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Recognizing clothes patterns and colours for blind people using neural network

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***Abstract*—** In this project, the system of automatically recognizing clothes pattern and colors are proposed. The image is captured by the camera and get processed to identify the pattern of the clothes that is chosen. This can be classified using the support vector machine algorithm. For this the features of the image have to be obtained. These features can be extracted using three descriptors. The Radon Signature descriptor is to extract statistical properties, the wavelet sub-bands are used to extract global features of clothing patterns. This gets combined with local features that are obtained from scale invariance feature transform to recognize complex clothing patterns**.** After identifying the features the support vector machine classify the images in order to their categories. The system uses the CCNY Clothing Pattern dataset. This system can be an effective method for all the visually impaired people that they can identify the pattern and respective colors without any help.

Keywords- support vector machine algorithm, Radon signature descriptor, scale invariance feature transform, CCNY

I. 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 [10] 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 [6] 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 [1] and [2] 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).

II TRAINING AND TESTING IMAGES

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

A. Irregular
B .Pattern less
C. Plaid
D. Stripe

Fig.1. dataset of training image

The entire clothing pattern can be inside this vast datasets 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. This 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.

III BLOCK DIAGRAM

The system of automatic pattern and color recognition system capable of real time recognizing the patterns and colors. Choosing the appropriate pattern and color of the clothes is important to assist the blind people to make decisions. The recognizing process depends basically on two factors they are preprocessing and feature extraction they are required to implement a system to recognize the different patterns. For that the training algorithm called support vector machine are used. The figure 2 gives the flow diagram of the system.

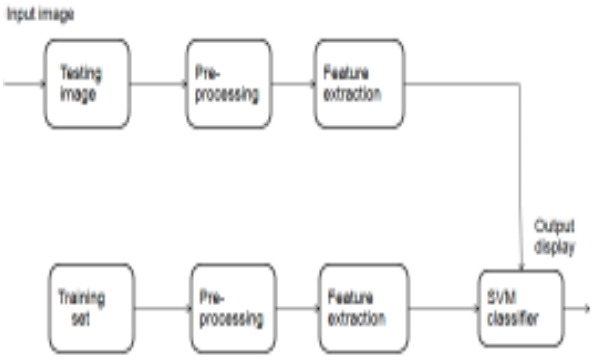

Fig.2.Block diagram

This system can handle clothes with complex patterns and recognize clothing patterns of four categories they are plaid, striped, patternless, 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.

IV METHODOLOGY

Extracting the feature is the important method of classifying the patterns. Each image has its own characteristics. To analysis this characteristics 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.

V SYSTEM DESCRIPTION

The classification of pattern and the color is the separate module to be analysis. Multiple complementary features can gain more advantage in different aspects. So, a combining many features into multiple complementary features is able to obtain better results than any individual feature channel. It is accepted to directly link together the feature vectors of multiple channels. While this method is simple and direct. The final feature combined in this way has a low dimension but more discerning power. It represents the accuracy of prediction output based on a particular feature. The Support Vector Machines (SVM) is used as the classifier

in clothes pattern recognition system. SVM finds a maximum margin hyper-plane in the feature space.

A. 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.

B. CLASSIFYING THE CLASSES

Support Vector Machines (SVM) has gained conspicuity in the field of machine learning and pattern classification. 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.

C. STEPS INVOLVES IN 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 the optimum boundary. Let us assume 3 input support vector set.

$$S1=\begin{bmatrix} X1i \\ X2j \end{bmatrix}, S2=\begin{bmatrix} X1i \\ X2j \end{bmatrix} \quad S3=\begin{bmatrix} X1i \\ X2j \end{bmatrix}$$

Step 2: Compute this support vector set with the bias 1:

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

Step 3: Finding the 3 parameters α1, α2, α3

$$\alpha 1.\ \overline{S1}.\overline{S1} + \alpha 2.\ \overline{S2}.\overline{S1} + \alpha 3.\overline{S3}.\ \overline{S1} = -1$$

$$\alpha 1.\overline{S1}.\overline{S2} + \alpha 2.\overline{S2}.\ \overline{S2} + \alpha 3.\overline{S3}.\ \overline{S2} = -1$$

$$\alpha 1.\ \overline{S1}.\overline{S3} + \alpha 2.\ \overline{S2}.\overline{S3} + \alpha 3.\ \overline{S3}.\overline{S3} = 1$$

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

$$w = \sum \alpha_i S_i$$

Step 5: The separating hyperplane 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.

