International Journal of Innovative Research in Electronics and Communications (IJIREC)
Volume 6, Issue 1, 2019, PP 27-35
ISSN 2349-4050 (Online) & ISSN 2349-4042 (Print)
DOI: http://dx.doi.org/10.20431/2349-4050.0601005
www.arcjournals.org

Audio Assistance for Blind People in Recognizing Cloth Patterns and Colors using Modified SVM along with Fuzzy Logic

Dr. S. Satheesh*

Professor, Department of ECE, RISE Krishna Sai Prakasam Group of Institutions, Valluru, Ongole, A.P, INDIA

Corresponding Author:** ***Dr. S. Satheesh, *Professor, Department of ECE, RISE Krishna Sai Prakasam Group of Institutions, Valluru, Ongole, A.p, India.*

Abstract: *Digital image quality evaluation is the area of concern from last several decades and to evaluate the image quality there are two acclaimed approaches namely subjective quality evaluation and Objective quality evaluation approach which are recognized as standard approaches by International Telecom Union (ITU). The conventional reported works based on these acclaimed standard approaches are failed to achieve the accuracy. Existing approaches like structural similarity index matrix (SSIM) is an innovative approach which performs well on the content dependent distortions (content dependent in the sense variation in color, shape, texture) but not as efficient as Peak to Signal Noise ratio. A novel algorithm is presented in this paper which provides an accurate performance to evaluate the quality of digital quality measurement. Mostly the conventional approaches fail to yield accurate results because most of the techniques relies on human visual data not on the residual distortion data which is termed as hidden distortion by most of the researchers. An innovative auto aggressive based on internal generative mechanism (IGM) which is successful to get Mean Square error both on distorted portion and residual portion as well. In order to yield the better result, we have to combine the both residual distortion and visual distorted portion MSE's. The experimental results yield the better performance as well as accuracy too.*

1. Introduction

For visually impaired people when they go to the textiles for selecting the dresses they could not be able to choose the clothes. So choosing clothes with suitable colors and patterns is very difficult for them. They can manage this difficulty with the help of other people. Some of them use plastic Braille labels or different types of electronic assistance but they cost high. Most of the blind people due to these difficulties they prefer to wear the clothes with a uniform color or without any pattern. The visually impaired people have difficulty for choosing the clothes. And also choosing clothes with complex patterns and colors is more challenging task for them. They use other methods to finding the pattern with the help of rotation and illumination invariant analysis it is possible to find out the patterns and also standard algorithms were developed for the blind people to find the pattern and color but due to the large intraclass pattern variations those method gone failure. To overcome all these problem computer vision based system is developed to recognize clothing patterns in four categories of pattern and identifies colors. In and the texture was identified, but finding the texture with very less dataset is not useful because the intensity value and the directionality changes for all the images, so the local features is to be extracted to overcome this problem. Due to large variance and local points of the same clothing pattern categories, global features and directionality of clothing patterns are stable within the same category. Therefore, it is able to obtain best result with local feature extraction. The combination of global and local features extraction for clothing pattern recognition that is radon Signature, Statistical descriptor (STA) and scale invariant feature transform (SIFT).

2. Training and Testing Images

The clothing patterns can be comes under the four categories they are

- Irregular
- Pattern less
- Plaid
- Stripe

Dataset of training image

The entire clothing pattern can be inside this vast dataset of CCYN. Each one pattern has its own directionality, intensity and lighting variation. If the test image of stripe pattern the image patches are horizontal direction and but, in the training, set the image patches are in vertical direction. This can be matched by rotation, illumination changes. This adjustment can be done only by extracting the global features like energy, entropy, variance, uniformity. Once the superlative function has been estimated according to the particular image, every pixel in the image is mapped in the same way, independent of the value of surrounding pixels in the image. These techniques are simple and fast, but they can cause a loss of contrast. Examples of common global tone mapping methods are contrast reduction. Local features are the points, small patches and lines. These two features combined together to get the position of each image pixels. These pixels can be in the matrix form. So, they combined together using the classifier.

