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Classification of Clothes from Two Dimensional Optical Images

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N. D. Kulkarni¹, A. M. Mete², Sayali S. Junawane^{*3}

¹ Professor, Computer Department, VIT, Pune.

² Professor, Computer Department VIT, Pune.

³ Student, Computer Engg. Department, VIT, Pune.

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ABSTRACT

In modern society, people usually dress according to the occasion and purpose to look and feel good. Clothing is also means of communication to reflect social status, lifestyle and membership of a particular culture. In today's world, people prefer to shop online from the comfort of their couch. To effectively search for the clothes in the online world, you need to apply various filters according to your need. To make use of these filters, cloths must be classified into various classes beforehand which is a very tedious manual process. In this paper, we propose a means to automate the classification process of the clothes. The broad classification of the clothes will be based on their dominant color, pattern printed/stitched on the cloth, neck type and sleeve type. Dominant color is a compact and efficient descriptor which employs representative colors to characterize the color information of an image. A method for extracting dominant color of an image is proposed in this paper. Determining the texture pattern of an image is a task performed by many. Different features are extracted for pattern recognition using algorithms like Scale Invariant Feature Transform (SIFT), pattern matching etc. The existing method of pattern classification uses support vector machine with RBF kernel in weka for classification. A geometric method for determining the pattern on the cloth is proposed in this paper. This method provides more flexibility as the same extracted feature set can be reused for various patterns. To determine the neck or collar type and the sleeve type Viola-Jones object detection framework is used. In this paper, we have discussed the performance of the trained the viola-jones cascade classifier to identify the neck and collar type as well as sleeve type.

INTRODUCTION

Clothing is very important in our daily life as it represents the lifestyle, culture and social status. Many contexts can be inferred from the type of clothes. However, recognizing the category of clothes is a challenging problem in computer vision. The main aim of this paper is to facilitate the ease of shopping to customer and to automate the administrator's work.

Various researcher has developed methods to classify various parameters of the clothes into different category. Wisarut Surakarin [1] implemented classification of clothing with weighted surf and local binary pattern. Our focus here is to classify the clothes on the above 4 parameters which are most useful while shopping clothes online.

The disadvantage with the existing system is that performance of SURF based algorithm is not good when illumination/light changes. We use the histogram method to find the Dominant color of an image. Geometric Method is used to determine the pattern of the cloth. The proposed method provides more flexibility. Object Detection is used to identify the sleeves and collar from an image. Object detection is a method which is responsible for identifying the existence of an object of a certain class. An existence of this object can be considered as a method of image processing to identify the object from the digital image. Viola-jones HAAR like features can be used to detect the sleeves and collar from an image.

Cascade Classifier:

The cascade classifier consists of list stages, and each stage consists of list of weak learners. The system detects objects by moving a window over the image. Each stage of the classifier labels the specific region defined by the current location of the window as either positive or negative if the classifier labels the specific region as, positive meaning that an object was found or negative means that the specified object was not found in the image.

If the labeling gives a negative result, then the classification of this region is complete and the window moved to the next location. If the labeling gives a positive result then the region moves to the next stage of classification. The classifier yields a final verdict of positive, when all the stages, including the last one, yield a result, saying that the object is found in the image. If the actual object is classified as a non-object, then the classification of that branch stops, with no way to correct the mistake made, therefore each stage of the cascade must have a low false positive rate. However, if the n^{th} stage classifies the non-object as actually

being the object, then this mistake can be fixed in ‘ $n+1$ -th and subsequent stages of the classifier, thus each can have a high false positive rate [8].

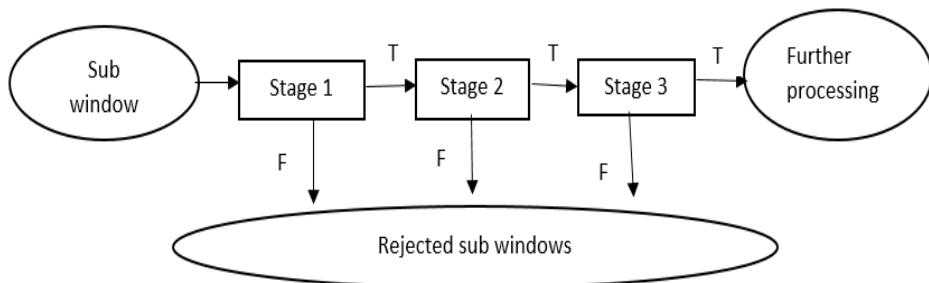


Fig.1 Stages of the cascade classifier

Training Cascade:

In the training of the cascade, the first necessary bit was to gather the images, then create samples based on them and finally start the training process. The OpenCV “train cascades” utility is an improvement over its predecessor in several aspects, one of them being that train cascades allows the training process to be multithreaded, which in turns reduces the time it takes to finish the training of the classifier. This multithreaded approach is only applied during the precalculation step, however, so the overall time to train is still quite significant, resulting in hours, days and weeks of training time.