VI RESULT AND DISCUSSIONS

The results were obtained by comparing the training image and the test image. The training image can be obtained in the database. Each image should undergo all the extraction process. The input image is given by 140X140 pixel size. This image size can be modified according to the need.

The system uses the dataset of CCNY, which dataset includes 627 images of four different typical clothing pattern designs are plaid, striped, patternless, and irregular. All the images are trained and given to the SVM algorithm. In this the patterns can be differentiated. The processes involved are

(1) Pre-processing
(2) Feature extraction
(3) SVM classifier

Image				
Pattern	plaid	striped	patternless	irregular
Color	yellow(49%) orange(36%) black(9%)	blue(75%) white(19%)	red(98%)	black(41%) red(26%) blue(6%) green(5%)

Fig.3 Output for all the different patterns and color

D. PRE-PROCESSING

Pre –processing can be done by radon transformation. This is mainly used to find the directionality of the pixel value. There are two type of directions they are anisotropic and isotropic. Anisotropic is directional dependent and isotropic is identical properties in all the direction.

For irregular and pattern less it has smooth principle orientations. But for the plaid patterns it has two principle orientations and for strips pattern it has one principle orientations. An example of irregular pattern

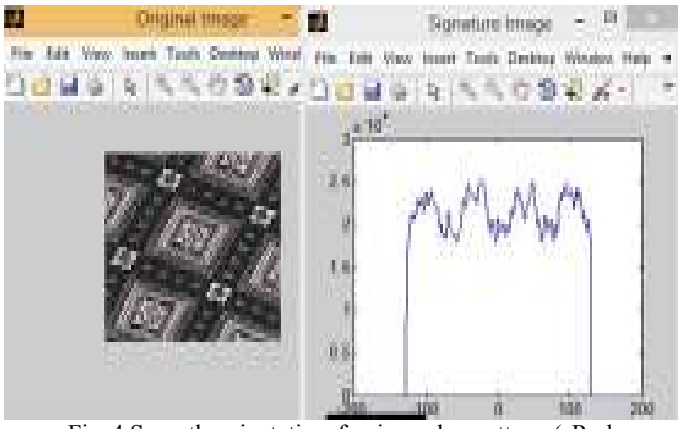

Fig 4.Smooth orientation for irregular pattern (Radon transforms)

E. FINDING GLOBAL AND LOCAL FEATURES

The global features can be found out using the filtering algorithm called wavelet decomposition. It can be decomposed with the energy level of high-high, high -low, low-high and low-low. The RGB to gray level conversion occurs. The local features can be obtained in the points. The three level of decomposition is uses. The image of 140x140 resized into 256x256 matrixes. So after resizing the image starts to decompose into 128x128 and goes on. This makes the decomposition of wavelets.

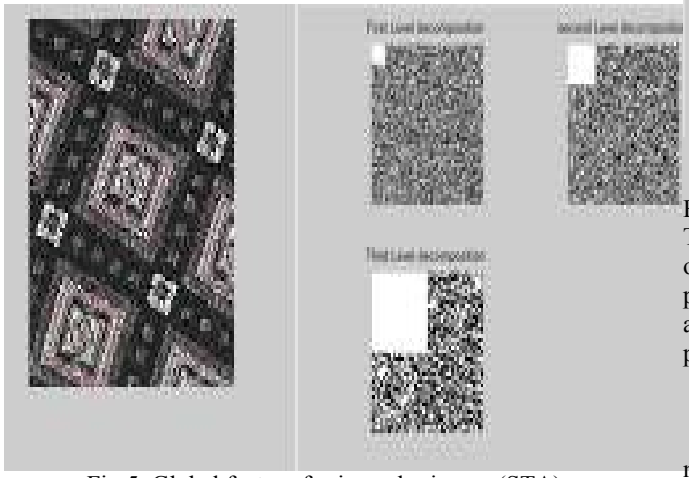

Fig 5. Global feature for irregular image (STA)

