundaries of regions of foreground pixels (i.e, White pixels, typically). Thus areas of foreground pixels shrink in size, and holes within those areas become larger.
Dilation is one of the two basic operators in the area of mathematical morphology, the other being erosion. It is typically applied to binary images, but there are versions that work on grayscale images. The basic effect of the operator on a binary image is to gradually enlarge the boundaries of regions of foreground pixels (i.e. White pixels, typically). Thus areas of foreground pixels grow in size while holes within those regions become smaller.

C. HISTOGRAM EQUALIZATION
Histogram modeling techniques[2,8] (*e.g.* histogram equalization) provide a sophisticated method for modifying the dynamic range and contrast of an image by altering that image such that its intensity histogram has a desired shape. Unlike contrast stretching, histogram-modeling operators may employ *non-linear* and *non-monotonic* transfer functions to map between pixel intensity values in the input and output images. Histogram equalization employs a monotonic, non-linear mapping which re-assigns the intensity values of pixels in the input image such that the output image contains a uniform distribution of intensities (*i.e.* a flat histogram). This technique is used in image comparison processes (because it is effective in detail enhancement) and in the correction of non-linear effects introduced by, say, a digitizer or display system as shown in table 1.

TABLE 1: METHODS FOR HISTOGRAM EQUALIZATION

Method	Advantage	Disadvantage
Histogram expansion	Simple and enhance contrasts of an image	If there are gray values that are physically far apart from each other in the image, then this method fails
LAHE	Offers an excellent enhancement of image contrast	Computationally very slow, requires a high number of operations per pixel
Cumulative histogram equalization	Has good performance in histogram equalization	Requires a few more operations
Par sectioning	Easy to implement	Better suited to hardware implementation.
Odd sectioning	Offers good image contrast	Has problems with histograms which cover almost the full gray scale

METHODOLOGY
Cumulative histogram is used in the proposed system. (Data about cumulative histogram) Cumulative Histogram Equalization [8] can be applied for the images which span the entire intensity range i.e. 0-255. This method usually increases the global contrast of many images, especially when the usable data of the image is represented by close contrast values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values.
The method is useful in images with backgrounds and foregrounds that are both bright or both dark. In particular, the method can lead to better views of bone structure in x-ray images, and to better detail in photographs that are over or under-exposed. A key advantage of the method is that it is a fairly straightforward technique and an invertible operator. So in theory, if the histogram equalization function is known, then the original histogram can be recovered. The calculation is not computationally intensive. A disadvantage of the method is that it is indiscriminate. It may increase the contrast of background noise, while decreasing the usable signal.

A. CUMULATIVE HISTOGRAM
Each array element gives the number of pixels with a gray-level less than or equal to the gray level corresponding to the array element.
a.Create the histogram for the image.
b.Calculate the cumulative distribution function histogram.
c.Calculate the new values through the general histogram equalization formula (1.1).
d.Assign new values for each gray value in the image.

$$c_j = \sum_{i=0}^{j} h_i \quad \text{.........(1.1)}$$

Where Cj=Cumulative frequencies, hi =Histogram counts.

IMPLEMENTATION
PROCESS LOGIC
In processing logic, initially we select the input image from any folder or file, next preprocessing is carried out to convert the original image into gray scale image, then histogram analysis is applied to calculate the maximum and minimum pixels count, then the morphological enhancement is carried out to obtain the final enhanced image from gray scale image, at last we get the background enhanced and equalized image as output which is shown in below Fig 1.

FIG. 1: PROPOSED ARCHITECTURE OF MORPHOLOGICAL BACKGROUND DETECTION & ENHANCEMENT

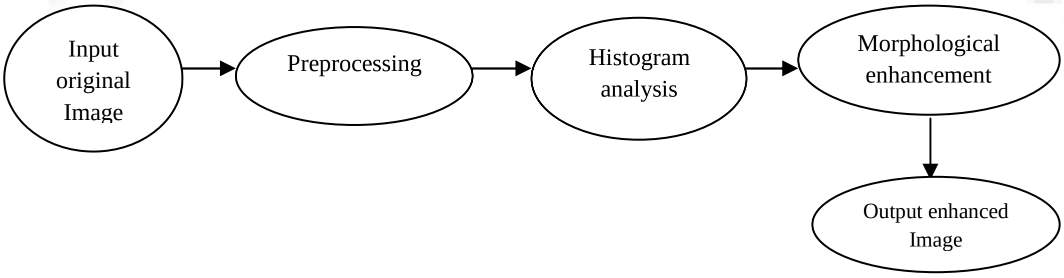


Fig 1, gives the proposed architecture of morphological background detection & enhancement process and it comprises of four modules namely, input image, Preprocessing, perform Histogram Analysis and morphological enhancement.

