

# Implementation of Fabric Fault Detection System

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**ABSTRACT:** In recent years most of the textile industries are automated. Many sewing, knitting and dyeing units involve both manual and automated processes. Detecting faults in fabric manually by human visual inspection is a tedious task. Its accuracy depends upon the skill of human operator and varies from person to person. The main objective of this project is to detect faults in fabric using image histogram techniques and the histograms of reference image and test image are compared and error is calculated. This output can be given to a microcontroller which is programmed such that on identifying a fault i.e. when the error exceeds the maximum permissible value, it is displayed on the screen and the motor of the machinery is turned off. Faults like scratch, whole, dirt, spot, crack-point and colour bleeding can be identified automatically. This method eliminates human inspection and can increase accuracy, thereby increasing productivity in textile industries. The software's used for this project are MATLAB and Keiluvision3.

**KEYWORDS:** Fabric fault, Microcontroller, Matlab, Keil

## I. INTRODUCTION

Quality is an important aspect in the production of textile fabrics. Fabric quality is consisting of two components, i.e., fabric properties and fabric defects. 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. The raspberry PI needs to be used for the processing as it support the machine learning. The raspberry PI needs to be installed as given in paper[5].

### 2. Challenges in Image Processing for Fabric Fault Detection using OpenCV:

#### 2.1 Collection of Data set:

Basic need of image processing is creating a database of images. To acquire images of fabric fault, one has to travel to different places. Data collection will be a challenging since variety of fabric detect may not be available at some place so we have to create a fabric fault manually.

#### 2.2 Image Background:

Image segmentation is important phase of image processing, where we separate most required part of image. Cloth image segmentation may be a challenge if background contains machine, light effect, steam and some other elements from fabric.

#### 2.3 Image Frame Capture Condition:

Automatic fabric fault detection systems give steady and efficient results, only if the camera is on while whole process. Capturing image frame under same condition is possible only inside high brightness light. It is a challenge to capture image frame under same condition in the field because of uncontrollable environment.

2.4 Fault segmentation:

Most fabric fault have no well-defined edges and they are having some unusual pattern on cloth because of which there will not be a proper segmentation, which will affect the final result.

2.5 Fault variations:

Fault depends on cloth, color and its types. Any change in the segments may result in fault variations. It is a challenge to identify the fabric fault with fault variations.

3. Flow of the system:

It shows the overall flow of the system working as shown in given figure.