The local features are obtained using the SIFT and RQA. In the image the local points and the small patches are taken. SIFT key points of objects are first extracted from a set of reference images and stored in a database.

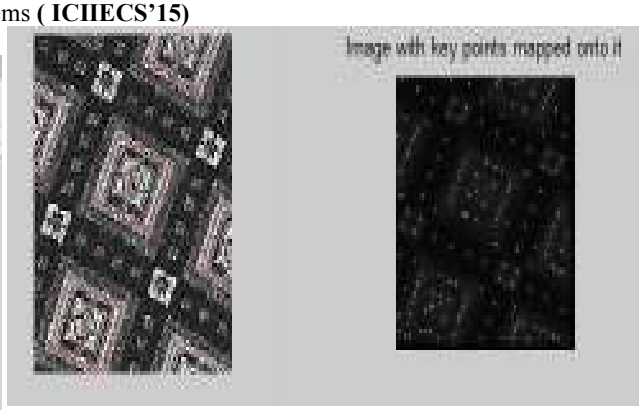

Figure 6.4. local feature for irregular image(SIFT)

Recurrence Quantification Analysis (RQA) is a set of techniques developed to quantify patterns that emerge in recurrence plots. The original technique starts from one-dimensional time series which are to result from a process involving several variables.

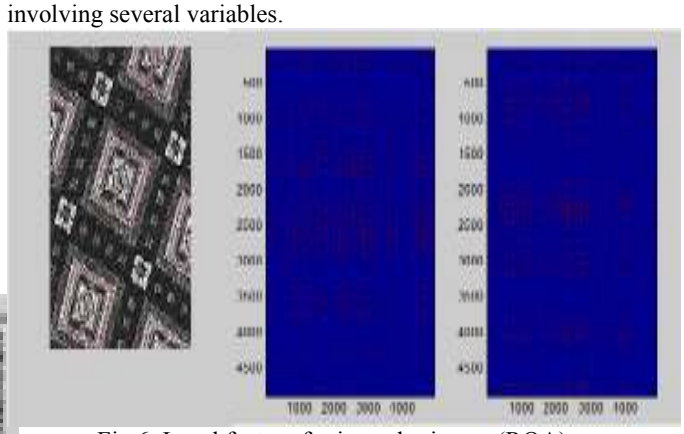

Fig 6. Local feature for irregular image (RQA)

F. SVM CLASSIFIER

These features can be obtained together to get the classified output. When the hyper-plane is drawn with the measured pixel value then the class can be easily identified. Combining all this descriptors the algorithm starts to classify the clothes pattern and color and gives the figure 6.1 as output.

VII CONCLUSION AND FUTURE SCOPE

The system method provides a simple and reliable method for recognizing the pattern and the color. The images are taken from CCNY database in order to implement the proposed system. All data were pre-processed and the feature of the images can be distinguished. This development of automatic recognizing clothing pattern system capable of real time identification of the pattern and the color in the cloth. In this project the image captured by the camera and get processed to identify the pattern of the clothes that is chosen. This system is more efficient and accurate to recognize the patterns because it can classify with large number of dataset number of operations by reducing number of samples to be

processed which results in reduced processing time required to be processed.

The future work includes implementation of automatic recognizing system in processor in order to implement the recognizing in embedded system. This system is validated in a raspberry pi processor.

References

1) Jarbas Joaci 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 Three-Dimensional 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 K-Means and Mean**", IEEE transaction on pattern recognition, 49-53.
7) Alberto Jard´on Huete, 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 Component-Based 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