3. Block Diagram

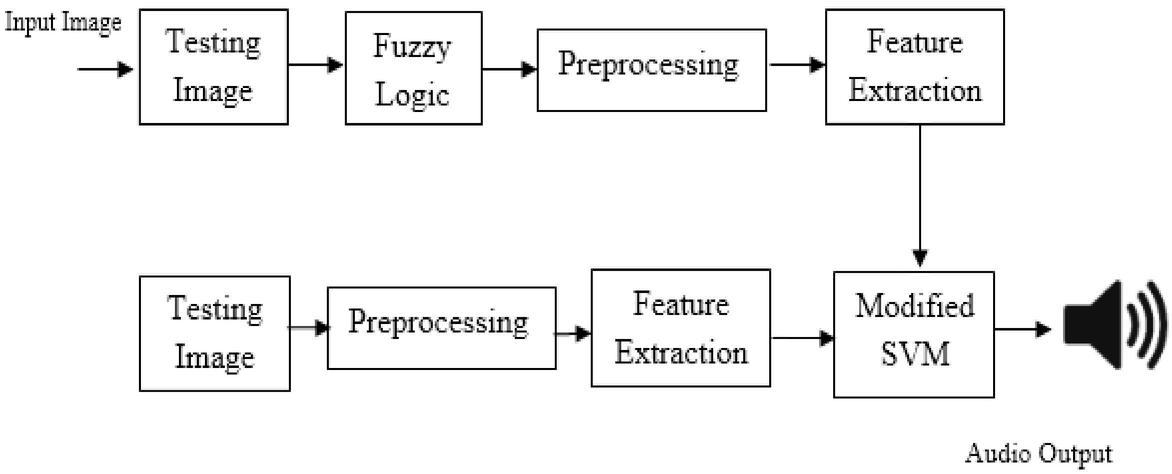

Figure3.2. *Block Diagram*

This system can handle clothes with complex patterns and recognize clothing patterns of four categories they are plaid, striped, pattern less, and irregular. This system is also able to identify 11 colors are red, orange, yellow, green, cyan, blue, purple, pink, black, grey, and white. In the case of multiple colors in the colors, the first several dominant colors are spoken to users. In order to handle the large intraclass variations the combination of global and local image features significantly outperforms the state-of-the-art texture analysis methods for clothing pattern recognition. It achieves comparable results to the state-of-the-art approaches on the traditional texture classification problems. The color can be identified using color normalized histogram of each clothing image in the HSI color space. In this three quantization is used they are hue, saturation, intensity. The weight of each color is the percentage of pixels belonging to this color each pixel in the image has its own saturation value and intensity. The white, gray, black color can be easily identified using the comparison of this saturation and intensity value. When the captured image undergoes this normalized histogram, the percentage of each color can be classified and gives the particular color.

4. METHODOLOGY

Extracting the feature is the important method of classifying the patterns. Each image has its own characteristics. To analysis this characteristic the features are used. These features can be extracted using the following algorithms.

Statistical (STA) feature extraction

Scale Invariance feature transform (SIFT)

Recurrence Quantification Analysis (RQA)

A. Statistical (STA) feature extraction Statistical feature extraction is done using the wavelet transform. The STA is used to decompose the image pixel into low pixels. STA have 4 features like variance, energy, uniformity and entropy. Using these features the images can be classified.

B. Scale Invariance feature transform (SIFT) SIFT is the local feature extraction. To perform easier recognition, it is important that the global and local features extracted from the training image be identified even under changes in image scale, noise and illumination, as the name mentioned it is invariant to the scale. The feature extracted are points, patches in the image.

C. Recurrence Quantification Analysis (RQA: Recurrence Quantification Analysis (RQA) is also a local feature extractor. Mainly it is used to increase accuracy in the SVM classifier. RQA has three feature they are Recurrence Plot – It is a graph that shows all the time at which a state of the dynamical system recurs. Recurrence rate- It is the percentage of points in the threshold plot. This obviously depends on the radius but not for the fixed radius.

