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Automatic Cloth Pattern and Color Recognition for Visually Impaired People Using SVM Algorithm

Sakil Ansari (B.Tech)[1]
Dr.V. Kamakshi Prasad (Professor and Head of Department)[2]
Department of CSE,College Of Engineering, JNTUH, Kukatpally, Hyderabad, TS-STATE, INDIA
[1]sakilansari4@gmail.com[2]kamakshiprasad@jntuh.ac.in

Abstract

This paper highlights the importance of human clothing, especially for visually impaired people. Choosing clothes with different colors is a challenging task for color blind people. Automatic clothing pattern recognition can bring the much needed independence in their lives. But, this is also a challenging research problem due to rotation, scaling, illumination, and especially large intra-class pattern variations. In this paper, we propose a camera based system that recognizes clothing patterns in four main categories (plaid, striped, pattern-less, and irregular) and identifies 16 clothing colors using the support vector machine algorithm. The features and texture of an image can be extracted by the three descriptors. The Radon Signature descriptor is to extract statistical properties, the wavelet subbands 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. To evaluate the effectiveness of the proposed approach, we used the CCNY Clothing Pattern dataset. The proposed method provides an effective method for visually impaired people that they can identify the pattern and respective colors easily without any help.

Keywords: SVM algorithm, Radon signature descriptor, SIFT, CCNY.

1. INTRODUCTION

According to the World Health Organization (WHO), low vision is defined as visual acuity of 20/200 orless in the better eye with best correction possible (WHO. 2004). At the same time, approximately 10% of the male population in Europe suffers from some form of vision deficiency (blindness), the most usual case being an inability to distinguish between certain s (e.g. red/green, blue/yellow). In extreme situations, only shades of grey might be distinguishable. Color plays an important role in the everydaylife of a normally sighted person.

Normally sighted people use as the basis of a number of everyday tasks, for example matching socks, choosing between different clothes. Choosing clothes with suitable colors and patterns is a challenging task for blind or visually impaired people. They manage this task with the help from family members, using plastic Braille labels or different types of stitching pattern tags on the clothes, or by wearing clothes with a uniform color or without any patterns. There are many challenges in developing a system that helps the visually-impaired people with the task of determining clothing colors and patterns.

Cloth Pattern Identification (CPI) is used to retrieve the image based on their features such as color, texture and shape [3]. The primary use of the cloth pattern identification is to retrieve the data from the database by using color and shape features. The main aim of the CPI is to increase the efficiency during image retrieval and image indexing. Therefore, human intervention in the indexing process is reduced. Here, we develop a camera-based system specifically for visually impaired people and also common people to help them recognize clothing patterns and colors.

To overcome all these problem computer vision based system is developed to recognize clothing

patterns in four categories of pattern and identifies colors. In 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.LITERATURE REVIEW

Assistive systems are being developed for different kinds of visually impaired people to improve the life quality and safety of such people including indoor navigation and way finding,display reading, banknote recognition, rehabilitation, and many more. Xiaodong Yang [1] developed a system for blind people to select clothes based on cloth pattern and colors in a cloth shop independently. This is a camera based system that can handle clothes with complex pattern and recognize clothes into four categories(plaid, stripped, patternless, and irregular)and identify 11 colors: red, orange,yellow, green, cyan, blue, purple, pink, black, grey and white.

FAIZ .M. Hasanuzzaman proposed a system to automatically recognize banknote of any currency to assist visually impaired people in [2]. This is also a camera based computer vision technology. This system has features like high accuracy, robustness, high efficiency, ease of use. This system is robust to conditions like occlusion, rotation, scaling,cluttered background,illumination change, wrinkled bills, and also eliminating false recognition and can guide theusertoproperly and correctly focus at the bill to be recognized using speed up robust features(SURF).

Nidhi Singhai et al A Survey On: Cloth pattern Identification system provides the analysis and comparative study of different techniques of Content based Image retrieval. Research papers also implements the features like Color histogram fuzzy technique, texture and edge density for accurate and efficient cloth pattern Identification System [3].

Szabolcs In Content-Based Image Retrieval Systems analyses Color Histogram Features Based Image Classification. Researchers introduced a novel approach from the low level image histogram features [5].

Lin, Chen and Chan introduced a novel approach for image retrieval. System implements three image features and a feature selection technique are used in that approach. The first based on color and the second feature is based on texture. This is called co-occurrence matrix (CCM) and (DBPSP) Difference Between pixels of scan pattern. Third image features for color histogram K-means (CHKM) [4].

Ritendra Datta et al related to new trends in image retrieval, a comparative study of results around 300 key empirical and theoretical contributions of the modern decade related to image retrieval and regular annotations. Researchers also spoke about noteworthy challenges included in the adaption of existing image retrieval techniques to build systems that can be useful in the real world.

QBIC system is compatible to queries which are based on example images. The visual feature used in the system includes color, texture and shape. In this system, the color are expressed in K-bin color histogram and the texture was described by an improved tamura texture the visual features [6].