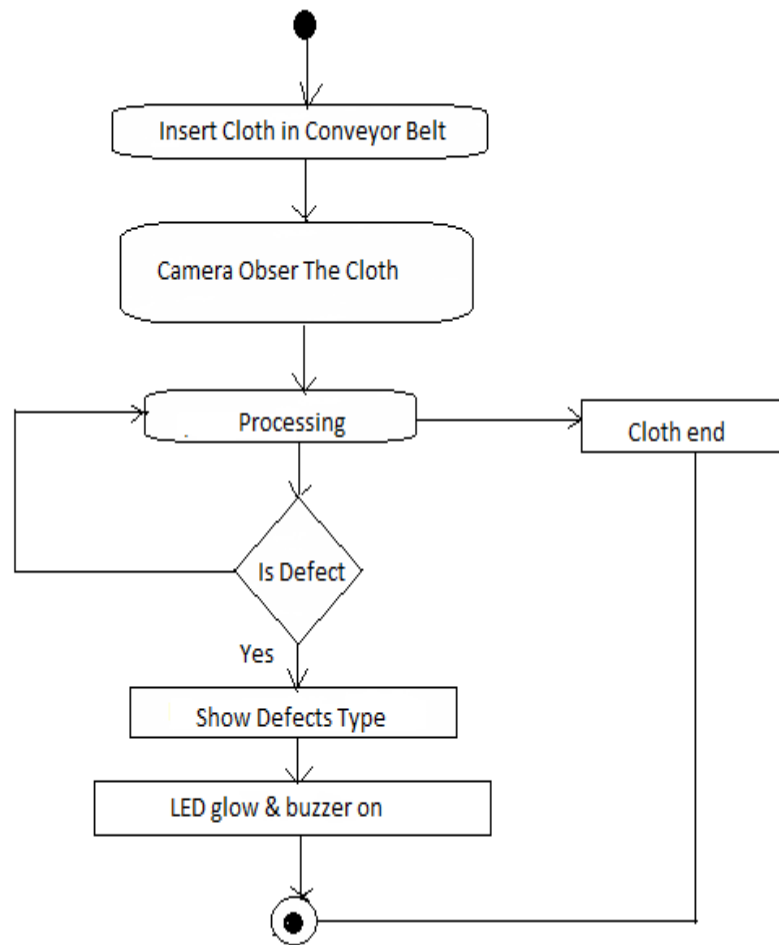


Figure 1 : Flow Diagram

II. LITERATURE SURVEY

1.1 Fabric defect detection algorithm using morphological processing and DCT:

Textile industry is one of the major industries in Egypt. Fabric defects severely affect the price of fabrics that represents a major threat to this industry in Egypt. In manual defect detection system, even with highly trained inspectors, small percentage of the defects is detected. A real time automatic defect detection system can increase the detection percentage, hence reduces the textile fabrication costs. In the paper [1], we present a new algorithm for fabric defect detection in textile industry. The proposed algorithm uses morphological processing and Discrete Cosine Transform (DCT) to automatically detect fabric defects. The proposed algorithm shows a promising performance and solves several drawbacks associated with the existing algorithms.

### 1.2 A novel approach to fabric defect detection using digital image processing:

The paper [2] presents a novel approach to the fast detection and extraction of fabric defects from the images of textile fabric. Automated visual inspection systems are much needed in the textile industry, especially when the quality control of products in textile industry is a significant problem. In the manual fault detection systems with trained inspectors, very less percentage of the defects are being detected while a real time automatic system can increase this to a maximum number. Thus, automated visual inspection systems play a great role in assessing the quality of textile fabrics. For the detection of fabric defects, decompose the image into its bit planes. The lower order bit planes are found to carry important information of the location and shape of defects. Then find the exact location by means of mathematical morphology.

### 1.3 Development of real-time vision-based fabric inspection system:

Quality inspection of textile fabric products is an important problem for fabric manufacturers. The paper [3] presents an automatic vision-based system for the quality control of web textile fabrics. Typical web material is 1-3 m wide and is driven with speeds ranging from 20 to 200 m/min. At present, the quality inspection process is manually performed by experts. However, they cannot detect more than 60 per of the overall defects for the fabric if it is moving faster than 30 m/min. To increase the quality and homogeneity of fabrics, an automated visual inspection system is needed for better productivity. Currently, the existing inspection systems are too expensive for small companies. In this paper, a PC-based real-time inspection system is proposed with benefit of low cost and high detection rate. The proposed algorithm showed good results for several types of fabric defects.

### 1.4 Real time Denim fabric inspection using image analysis:



Figure 2.: Technique Invented For Fabric Fault Detection

In spite of using modern weaving technology, many types of fabric defects occur during production. Most defects arising in the production process of a fabric are still detected by human inspection in paper[8]. A machine vision system that can be adapted to different types of fabric inspection machines is proposed in this study. Image frames of denim fabric were acquired using a CCD line-scan camera. An algorithm was developed by using the Gabor filter and double thresholding methods.

## III. PROPOSED SYSTEM

In general, the architecture in support of user interference with the system which deals with testing process of the fabric cloth to identify the defect present over and to overcome with the appropriate solution for the same. The user is dealing with the set of fabric role on the conveyor belt which when rotates the Raspberry pi camera interface with Raspberry OS captures the images as per second, as shown in given figure. The database contains with the dataset of trained data which includes the image of fault fabric and clean fabric, the image capture by camera compare with these dataset. There is machine learning technique used for the database creation in which the sample of different cloths of fault are collected and the machine is trained with comparison of collected samples. Supervised learning is given to the machine to detect the fault where it will compare the datasets. The Arduino is used for the Buzzer and LED to glow, when a fault get compare with the dataset of training data of images. Which leads to stop the conveyor belt. Fault when get detected the system works stop then its task of tester to cut that faulty cloth. These system helps in the automation of the testing of the fabric cloth with the help of machine learning of training the dataset.