After an image is considered for detecting the pattern and colour it is first enhanced using the fuzzy logic-based on certain conditions

A.Fuzzy Logic resembles the human decision-making methodology. It deals with vague and imprecise information. This is gross oversimplification of the real-world problems and based on degrees of truth rather than usual true/false or 1/0 like Boolean logic. Take a look at the following diagram. It shows that in fuzzy systems, the values are indicated by a number in the range from 0 to 1. Here 1.0 represents absolute truth and 0.0 represents absolute falseness. The number which indicates the value in fuzzy systems is called the truth value. In other words, we can say that fuzzy logic is not logic that is fuzzy, but logic that is used to describe fuzziness.

B. Modified SUPPORT VECTOR MACHINE ALGORITHM (SVM) SVM algorithms are used in classification. This classification can be viewed as the task of separating classes in the feature space. This classification can be used in many applications like bioinformatics, text and image recognition. This can be the fast algorithm for identifying the Support Vectors of a given set of points.

C. CLASSIFYING THE CLASSES in Modified Support Vector Machines (SVM) has gained conspicuity in the field of machine learning and pattern classification due to its unique tuning feature which improves accuracy. Classification is achieved by realizing a linear or non-linear separation surface in the input space. In Support Vector classification, the separating function can be expressed as a linear combination of kernels associated with the Support Vectors as

$$f(x) = \sum_{x_j \in S} \alpha_j y_j K(x_j, x) + b$$

Where xi denotes the training patterns, yi 2 {+1,−1} denotes the corresponding class labels and S denotes the set of Support Vectors.

Steps Involved in Modified SVM Algorithm

Given the two classes X1 and X2, let us assume X1 are the positive class and X2 are the negative class.

Step 1: Find the support vector class, to get optimum boundary. Let us assume 3 input vector set.

$$S1 = \begin{bmatrix} X1i \\ X2j \end{bmatrix} \qquad S2 = \begin{bmatrix} X1i \\ X2jX2j \end{bmatrix} \qquad S3 = \begin{bmatrix} X1i \\ \; \end{bmatrix}$$

Step 2: compute this support vector set with bias 1

$$\overline{S1} = \begin{bmatrix} X1i \\ X2j \\ 1 \end{bmatrix} \qquad \overline{S2} = \begin{bmatrix} X1iX1i \\ X2j \\ 1 \end{bmatrix} \qquad \overline{S3} = \begin{bmatrix} \\ X2j \\ 1 \end{bmatrix}$$

Step 3: find the three parameters $\alpha1, \alpha2, \alpha3$

$$\alpha1.\overline{S1}.\overline{S1} + \alpha2.\overline{S2}.\overline{S1} + \alpha3.\overline{S3}.\overline{S1} = -1$$

$$\alpha1.\overline{S1}.\overline{S2} + \alpha2.\overline{S2}.\overline{S2} + \alpha3.\overline{S3}.\overline{S2} = -1$$

$$\alpha1.\overline{S1}.\overline{S3} + \alpha2.\overline{S2}.\overline{S3} + \alpha3.\overline{S3}.\overline{S3} = -1$$

Step 4: The hyper plane that discriminates the position class from the negative class is given by :

$W = \sum \alpha_i.S_i$

Step 5: The separating hyper plane equation formula is

$Y = WX+B$

Step 6: Plot the line according to the value. If the value is greater than the augmented value it belongs to the class positive and if it is lesser than the augmented value it belongs to the class negative

5. RESULT ANALYSIS COMPLETE INDETAIL

5.1. Result Analysis

We have both Subjective and objective results. Subjective refers to human vision and objective refers to parameters like entropy, energy, etc.

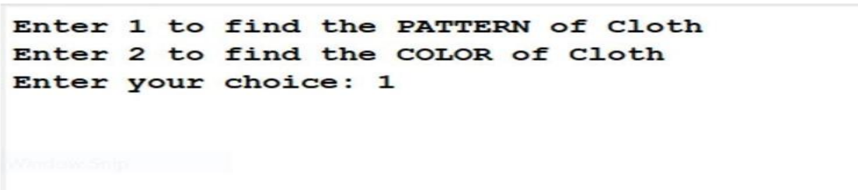

Fig5.2. *To find Pattern of Cloth*

Let us consider option 1 and find the pattern of the cloth for which we require to find the pattern.