3. RELATED WORK

3.1 Feature extraction

3.1.1 Global Feature extraction

The extraction task transforms rich content of images into various content features. Feature extraction is the process of generating features to be used in the selection and classification tasks. Feature selection reduces the number of features provided to the classification task. Those features which are likely to assist in discrimination are selected and used in the

classification task. Our system proposes a method combining advantages of both global and local features. The objective is to provide a reasonably short image hash with good performance, i.e., being perceptually robust while capable of detecting and locating content forgery. Our system use Zernike moments of the luminance/chrominance components to reflect the image's global characteristics, and extract local texture features from salient regions in the image to represent contents in the corresponding areas.

3.1.2 Texture Extraction

To achieve fine-grain segmentation at the pixel level, we must be able to define features on a per pixel basis. Extracting color information is straightforward. Texture feature extraction is very computationally intensive for individual pixels. In our approach, target image is divided into different high level blocks at each pixel. These blocks are called as backbone blocks. Fast Texture Estimation Algorithm is applied to each block and analyze the solid color estimation and uniform color estimation. Now, assign texture alignment to the each block. Since, the target image is analyzed at pixel by pixel it has more accuracy. Finally, handle the out of blocks pixel.

3.2 SVM classifier model

Our system employs Support Vector Machines (SVM's) as the classifier. The Support Vector Machines is used as the classifier in our clothes pattern recognition system. It is defined as the magnitude of confidence margin of the instance. SVM is fundamentally a two-class classifier. The one-versus-one approach is used to recognize and categories by training different 2-class SVMs on all possible pairs of classes. An instance is recognized as the category with the highest number of votes. There are four categories in the clothes pattern dataset. So, no matter what dimension of original features their confidence margin representations are all with the same dimension.

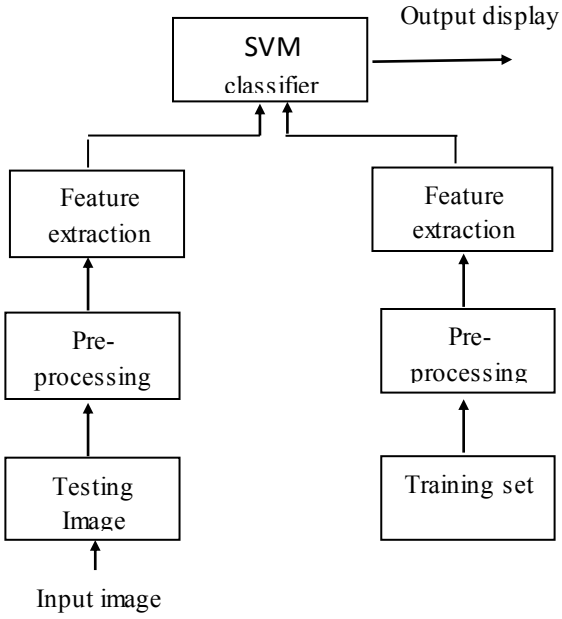
3.3 Pattern Recognition

Here, set of images are trained into the database along with the respective sound file and text document. From the pattern generated, global and local features are extracted. The extracted global and local features are combined to recognize Patterns by using a support vector machines (SVM). SVM model used to compute the vector values from the pattern. Those vector values are compared with the values which already trained in the database. The matched vector values hold the respective audio and text file. Corresponding audio format and text document will be identified.

4. PROPOSED METHOD

4.1. Processing

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.



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.

4.2. 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)

i. 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.

ii. 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.

iii. 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.

4.3. 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 classifierin 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

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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 $x_{j,}$ denotes the training patterns, y_j varies {+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.

$$S_1 = \begin{bmatrix} X_{1i} \\ X_{2i} \end{bmatrix}, S_2 = \begin{bmatrix} X_{1i} \\ X_{2i} \end{bmatrix}, S_3 = \begin{bmatrix} X_{1i} \\ X_{2i} \end{bmatrix}$$

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

$$\bar{S_1} = \begin{bmatrix} X_{1i} \\ X_{2j} \\ 1 \end{bmatrix}, \bar{S_2} = \begin{bmatrix} X_{1i} \\ X_{2j} \\ 1 \end{bmatrix}, \bar{S_3} = \begin{bmatrix} X_{1i} \\ X_{2j} \\ 1 \end{bmatrix}$$

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

$$\alpha_1 . \bar{S_1} . \bar{S_1} + \alpha_2 . \bar{S_2} . \bar{S_1} + \alpha_3 . \bar{S_3} . \bar{S_1} = -1$$

$$\alpha_1 . \bar{S_1} . \bar{S_2} + \alpha_2 . \bar{S_2} . \bar{S_2} + \alpha_3 . \bar{S_3} . \bar{S_2} = -1$$

$$\alpha_1 . \bar{S_1} . \bar{S_3} + \alpha_2 . \bar{S_2} . \bar{S_3} + \alpha_3 . \bar{S_3} . \bar{S_3} = -1$$