Since the training process needs a lot of positive and negative input images, which may not always be present, then a way to circumvent this is to use a tool for the creation of such positive images. OpenCV has a built in mode which allows creating more positive images with distorting the original positive image and applying a background image. However, it does not allow to do this for multiple images.

Another important aspect to consider is the number of positives and negatives. When executing the command to start training, it is required to enter the number of positive and negative images that will be used. Special care should be taken with these variables, since the number of positive images here denotes the number of positive images to be used in each step of the classifier training, which means that if one were to specify to use all images on every step, then at one point the training process would end in an error. This is due to the

way the training process is set up. The process needs to use many different images on every stage of the classification and if one were to give all to the first stage, then there would be no images left over for the second stage, thus resulting in an error message.

The training can result in many types of unwanted behavior. Most common of these is either overtraining or undertraining of the classifier. An undertrained classifier will most likely output too many false positive since the training process has not had time to properly determine which is actually positive and which is not. An output may look similar to image shown below.

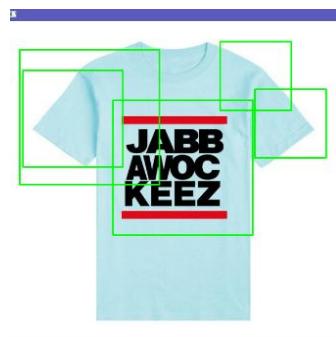


Fig.2 Result of undertrained classifier.

The opposite effect is observed if too many stages are trained, which means that the classification process may determine that even positive in picture are negative ones, resulting in empty result set. The best result obtained in this work is depicted on image below

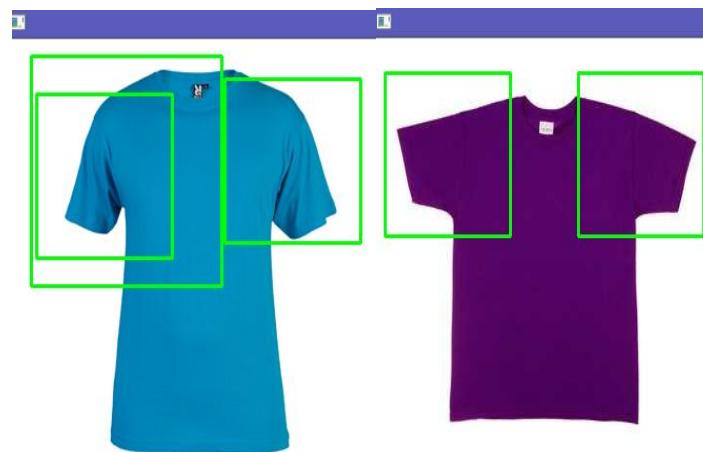


Fig.3 Best solution obtained

Related Work:

Many researchers have proposed techniques for cloth search and retrieval A. Nodari et al. [3] and Cushen and Nixon [4] proposed content-based image retrieval to query image from online shopping in mobile application. There is less work on clothing recognition and classification. S. Miura et al. [5] proposed dividing clothing image into five areas which include shoes, bottom, top inner, top outer and search clothing image by same area detection. X. Yuan et al. [6] present integration of SIFT-LBP based on Bag of Features to achieve the superior performance of accuracy score. S. Banerji et al. [7] In this work, we do not focus on clothing image retrieval. We are improving classification performance of clothing by being more selective in the subarea of the clothes, determining the Dominant color, recognizing the patterns, Determining the Sleeves and collar type.

Proposed Methodology:

The paper is about to classify the clothes based on the Dominant color, to recognize the pattern of the cloth., to determine the sleeves type and collar type, we are also trying to automate the administrator's process. Block diagram of proposed method is shown.