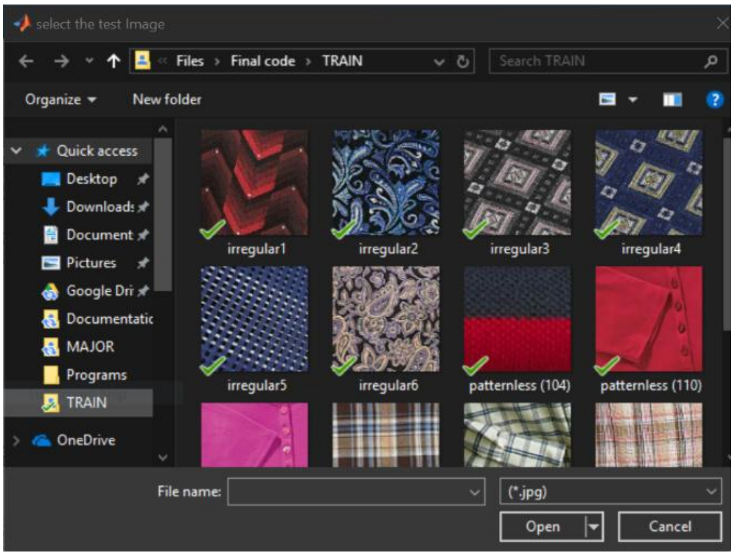

Fig5.3. *Image selection for which the pattern needs to be found*

After we run the code by choosing the input image for which the pattern needs to be found, we obtain the objective parameters in the form of comparing the original with obtained quantities.

Fig5.4. *Original Image*

The above figure is original image on which we need to perform operations inorder to improve the quality of the image for better picture quality.

Fig5.5. *Enhanced Image*

As we have seen the input image is not so clear due to the change in colour, brightness, etc., this image has undergone various processing techniques to get an improved quality of the input image using fuzzy logic. This image is the output of our image processing for input.

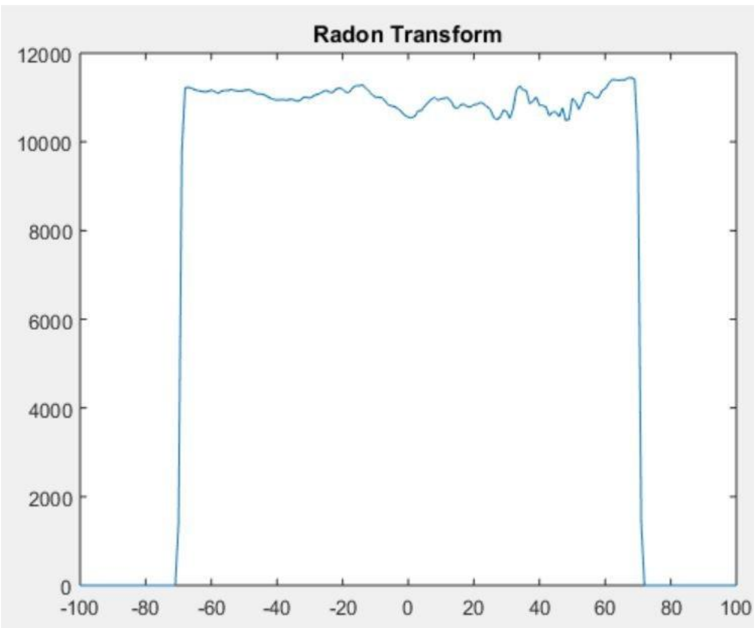

Fig5.6. *Radon Transform*

After we run the code by choosing the input image 2 which is to be improved, we obtain the objective parameters in the form of comparing the original with obtained quantities of entropy and contrast.

Applying the Radon transform on an image f(x,y) for a given set of angles can be thought of as computing the projection of the image along the given angles. The resulting projection is the sum of the intensities of the pixels in each direction, i.e. a line integral. The result is a new image $R(\rho,\theta)$. This is depicted in Figure 5.6.1 on the facing page.

