

# Classification of T-shirts based on Pattern

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**Abstract---** In online shopping the fabric is the one of the most demanded items. People tend to choose the item based on the categorization. As evident growth in day to day online market, the manual way of categorizing the object is a difficult task. Hence our idea is to classify the T-shirt based on the visual pattern present in it. People uses their visual cues to identifying the pattern in the t-shirt into categories like Striped, solid e.t.c. we have developed a methodology to extract the visual pattern for each categories and further used for automatic labeling. This study gives idea of classification of T-shirts based on pattern on it. For classification we use tree classification. We mainly classify into two types of T-shirts mainly Solid and Striped. For feature extraction of the solid and striped were done by combination of segmentation and statistical analysis on segments.

**Keywords---** Classification, Solid, Striped, Segmentation.

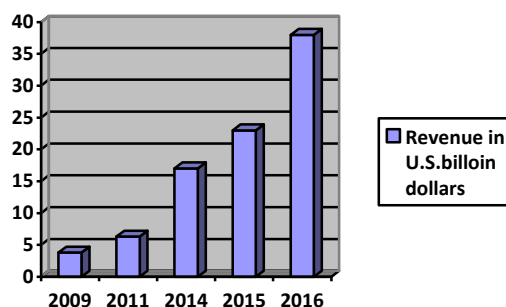


Figure 1.1: Online retail sales in India from 2009 to 2016

## I. INTRODUCTION

Now-a-days people are more interested in online shopping instead of going to stores. In the present Scenario 80% of the Americans shop items through online. As shown in figure 1.1 online sales are rapidly growing and the sales are dramatically increases in India 10% sales growth is there in 2016 than the 2009(3.8 to 38 billion dollars). So many e-companies are developing these days. Online shopping industries have been developing rapidly in the market and in information. Better way to maintain such a huge volume of information demands the automation in it. Development of new technology is one of the main aspect for effective online shopping. The one of the major demand in purchase system in trendy fashion in dresses, accessories etc., because ease of accesses and they can find many options. In this we are mainly focused on the shirts. Most of the people are interested in buying T-shirts in online shopping. Problem comes people have select the shirt based on graphics present. For easy access they have to search for the type required for them. So automation plays major role here it is difficult to separate manually by seeing them. We implemented a machine learning algorithm for two types of T-shirts especially Solid (plain) and Striped.

It will also use in clothing manufactures side, since there is lot of man power is required for separate t-shirts based on graphics on it. So this will help them to separate the shirts.

After implementing this, machine can categories the T-Shirts into Solid and Striped:

- It will help online stores for dividing into category easily.
- It will reduce the human work in production time while packing.

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## II. BACKGROUND

Mainly the type of t-shirts are visualize based on the graphic present on it. To determine the image we have to recognize the pattern or graphics present on it for that features must extracted from the image. Features extraction is to be done with image processing techniques like edge detection, Image Segmentation etc. After extracting features the classification some classifiers should be needed here we used tree classifier as shown in figure 2.1. For feature extraction we mainly use image segmentation and some of the edge deduction. Segmentation is the technique that used to separate the foreground and background. It is widely use in image processing field. There are many type of segmentation algorithms present. In that we segmented based on maximum no of pixels present, since in the shirt image most of the pixels belongs to the shirts.

Decision Tree Classifier

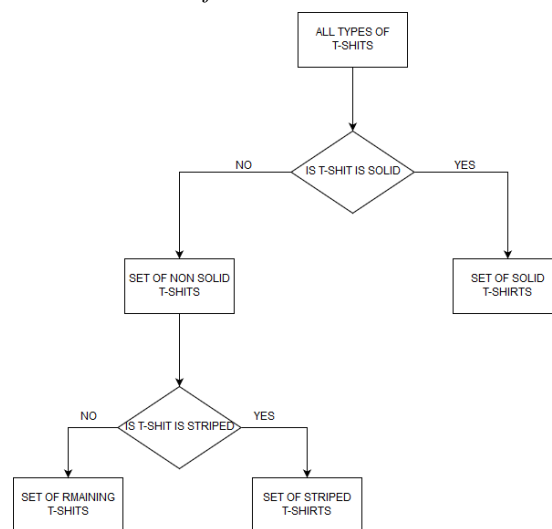


Figure 2.1: Decision Tree Classifier Used for Classification



*Image Segmentation*

Let R represent the entire spatial region occupied by an image. Image segmentation is a process that partitions R into  $n$  sub-regions,  $R_1, R_2... R_n$ . This is typically used to identify objects or other relevant information in digital images.

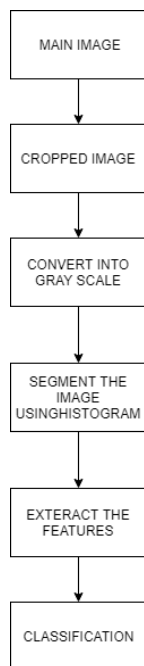
Some of the image segmentation techniques are

- a) Otsu's Method
- b) K-Means Clustering
- c) Watershed Algorithm
- d) Global Segmentation

*Edge Detection*

Edge detection is an image processing technique for finding the boundaries of objects within images. Edge detection is used for image segmentation and data extraction. It works by detecting discontinuities in brightness.