MODULE 1: SELECT THE INPUT IMAGE

In this module, user can choose a file from the directory it can be done by using the class JfileChooser. JFileChooser has supporting classes: FileFilter class, FileSystemView class, FileView.

- FileFilter class is for restricting files and directories to be listed in the File View of the JFileChooser.
- The File View controls how the directories and files are listed within the JFileChooser.
- The FileSystemView is an abstract class that tries to hide file system-related operating system specifics from the file chooser.

MODULE 2: PREPROCESSING THE IMAGE

In this module, the original image is converted into the gray image to calculate the intensity information.

MODULE 2.1: CONVERT THE IMAGE FROM COLOR IMAGE TO GRAYSCALE

A grayscale (or gray level) image is simply one in which the only colors are shades of gray. In photography and computing[10,11], a grayscale or grayscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest.

Grayscale images are distinct from one-bit black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white (also called bi-level or binary images). Grayscale images have many shades of gray in between. Grayscale images are also called monochromatic, denoting the absence of any chromatic variation.

Conversion of a color image to grayscale is not unique different weighting of the color channels effectively represents the effect of shooting black-and-white film with different-colored photographic filters on the cameras. A common strategy is to match the luminance of the grayscale image to the luminance of the color image.

In this module the original image is converted into gray image.

Input ( )

{

Take the original image as an input

}

Processing ( )

{

Get each pixel of the original image and using transformations convert it into
gray image

Step 1: Each pixel of the original image is obtained by using the Pixelgrabber () function.

Step 2: To convert any color to a grayscale representation of its luminance, First we must obtain the values of its red, green, and blue (RGB)

Step 3: Then add together 30% of the red value, 59% of the green value, and 11% of the blue value to obtain gray image

The formula Y = 0.3*R + 0.59*G +0.11*B

}

Output ( )

{

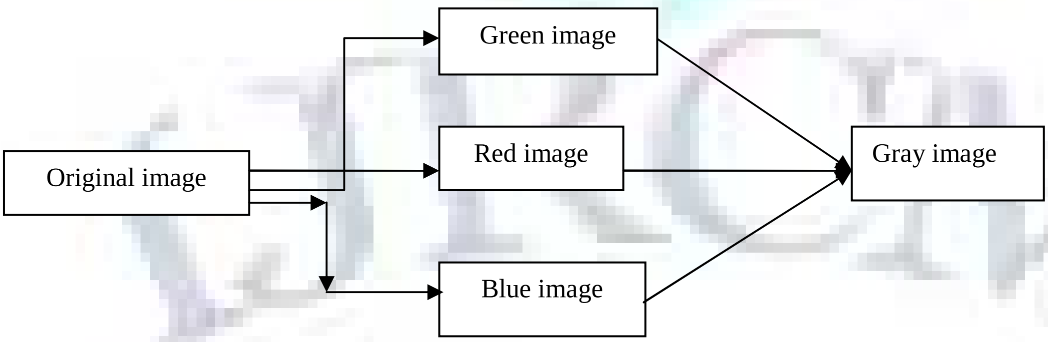
Get the output has gray image

}

To convert any color to a grayscale representation of its luminance, first one must obtain the values of its red, green, and blue (RGB) primaries in linear intensity encoding, by gamma expansion as shown in below fig 5.5. Then, add together 30% of the red value, 59% of the green value, and 11% of the blue value (these weights depend on the exact choice of the RGB primaries, but are typical). The formula (11*R + 16*G + 5*B) /32 is also popular since it can be efficiently implemented using only integer operations. Regardless of the scale employed (0.0 to 1.0, 0 to 255, 0% to 100%, etc.), the resultant number is the desired linear luminance value it typically needs to be gamma compressed to get back to a conventional grayscale representation.