This can be written mathematically by defining

$\rho = x \cos\theta + y\sin\theta$

Equ. 5.1

after which the Radon transform can be written as

$R(\rho,\theta) = \int\int f(x,y)\delta(\rho - x \cos\theta - y\sin\theta)dx\, dy$

Equ. 5.2

where $\delta(\cdot)$ is the Dirac delta function.

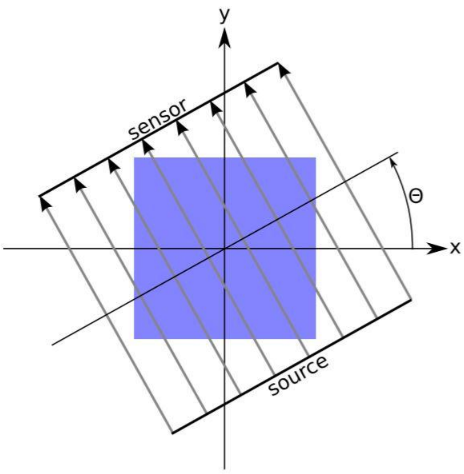

Fig5.6.1. *The source and sensor contrapment is rotated about the center of the object. For each angle θ the density of the matter the rays from the source passes through is accumulated at the sensor. This is repeated for a given set of angels, usually from θ ∈ [0;180). The angel 180 is not included since the result would be identical to the angel 0.*

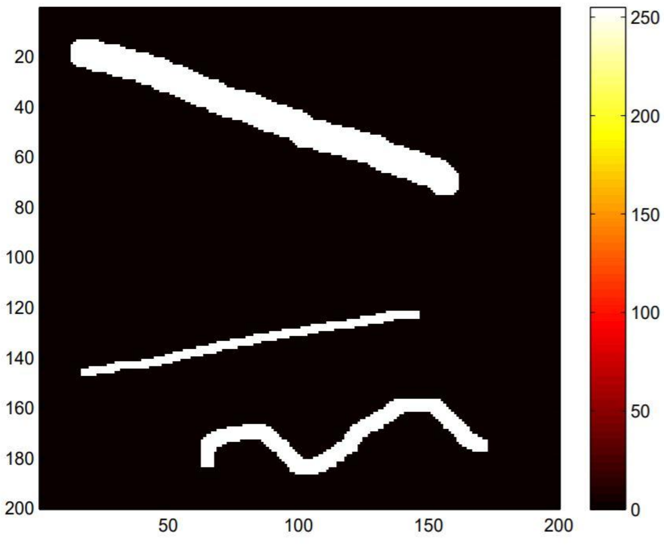

Fig5.6.2. *An image used as input for illustration of radon transform*

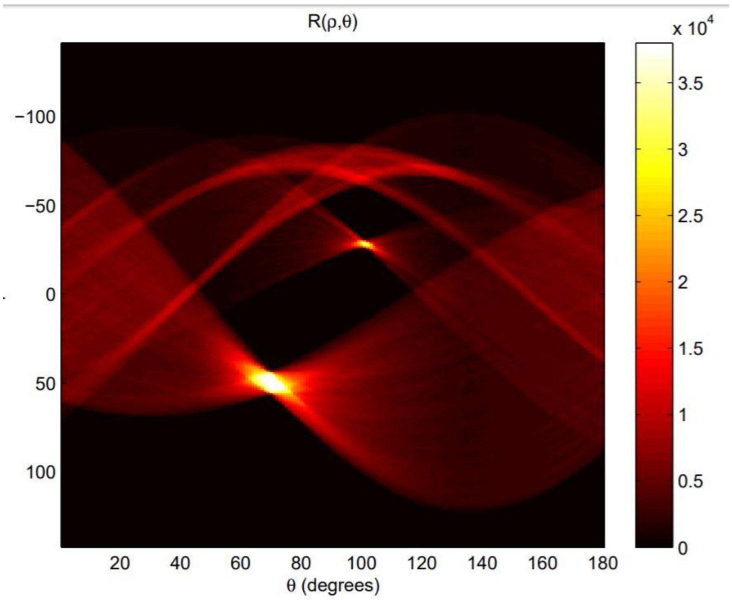

Fig5.6.3. *Result obtained with the implementation of radon transform on fig 5.6.2. The fat line is the largest, bright spot and the thin line is the small, bright spot. The curves not meeting to form a bright spot is the wavy line.*