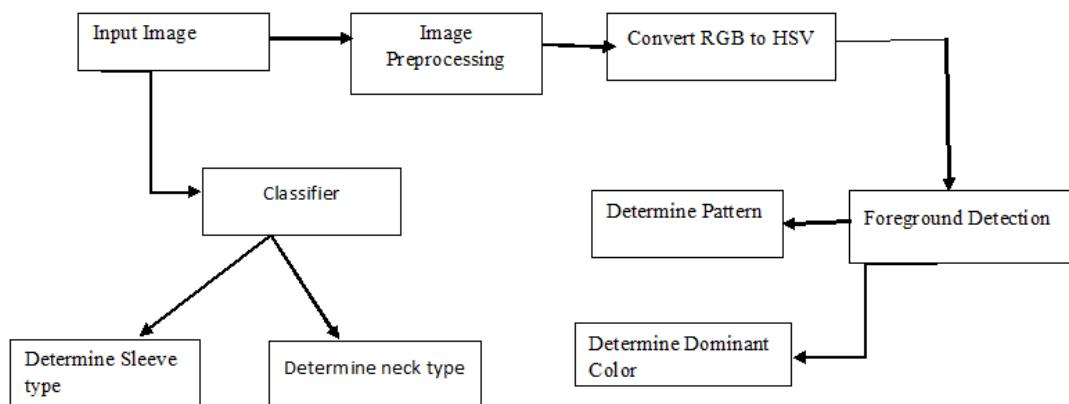


Fig.4 Framework of Proposed System

Dominant Color algorithm:

Classifying the clothes based on the Dominant color can be done in following way: Get the image from user then convert the RGB image into HSV format we need to convert the RGB image to HSV because R, G, B components of an objects color in a digital image are all correlated with the amount of light hitting the object. Image description in terms of those

components makes object discrimination difficult. Description in terms of hue/lightness/saturation are often more relevant. Then you need to detect the foreground of an image. You need to use this foreground as a mask while drawing the histogram. You need to check the bin content to determine the perfect Dominant color.

Table 1-Color check

Colour	Saturation	Value
<i>Red</i>	High	High
<i>Pink</i>	Low	High
<i>Green</i>	High	High
<i>Blue</i>	High	High
<i>Dark blue</i>	High	Low

Algorithm:

Initialize the

Low hue= {0, 20... 160}



Upper hue= {19, 39...179}

Step 1: Read the image.

Step 2: Convert the RGB image to HSV.

Step 3: Apply the inRange function to HSV image.

inRange(hsv, cv::Scalar(hmin,smin,vmin),cv::Scalar(hmax,smax,vmax),outimg)

output of this function is a 8bit grayscale image which is black and white in color (i.e. binary image).

Step 4: Apply threshold to the output of inRange function and then use this as a mask while drawing the histogram.

Step 5: Compute and Draw the Histogram for Hue, Saturation, Value.

For Hue,

For Saturation

For value

Hist size= {9}

Hist size= {16}

Hist size= {10}

Ranges= {0,179}

Ranges= {0,255}

Ranges= {0,255}

Bool uniform=true;

Bool accumulate =False;

Mat h_hist;

calcHist(&hsv_planes[0],1,0,mask,h_hist,1,&histSize,&ranges,uniform,accumulate)

Step 6: Iterate over bins and find the bin having highest bin count and then find the

lower and upper hue of that max bin.

Step 7: Again apply the inRange function to the highest hue identified from above.

Step 8: Perform BITWISE_AND operation.

Bitwise and (mask, output_of inrange, final output);

Step 9: Repeat step 5 to 8 for saturation and value.

Step 10: Finally you get Dominant color for the given image.

Pattern recognition algorithm:

In proposed method, we are recognizing the pattern using the geometric method. The patterns we are detecting are Lines, Checks, Plain or any Irregular patterns. We apply the canny edge detection algorithm on the image then we apply the HoughLinesP on the detected edges. The HoughLinesP Finds line segments in a binary image using the probabilistic Hough transform. Then we apply the simple geometric method to detect the lines and then determine the pattern.

Algorithm:

Step 1: Read the image

Step 2: Apply the canny edge detection algorithm.

Step 3: Apply HoughLinesP.

Step 4: Iterate over the lines. Read the four points of the line(x1, y1,x2,y2)

Step 5: compute the following values.

$$\text{Tempx} = \text{abs}(x_2 - x_1)$$

$$\text{Tempy} = \text{abs}(y_2 - y_1)$$

Step 6: If tempx is equal to zero or if it is less than tempy then the line is vertical

If tempy is equal to zero or if it is less than tempx then the line is horizontal

Step 7: Iterate over the horizontal and vertical line and check weather lines are intersecting

Viola-Jones cascade algorithm for sleeves and Collar Detection:

The viola-jones cascade classifier is used to detect the Sleeves and collar from an image.