This is not the method used to obtain the luma in the Y'UV and related color models, used in standard color TV and video systems as PAL and NTSC, as well as in the L*a*b color model. These systems directly compute a gamma-compressed luma as a linear combination of gamma-compressed primary intensities, rather than use linearization via gamma expansion and compression. To convert a gray intensity value to RGB, simply set all the three primary color components red, green and blue to the gray value, correcting to a different gamma if necessary.

FIG. 2: CONVERTING COLOR IMAGE TO GRAYSCALE



MODULE 3: PERFORM HISTOGRAM ANALYSIS

In an image processing context, the histogram[2] of an image normally refers to a histogram of the pixel intensity values. The histogram is a graph showing the number of pixels in an image at each different intensity value found in that image. For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels amongst those grayscale values. Histograms can also be taken of color images either individual histogram of red, green and blue channels can be taken, or a 3-D histogram can be produced, with the three axes representing the red, blue and green channels, and brightness at each point representing the pixel count. The exact output from the operation depends upon the implementation it may simply be a picture of the required histogram in a suitable image format, or it may be a data file of some sort representing the histogram statistics.

HISTOGRAM ANALYSIS

In this module the histogram for the gray image is computed.

Input ( )

{

Take the gray image as an input

}

Processing ( )

{

Step 1: The image is scanned in a single pass and a running count of the number of pixels found at each intensity value is kept. This is then used to construct a suitable histogram.

Step 2: Get maximum pixel count and minimum pixel count and plot the graph, Frequency along x-axis and pixel as y-axis. The maximum pixel count can be obtained by comparing each pixel value

}

Output ( )

{

Get the histogram for an image

}

The operation is very simple. The image is scanned in a single pass and a running count of the number of pixels found at each intensity value is kept. This is then used to construct a suitable histogram.

Histograms have many uses. One of the more common is to decide what value of threshold to use when converting a grayscale image to a binary one by thresholding. If the image is suitable for thresholding then the histogram will be bi-modal i.e. the pixel intensities will be clustered around two well-separated values. A suitable threshold for separating these two groups will be found somewhere in between the two peaks in the histogram. If the distribution is not like this then it is unlikely that a good segmentation can be produced by thresholding.

MODULE 4: MORPHOLOGICAL ENHANCEMENT

In this module the gray image is converted into Final enhanced image.

Input ( )

{

Take the gray image as an input

}

Processing ( )

{

Perform some transformations to enhance the image

Step 1: Consider a discrete grayscale image {x} and let n_i be the number of occurrences of gray level i. The probability of an occurrence of a pixel of level i in the image is given in formula 6.1.

$$p_x(i) = p(x = i) = \frac{n_i}{n}, \quad 0 \le i < L \qquad \text{.....................} (1.1)$$

Where, L being the total number of gray levels in the image, n being the total number of pixels in the image, and $p_x(i)$ being in fact the image's histogram for pixel value i, normalized to [0,1].

Step 2: In this step we have to equalize histogram The general histogram equalization formula is

$$h(v) = \mathrm{round}\left(\frac{cdf(v) - cdf_{min}}{(M \times N) - cdf_{min}} \times (L-1)\right) \qquad \text{.....................} (1.2)$$

Where, cdf_{min} is the minimum value of the cumulative distribution function M × N gives the image's number of pixels (where M is width and N the height) and L is the number of grey levels used, v is the pixel value

}

Output ( )