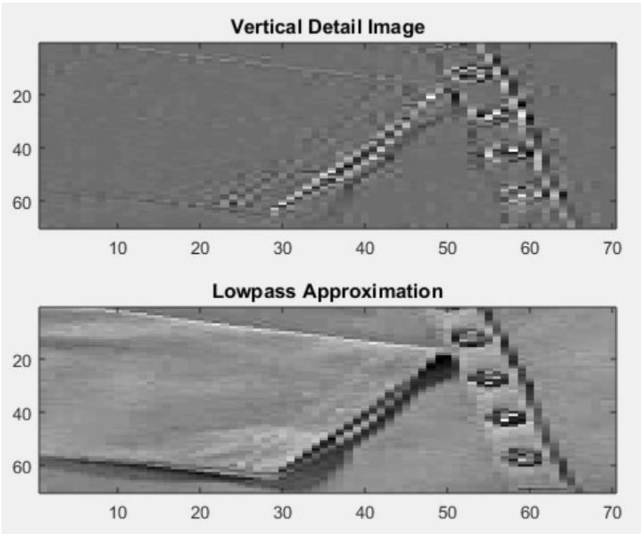

Fig5.7. *Global and Local Features*

Siftmatch function is used to get the vertical detail image and lowpass approximation parameters and this function reads two images, finds their SIFT features, and displays lines connecting the matched keypoints. A match is accepted only if its distance is less than distRatio times the distance to the second closest match.

Features are the information extracted from images in terms of numerical values that are difficult to understand and correlate by human. Suppose we consider the image as data the information extracted from the data is known as features. Generally, features extracted from an image are of much more lower dimension than the original image. The reduction in dimensionality reduces the overheads of processing the bunch of images.

Basically there are two types of features are extracted from the images based on the application. They are local and global features. Features are sometimes referred to as descriptors. Global descriptors are generally used in image retrieval, object detection and classification, while the local descriptors are used for object recognition/identification. There is a large difference between detection and identification. Detection is finding the existence of something/object (Finding whether an object is exist in image/video) whereas Recognition is finding the identity (Recognizing a person/object) of an object.

Global features describe the image as a whole to the generalize the entire object whereas the local features describe the image patches (key points in the image) of an object. Global features include contour representations, shape descriptors, and texture features and local features represents the texture in an image patch. Shape Matrices, Invariant Moments (Hu, Zerinke), Histogram Oriented Gradients (HOG) and Co-HOG are some examples of global descriptors. SIFT, SURF, LBP, BRISK, MSER and FREAK are some examples of local descriptors.

Generally, for low level applications such as object detection and classification, global features are used and for higher level applications such as object recognition, local features are used. Combination of global and local features improves the accuracy of the recognition with the side-effect of computational overheads.

Fig5.8. *Pattern of Cloth*

The above figure compares the test image with the dataset by considering the SIFT, STA features.

Now, let us find the Color of the cloth

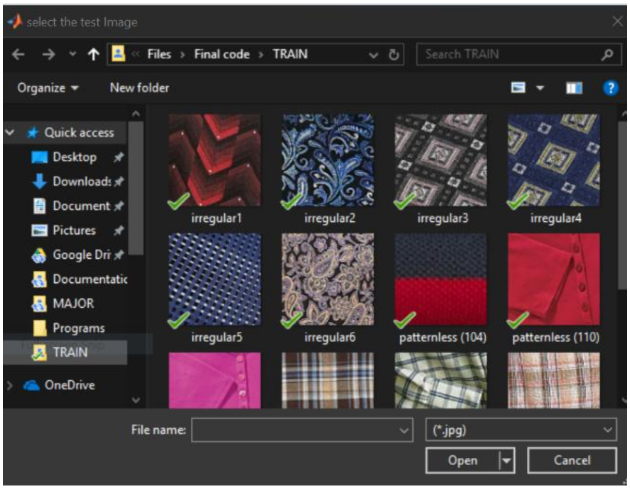

Fig5.9. *Selecting the image for which the color is to be identified*

Fig 5.10. *Selecting the image for which the color is to be identified*

The above image has been selected for identifying the color present in the given cloth. The above is the figure showing given image that is considered for identifying the color present in the cloth.