Steps followed:



Step 1: Collect the database (positive/negative images).

Step 2: Crop and mark positive images

Step 3: Create a vector of positive images.

Step 4: Perform HAAR training.

Step 5: Create a XML file.

Experimental Result:

Performance analysis of classifier:

Table 2-Performance of classifier

No. of Samples	Accuracy(Dominant Color)	Accuracy(Pattern)
30	90%	86%
60	91.66%	90%
90	92.22%	91%
120	93.33%	91.66%
150	94%	92.66%

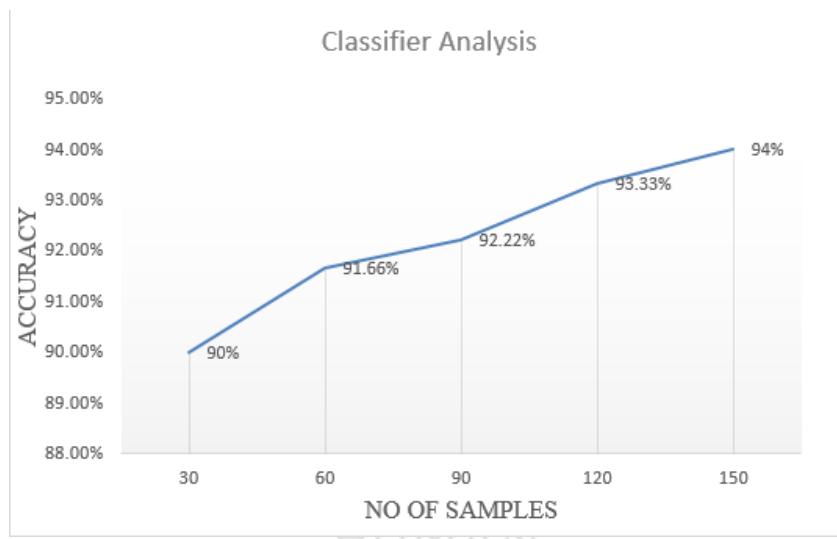


Fig.5 Classifier Analysis (Dominant Color)

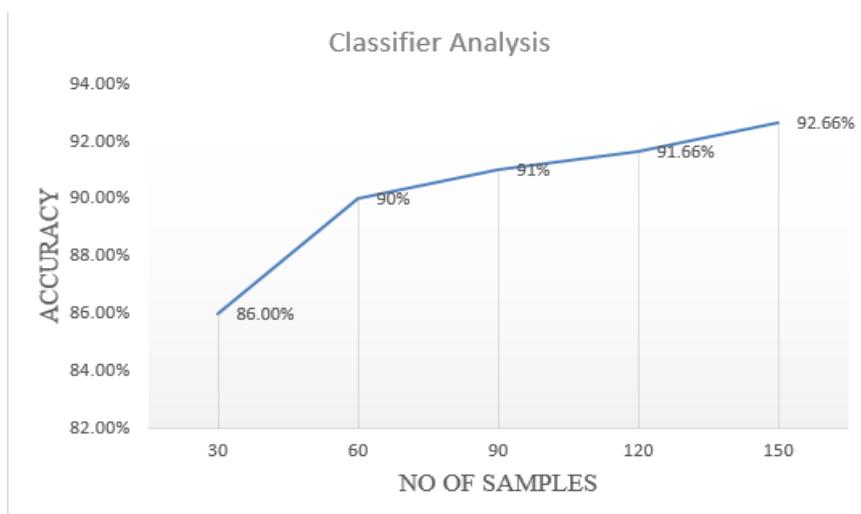


Fig.6 Classifier Analysis (Pattern)

Table 3-Evaluation of classifier

No. of trained Images	No. of tested Images	Correctly classified	Misclassified	Accuracy
100	50	46	4	92.00%

CONCLUSION

Classification of clothes from two dimensional optical images is used in online shopping to provide user the ease of shopping. We also automate the administrator's process. In this paper, we proposed a method to determine the dominant color, pattern of the image and to detect the sleeve type and collar (neck) type from an image. In proposed method, dominant color is detected on the basis of Histogram. Pattern is detected using the geometric method and the sleeves and collar can be detected using viola-jones haar cascade object detection.

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