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# Fabric Fault Detection using Image Processing Method

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**Abstract**: Quality control is an important feature in textile industry. In textile industry, fabric pre-processing is important to maintain quality of fabric. In modern world most of the fabric pre-processing is still carried out manually using human visual inspection. This process is costly, time consuming and needs more labour work. Therefore, automated fabric inspection is required to identify fault present in the fabric. The main objective of this project is to create real time automated fabric fault detection system which will reduce industrial cost by 15-16%. Proposed system will find out fault using the technique of segmentation.

**Keywords**: Gaussian Blur, Segmentation, Thresholding, HSV, Fabric fault.

## I. INTRODUCTION

Quality control is an important feature in textile industry. Fabric quality is achieved by eliminating fabric defects and measuring properties (Density, Yarns count per inch) of fabric. Fabric faults or defects are responsible for nearly 85% of the defects found by the garment industry. Manufacturers recover only 45 to 65 % of their profits from seconds or off-quality goods. It is imperative, therefore, to detect, to identify, and to prevent these defects from reoccurring. Surveys carried out in the early 1975 shows that inadequate or inaccurate inspection of fabrics has led to fabric defects being missed out, which in turn had great effects on the quality and subsequent costs of the fabric finishing and garment manufacturing processes [1]. Manual inspection is costly, time consuming, need more labour work and level of accuracy achieved is not satisfactory to meet market requirements.

Hence, expected quality cannot be achieved with manual inspection. Automated, i.e. computer based system to identify fault present in fabric is solution to the problems caused by manual inspection. Automated fabric defect inspection system has been attracting extensive attention of the researchers of many countries for years. The global economic pressures have gradually led business to ask more of itself in order to become more competitive.

As a result, intelligent visual inspection systems to ensure high quality of products in production lines are in increasing demand of printed textures (e.g. printed fabrics, printed currency, wall paper) requires evaluation of color uniformity and consistency of printed patterns, in addition to any discrepancy in the background texture, but has attracted little attention of researchers [2]. Therefore, automated fabric inspection becomes important to improve fabric quality. Automated fabric fault detection system will deal with fabric defects such as hole, scratch, stretch, fly yarn, dirty spot, cracked point, misprints, color bleeding etc. Fabric industries face loss if these defects are not identified.

## II. LITERATURE REVIEW

Mainly three defect detection techniques are developed for automated fabric defect detection namely, statistical, spectral, and model based. Number of techniques has been deployed for defect classification. Among them, neural network, support vector machine (SVM), clustering, and statistical inference are prominent ones [2].

The task of Scene analysis and feature extraction is challenging issue. The complexity of the subsequent steps increases and the classification task becomes hard by selecting an inappropriate feature set. In the beginning of automated textile inspection system, various scene of different colored defective and defect free fabric should be analysed.

Then each defect occurred should be analysed properly. This will facilitate selection of the features for classification. Each of the features should be properly justified in terms of their discriminatory qualities and complexities to extract them, which is also very challenging. This results in an appropriate feature set, which will make the system's performance good. Machine learning methods can also be used [20] [21] [22].

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## III. METHODOLOGY

### A. Block Diagram (Software)

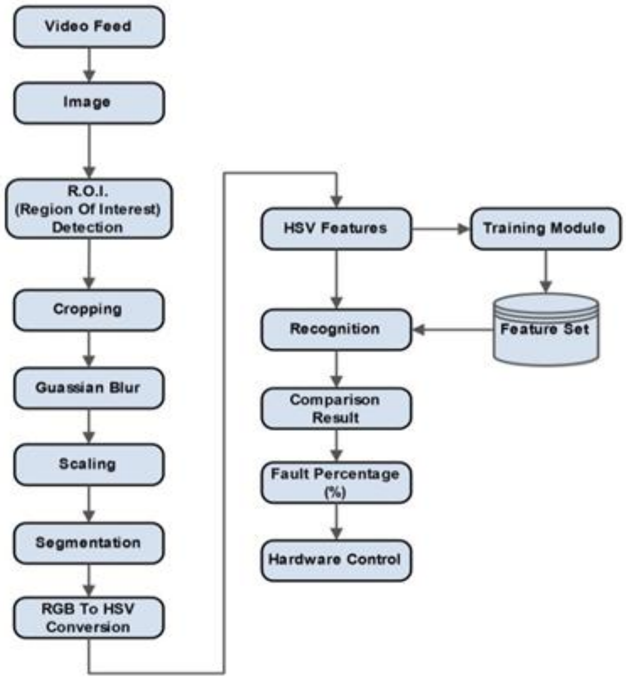


Fig.1. Block Diagram

### B. Gaussian Blur

Two-dimensional Gaussian blur operations are used in many image processing applications. The execution times of these operations can be rather long, especially where large kernels are involved [3]. Proper use of two properties of Gaussian blurs can help to reduce these long execution times:
1. Large kernels can be decomposed into the sequential application of small kernels.
2. Gaussian blurs are separable into row and column operations. This paper makes use of both of these characteristics and adds a third one:
3. The row and column operations can be formulated as finite-state machines (FSMs) to produce highly efficient code and, for multi-step decompositions, eliminate writing to intermediate images. Gaussian blur mainly uses 3 types of kernels 3*3, 5*5, 7*7. Here we will be using 3*3 kernels.