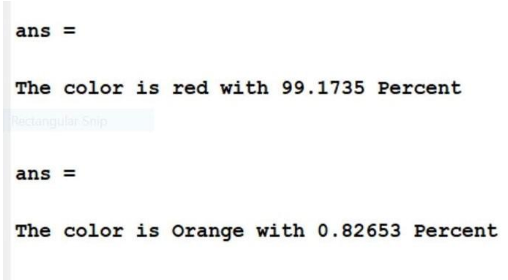

Fig5.11. *Obtained Color percentages*

From the above figure, it is very clear that the amount of percentages present in the given cloth has been identified successfully. Finally, the audio output of both pattern and color percentages can be observed through the speech synthesizer.

6. Comparison with Existing and Proposed Method

PARAMETER	WITHOUT FUZZY	WITH FUZZY
Standard deviation	10.94	19.06
Energy	01.01	05.10
Uniformity	00.31	00.48
Entropy	04.85	04.98

This proves the improvement in statistical properties by the addition of fuzzy logic helped us gaining the quality and ensures improvement in accuracy for decision making at the svm classifier.

Citations

[1] JarbasJoaci de Mesquita Sa, Andre Ricardo Backes,Paulo Cesar Cortez (2013) “Texture analysis and classification using shortest paths in graphs”, Elsevier, pattern recognition, 1314–1319.

[2] Xiaodong Yang, YingLi Tian (2013) “Texture representations using subspace embeddings”, Elsevier, pattern recognition, 1130-1137.

[3] Christopher sentelle, Georgios anagnostopoulos, Michael georgiopoulos (2011) “Efficient revised simplex method for SVM training”, IEEE transactions on neural networks, 22(10), 1650-1661.

[4] Yuntao Qian, Minchao Ye, Jun Zhou (2012) “Hyper-spectral Image Classification Based on Structured Sparse Logistic Regression and ThreeDimensional Wavelet Texture Features”, IEEE transactions on geo-science and remote sensing, 51(4), 2276-2291.

[5] Sandro cumani, Pietro Laface (2012) “Analysis of large-scale SVM training algorithms for language and speaker recognition”, IEEE transactions on audio, speech, and language processing, 20(5), 1585- 1596.

[6] ShiftXingming Zheng, Ningzhong Liu, (2012), “Colour Recognition of Clothes Based on KMeans and Mean”, IEEE transaction on pattern recognition, 49-53.

[7] Alberto Jard´onHuete, Juan G. Victores, Santiago Mart´ınez, Antonio Gim´enez, and Carlos Balaguer, (2012), “Personal Autonomy Rehabilitation in Home Environments by a Portable Assistive Robot”, IEEE transactions on systems, man, and cybernetics, 42(4), 561-569.

[8] Faiz M. Hasanuzzaman, Xiaodong Yang, and YingLi Tian (2012) “Robust and Effective ComponentBased Banknote Recognition for the Blind”, IEEE transaction on system, man and cybernetics, 1024- 1033.

[9] Chucai Yi, YingLi Tian, Aries Arditi(2011) “Portable Camera-based Assistive Text and Product Label Reading from Hand-held Objects for Blind Persons”, IEEE Transactions on Mechatronics, 1-10.

[10] Yuan and YingLi Tian, (2010), “Rotation and illumination invariant Texture Analysis”, IEEE transaction on Image and Signal Processing, 2643- 2653

Citation: *Dr. S. Satheesh, (2019). Audio Assistance for Blind People in Recognizing Cloth Patterns and Colors using Modified SVM along with Fuzzy Logic. International Journal of Innovative Research in Electronics and Communications (IJIREC), 6(1), pp.27-35. DOI: http://dx.doi.org/10.20431/2349-4050.0601005*