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## Fabric fault processing using image processing techniques

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### Abstract

Fabric inspection is important for maintaining the quality of fabric. Traditional inspection process for fabric defects is human visual inspection which is insufficient and costly. The quality inspection process for textile fabrics is mainly performed manually. About 70% of fabric defects could be detected by the most highly trained inspectors. In textile industry improved performance in the inspection of fabrics leads to good product quality and contributes to increased profitability and customer satisfaction. Hence the automatic fabric defect inspection is required to reduce the cost and time waste caused by defects. Therefore, automated detection of fabric defects, which results in the production of high-quality products at a high production speed is desirable. The detection of local fabric defects is one of the most problems in computer vision. To upgrade this process the fabrics when processed in textiles the fault present on the fabrics can be identified using MATLAB with Image processing techniques. These image processing techniques are applied using MATLAB and for the input image of a defective fabric, conversion into grey scale image, noise filtering, binary image conversion, histogram technique, thresholding are applied on the image and the output is obtained.

**Keywords:** Fabric Fault Processing, MATLAB, Image Processing, Grey Scale Image Noise Filtering, Histogram, Thresholding.

### 1. Introduction

Fabric defect detection is an important part of quality control in the textile industry. Usual methods of fabric inspection on the production line is done essentially by the worker on the circular knitting machine by introducing a light source in the middle of the circular product which enables the worker to detect the produced defects, and then stop the machine immediately. Stress and fatigue happens to the worker due to inspection in case of higher and quicker productivity. However, the method has been both time consuming and has lower accuracy of detection.

Defect detection or inspection is a process identifying and locating defects. A fabric defect is a result of the manufacturing process. The textile industry is very concerned with quality. It is desirable to produce the highest quality goods in the shortest period of time possible <sup>[1]</sup>.

Quality inspection is an important aspect of industrial manufacturing. In textile industry, fabric defect detection plays an important role in the quality control. The quality of the fabric can be improved by decreasing defects in the fabrics <sup>[2]</sup>.

### 2. Fabric Defects

Fabric texture refers to the feel of the fabric. It is rough, velvety, smooth, soft, silky, lustrous, etc. The different textures of the fabric depend upon the types of weaves used. Textures are given to all types of fabrics, cotton, silk, wool, leather, and also to linen. Textile Fabric materials are used to prepare different categories and types of Fabric products in the textile industry. Natural fabric and synthetic fabric are the two different classifications of textile fabric. Synthetic fabrics are fairly new and have evolved with the continuous growth in textile industry <sup>[1]</sup>. In a fabric, defects can occur due to:

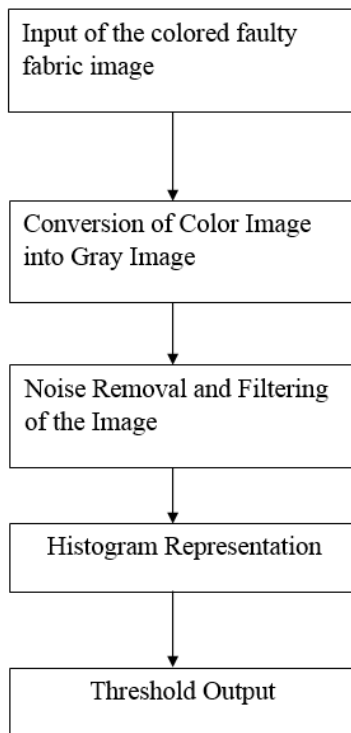
- machine faults
- yarn problems
- poor finishing
- excessive stretching
- hole
- scratch
- dirt spot
- crack point
- Color bleeding.

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### 3. Image Processing

An image may be defined as a two-dimensional function,  $f(x, y)$ , where  $x$  and  $y$  are spatial (plane) coordinates, and the amplitude of  $f$  at any pair of coordinates  $(x, y)$  is called the intensity or gray level of the image at that point. When  $x, y$ , and the amplitude values of  $f$  are all finite, discrete quantities, we call the image a digital image. The field of digital image processing refers to processing digital images by means of a digital computer. Note that a digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are referred to as picture elements, image elements, pels, and pixels. Pixel is the term most widely used to denote the elements of a digital image [5].

### 4. Methodology



**Fig:** fabric fault processing methodology

With the help of MATLAB we are taking an image of faulty fabric as an input to identify the fault in fabric. Then convert it to gray scale image. After converting it into gray scale image we filter it with the help of best suitable filter. This filtered image would be converted into binary image. And then histogram would be obtained to the faulty fabric image. At the last stage we obtain a grey threshold image as an output.

**Input of the Faulty Fabric Image:** This phase is the initial phase of the system. Here the image is given as the input that is mainly taken by the various input cameras such as CCD (Charged Coupled Device) camera, CMOS (Complementary Metal Oxide Semiconductor) camera, or any basic Digital camera, etc.

**Conversion of Color Image into Gray Image:** The acquired image must be converted into gray scale to

eliminate the hue and saturation information while retaining the luminance.

In this phase the color image that is given as the input is converted into the gray image. A grayscale image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information.

Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. In this phase the image that is given as the input is converted to the gray image.

**Noise Removal and Filtering of the Image:** Digital images consist of many types of noise. Noise is the result of errors in the image acquisition process. This phase basically deals with the removal of external noise and disturbances in the image that is given.

**Histogram Representation:** A histogram is a graphical representation of the distribution of data. It is an estimate of the probability distribution of a continuous variable (quantitative variable) and was first introduced by Karl Pearson. A histogram output obtained from the overall processing is used for drawing the conclusions for the classification of the faults.

**Thresholding:** Image thresholding is a simple, effective, way of partitioning an image into a foreground and background. This image analysis technique is a type of image segmentation that isolates objects by converting grayscale images into binary images. Image thresholding is most effective in images with high levels of contrast.

### 5. Conclusion

It is easy to identify faults on fabric images and process by using this method. Thus the MATLAB Implementation is done for fault identification such as hole, scratch, fading and other faults on fabrics can be identified and processed. Hence a different approach wherein various thresholding algorithms can be successively applied on the input image can yield better results. The manual textile quality control usually goes over the human eye inspection. Notoriously, human visual inspection is tedious, tiring and fatiguing task, involving observation, attention and experience to detect correctly the fault occurrence. The accuracy of human visual inspection declines with dull jobs and endless routines. Sometimes slow, expensive and erratic inspection is the result. Therefore, the automatic visual inspection protects both: the man and the quality. Here, it has been demonstrated that this system is capable of detecting fabrics' defects with more accuracy and efficiency. Thereby applying Matlab functions to the color faulty fabrics it is processed and finally the Histogram is obtained for the same image and thresholding is done to obtain the intensity of the image. In future this can be extended to any number of fault identifications on fabrics and can be processed.

### 6. Future Scope of the Work

In future this work may be extended such that the output is given to neural network and the Microcontrollers of any type can be utilized and programmed such that it can detect the

faulty fabric part. If the microcontroller is connected with motors of any type then it will be operated under normal fabric condition and can stop the motor if there is any fault on fabrics.

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