{

Get the final enhanced image

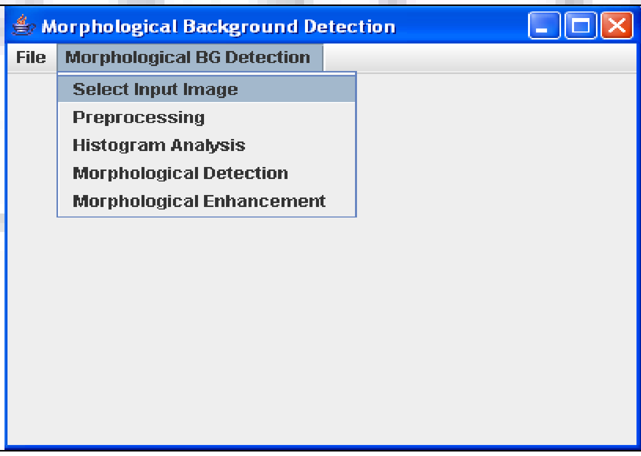
}

EXPERIMENTAL RESULTS

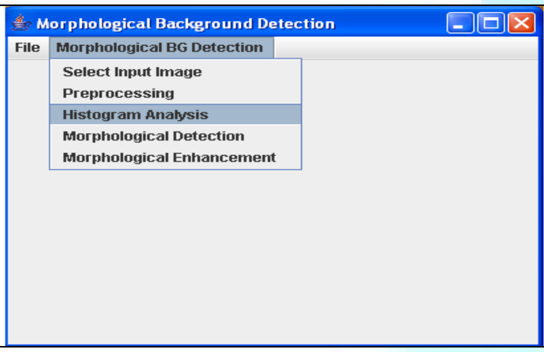
FIG. 4: GIVES THE VARIOUS OPERATIONS OF THE PROPOSED APPROACH AND THE CORRESPONDING OUTPUTS

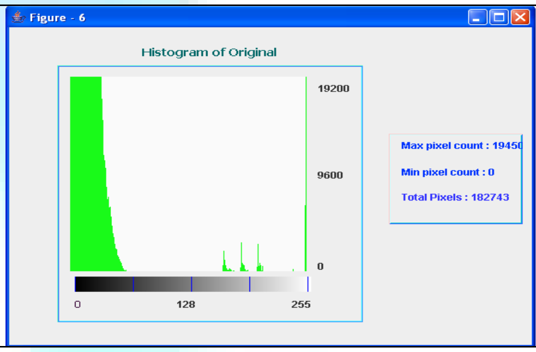
PREPROCESSING STAGE

- Y = 0.3*R + 0.59*G +0.11*B

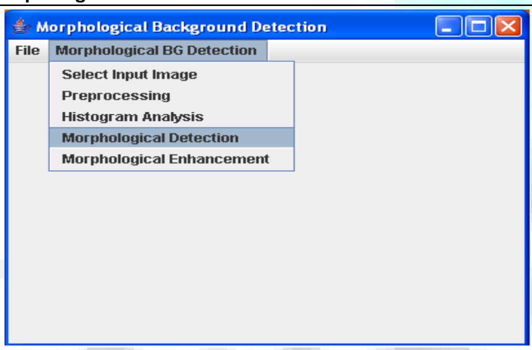


HISTOGRAM ANALYSIS



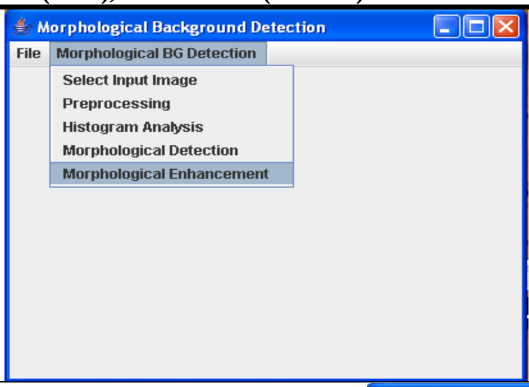


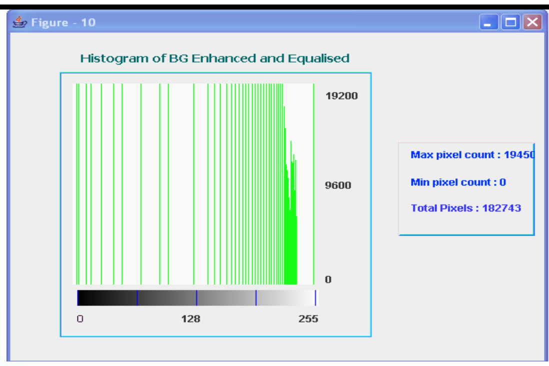
Morphological Detection



HISTOGRM OF BACKGROUND ENHANCED IMAGE

MORPHOLOGICAL ENHANCEMENT





CONCLUSION

This paper is on "Morphological background detection and enhancement of images with poor lightning using Cumulative Histogram" presents a study to detect the image background and to enhance the contrast in grey level images with poor lighting. However, a difficulty was detected when the morphological erosion and dilation were employed therefore, a new proposal to detect the image background was propounded, and that is based on the use of morphological connected transformations.

These contrast transformations are characterized by the normalization of grey level intensities, avoiding abrupt changes in illumination. The operators performance employed in our paper were compared with others given in the literature survey. Finally, a disadvantage of contrast enhancement transformations studied in our paper is that they can only be used satisfactorily in images with poor lighting; in a future work, this problem will be considered.

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