This implementation requires two temporary variables, one memory location or register for the state of the row machine (SR0), for images with NPixels in each row, a column state buffer SC0[i], i = 1, 2, … NPixels. The 3x3 implementation requires two temporary variables, two memory locations or registers for the state of the row machine, SR0 and SR1, and two column state buffers, SC0[i] and SC1[i]. The column state buffers are set to zero at the start of the overall operation, and the row state buffers are set to zero at the start of each row. The main loop code is given below. The output is written to address [j-1][i-1] because this is the center of the current 3x3 neighbourhood [4].

### C. Segmentation

Image segmentation is the process of partitioning a digital image into multiple segments. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images [5]. The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image(edge detection).Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity or texture [5]. Thresholding is a process of converting a greyscale input image to a bi-level image by using an optimal threshold. The purpose of thresholding is to extract those pixels from some image which represent an object (such as graphs, maps) [9] [10]. Though the information is binary the pixels represent a range of intensities. Here adaptive thresholding is used. In adaptive thresholding, different threshold values for different local areas are used to represents the objects [6] [11] [12] [18].
As binary images are easy to operate, other storage format images are often converted into binary images are used for enhancement or edge detection. All images can be neatly segmented into foreground and background using simple

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thresholding [5]. The purpose of thresholding is to extract those pixels from some image which represent an object (such as graphs, maps). This way can be determined by looking at an intensity histogram of the image. The systems given in the other work were also studied [18]. S. L. Banagre et al have proposed the image processing techniques use in their work [27] [28] [29] [30].

**D. HSV**

We evaluate the content based image retrieval HSV color space of the images in the database. The HSV stands for the Hue, Saturation and Value, provides the perception representation according with human visual feature. The HSV model, defines a color space in terms of three constituent components: Hue, the color type Range from 0 to 360. Saturation, the "vibrancy" of the color: Ranges from 0 to 100%, and occasionally is called the "purity". Value, the brightness of the color: Ranges from 0 to 100%. HSV is cylindrical geometries, with hue, their angular dimension, starting at the red primary at 0°, passing through the green primary at 120° and the blue primary at 240°, and then back to red at 360° [7, 8]. The quantization of the number of colors into several bins is done in order to decrease the number of colors used in image retrieval, J.R. Smith designs the scheme to quantize the color space into 166 colors. Li design the non-uniform scheme to quantize into 72 colors. We propose the scheme to produce

$$H = \begin{cases} \frac{G-B}{V-\min\{R,G,B\}} \cdot 60^\circ, & \text{if } V = R \text{ and } G \geq B; \\ \left(\frac{B-R}{V-\min\{R,G,B\}} + 2\right) \cdot 60^\circ, & \text{if } G = V; \\ \left(\frac{R-G}{V-\min\{R,G,B\}} + 4\right) \cdot 60^\circ, & \text{if } B = V; \\ \left(\frac{R-B}{V-\min\{R,G,B\}} + 5\right) \cdot 60^\circ, & \text{if } V = R \text{ and } G < B \end{cases} \qquad H \in [0^\circ, 360^\circ[$$

$$S = \frac{V - \min\{R, G, B\}}{V} \qquad S \in [0, 1]$$

$$V = \max\{R, G, B\} \qquad V \in [0, 255]$$

15 non-uniform colours. The formula that transfers from RGB to HSV is defined as below: The R, G, B represent red, green and blue components respectively with value between 0-255. In order to obtain the value of H from 0o to 360 o, the value of S and V from 0 to 1, we do execute the following formula:

H+ ((H/255*360) mod 36
V=V/255
S=S/255

**E. Hardware Description**

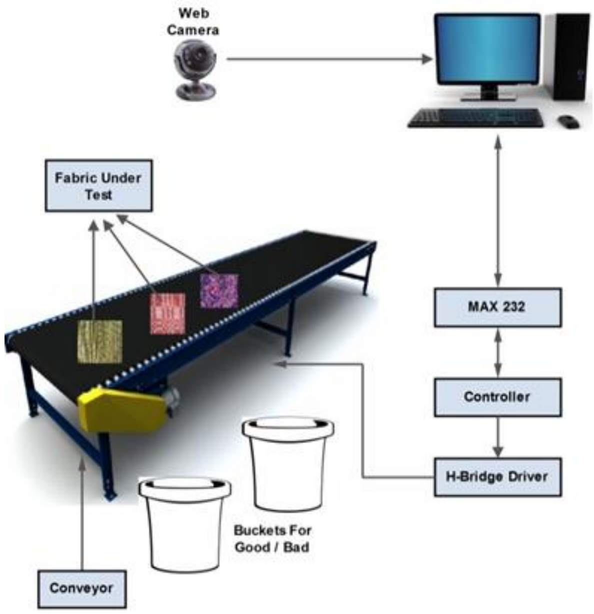


Fig.2. Flow of system and Hardware description

The hardware components that is being used for this project are conveyor belt which is used as a cloth feed to the camera which takes continuous video at 10fps.The infrared sensor is used to detect whether there is cloth on conveyor belt to check for input to camera is present or not. The motor used is conveyer belt is driven by L293D motor driver IC. The whole hardware system is driven of ATMEGA32 microprocessor.MAX232 is used for serial communication between the system and camera. Buzzer raises the alarm if fault is detected in the fabric on conveyor belts.

## IV. CONCLUSION

To minimize the loss due to verity of defect occurring in the fabric, a manufacturer should try to minimize those defects by using automated systems like fabric fault detection. This system will be useful for the manufacturers as it will inform about the faulty fabric in advance. It will save the time and energy of manually testing the fabric quality.

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