**III. Methodology**



*Extracting shirt region in the image*

We have to extract the required part of image i.e., from neck to waist where the required pattern present Hence the most the image in this been captures such a way that technique called cropping. We used this because in all the cases the required pattern is present on the same region. We can use segmentation also but some images containing faces, shapes in it also segmented which is not required.



**Figure 3.1 Main Image**

**Figure 3.2 Cropped Image**

*Converting into grayscale image*

We converted into grayscale image because color information was not use full for recognizing graphics

present on it. We use `rgb2gray` commend in matlab for converting color image into grayscale image

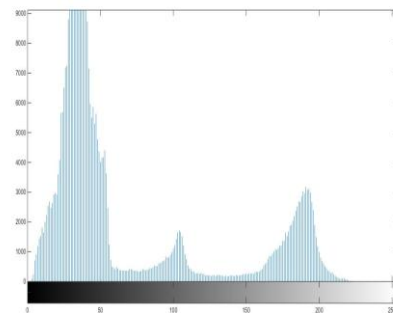


**Figure 3.3 Grayscale Image**

*Segmentation*

Applied the segmentation to the image for that we took the maximum value in histogram of the image and took the corresponding grey level of the value. Then declared the range from it. For whole image if the pixel value is present between the images then those pixels will belongs to one segment. We use this segmentation because the most of the image area was covered with t-shirt. Pixels doesn't belongs to this range it will become into another segment.

For better results we further cropped the image into smaller



**Figure 3.3: Histogram of Image**

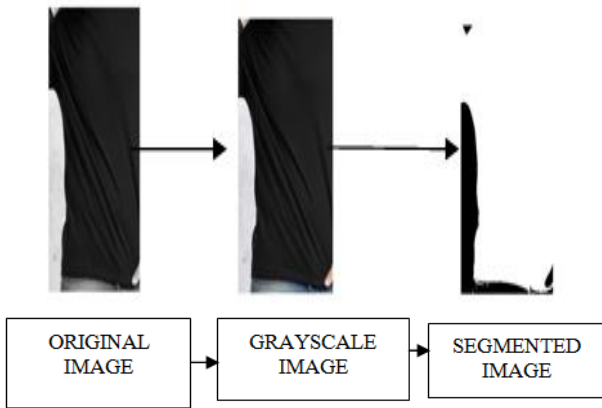


**Figure 3.4: Segmented Image**

*Extracting the feature of Solid class*

For the cropped image we counted number of black pixels and white pixels by traversing each row of the image. Then we calculate the absolute difference. Difference is the m feature for the Solid class. Such that if the difference is greater than 100000 then the image is belongs to Solid class.





Extracting the feature of striped class

For this cropped image calculate the white pixels and black pixels in each row. In a row if white pixels are more than black pixels then convert black pixels into white vice-versa. After that take average of every row which gives the column vector of ones and zeroes. Here our idea is if the pattern is striped then the zeros and ones will appear alternatively. Then we counted number of times the transition occur between ones and zeroes. This count become feature in striped class. If the count is greater than or equal to 4 then the T-shirt is belongs to Striped class.

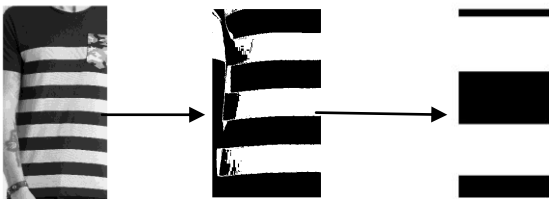


Figure 3.7: Original Image      Figure 3.8: Segmented Image

Figure 3.9: Image after taking average of each row

#### IV. RESULTS

In the data set there are 520 images in which 101 images belongs to solid type, 100 images belongs to striped type and the remaining are belongs to others type.

While classifying into solid type number of images are correctly classified are 322 images. The images that belongs to solid type that are correctly classified are 99 images and misclassified are 2 images. The Images that belongs to striped that are classified into solid are 30 images because those images have very small gap between two stripes. This is the main limitation of the algorithm.

*Correctly classified:* Images belongs to one class and classified into the same class.

*Miss classified:* Images belongs to one class but not classified into that class.

Accuracy of the classification is given by

Accuracy=(number of images correctly classified÷ total number of images) ×100

Results occur during classification of SOLID type T-shirts

TABLE I. RESULTS OF SOLID TYPE

TYPE	TOTAL NO OF IMAGES	CORRECTLY CLASSIFIED	MISS CLASSIFIED
SOLID	101	99	2
STRIPED	100	70	30
OTHERS	319	143	176

$$\text{Accuracy} = (312 \div 520) \times 100 = 60\%$$

While classifying into striped type number of images are correctly classified are 460 images. The images that belongs to striped type that are correctly classified are 90 images and misclassified are 10 images. The Images that belongs to solid that are classified into striped are 89 images

Results occur during classification of STRIPED type T-shirts

TABLE II. RESULTS OF STRIPED TYPE

TYPE	TOTAL NO OF IMAGES	CORRECTLY CLASSIFIED	MISS CLASSIFIED
STRIPED	100	90	10
SOLID	101	89	12
OTHERS	319	280	39

$$\text{Accuracy} = (459 \div 520) \times 100 = 88\%$$

#### V. CONCLUSION

This paper total theme was to classify the t-shirts based on patterns present on it, to extract the features in images mainly segmentation is used and to classify decision tree classifier was used.

In the future we will try to classify t-shirts into some more types.

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