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

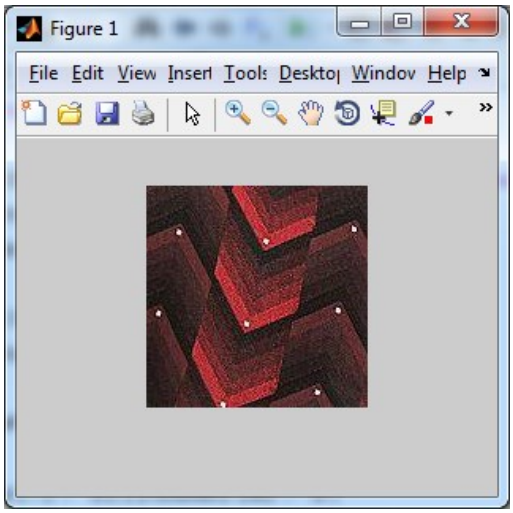
$$W = \sum \alpha_i S_i$$

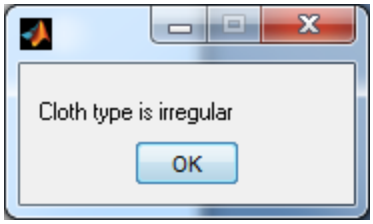
Step 5: The separating hyperplane equation formula is

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.

5. SIMULATION RESULTS

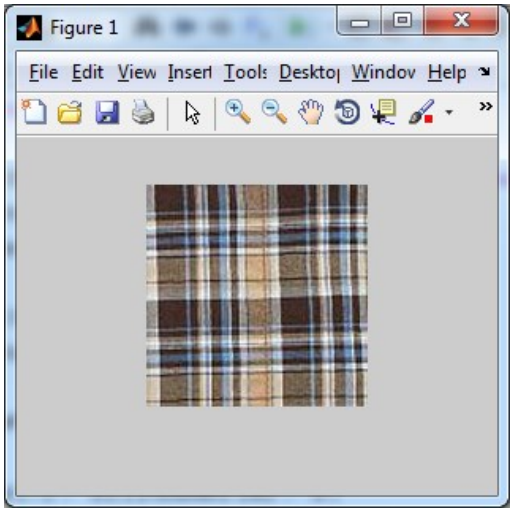


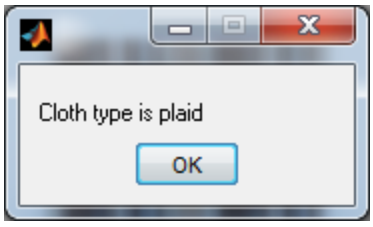


The colors is Orange with 40.301 Percent

The colors is red with 34.7755 Percent

The colors is Yellow with 11.0663 Percent

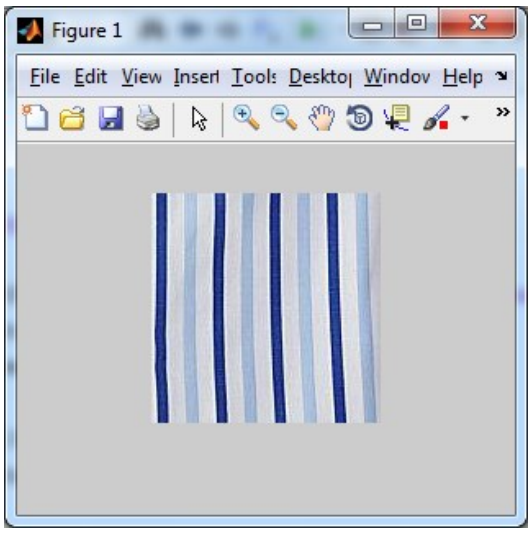


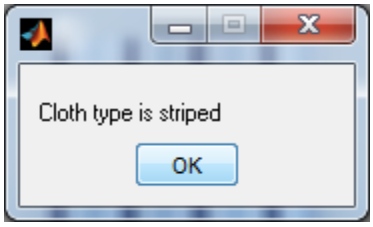


The colors is Yellow with 44.2041 Percent

The colors is blue with 23.6582 Percent

The colors is Green with 9.648 Percent

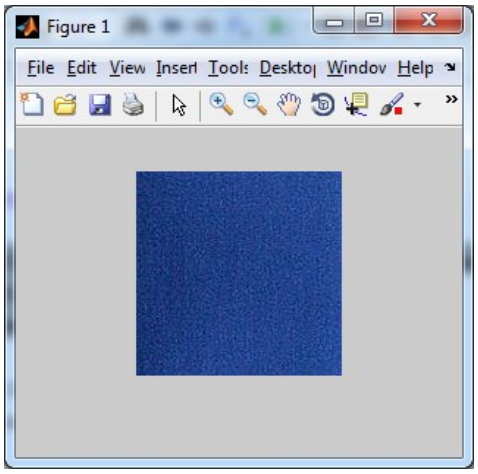




The colors is blue with 89.7908 Percent

The colors is Cyan with 3.4541 Percent

The colors is purple with 1.3265 Percent



The colors is blue with 100 Percent

6. CONCLUSION

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

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