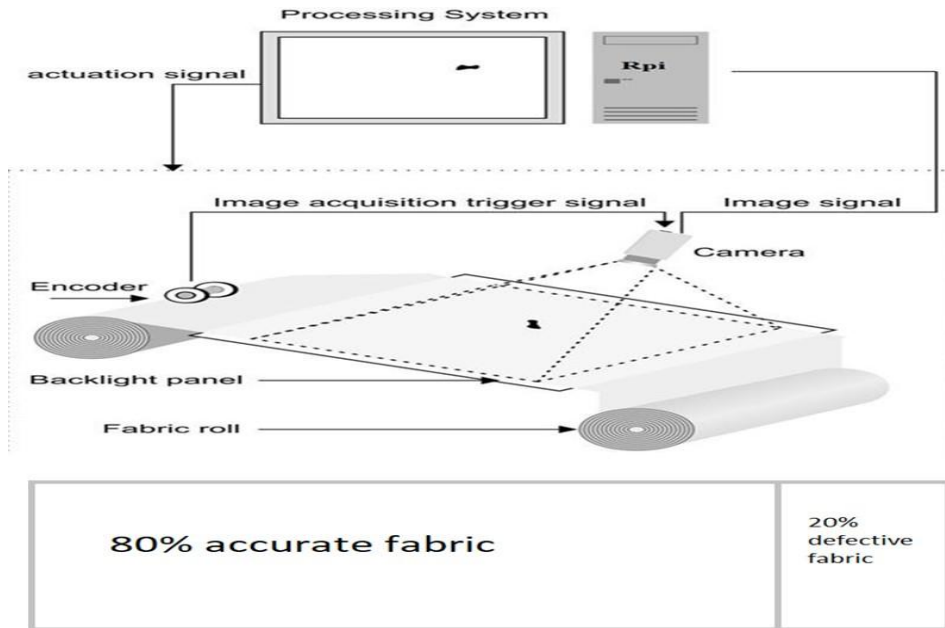


Figure 3: System Architecture

**Implementation:**

Project is designed in five parts where each part is responsible for different aspects.

**Image Acquisition:** The images of various fabric acquired using a digital camera with required resolution for better quality. The construction of an image database is clearly dependent on the application. The image database itself is responsible for the better efficiency of the classifier which decides the robustness of the algorithm.

**Image Pre-processing:** In the second step, this image is pre-processed to improve the image data that suppressun desired distortions, enhances some image features important for further processing and analysis task. It includes color space conversion, image enhancement, and image segmentation.

**Image Segmentation:** Image segmentation is process used to simplify the representation of an image into something that is more meaningful and easier to analyse. Asthepremiseoffeatureextractionandpatternrecognition,imagesegmentation is also the fundamental approaches of digital image processing.

**Feature Extraction:** After segmentation the area of interest i.e. defect part extracted. In the next step, significant features are extracted and those features can be used to determine the meaning of a given sample. Actually, image features usually includes color, shape and texture features. With the help of texture features, fabric fault are classified into different types.

**Classification:** This is the final stage in defect detection of fabric. The features extracted in feature extraction phaseare used for classification.

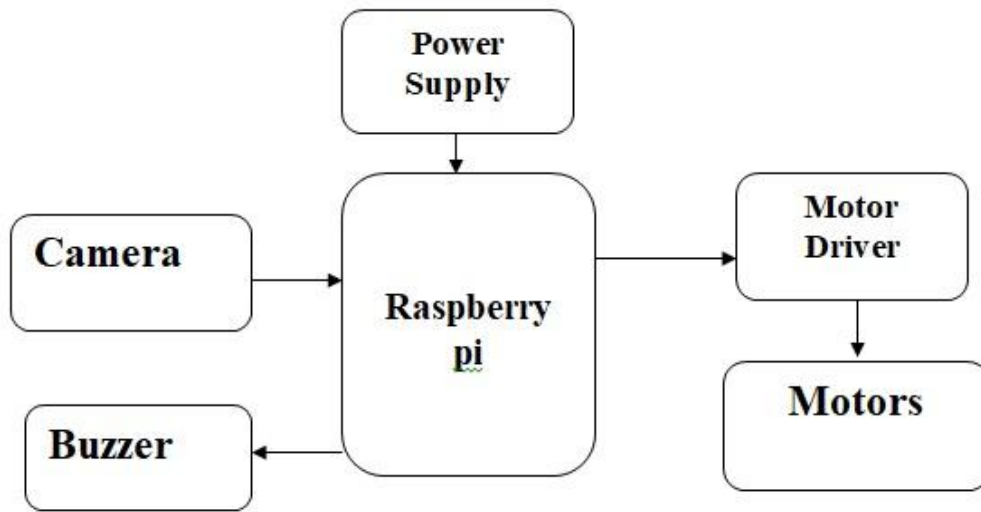


Figure 4: Block Diagram

#### IV. TECHNIQUE USED

##### Template Matching Technique:

Template matching is a technique in digital image processing for finding small parts of an image which match a template image. It can be used in manufacturing as a part of quality control, a way to navigate a mobile robot, or as a way to detect edges in images. This technique is used in open cv as given in paper[7].

The main challenges in the template matching task are: occlusion, detection of non-rigid transformations, illumination and background changes, background clutter and scale changes.

##### Template-based matching explained using cross correlation or sum of absolute differences:

A basic method of template matching uses an image patch (template) as shown in paper [6], tailored to a specific feature of the search image, which we want to detect. This technique can be easily performed on grey images or edge images. The cross correlation output will be highest at places where the image structure matches the mask structure, where large image values get multiplied by large mask values.

This method is normally implemented by first picking out a part of the search image to use as a template: We will call the search image  $S(x, y)$ , where  $(x, y)$  represent the coordinates of each pixel in the search image. We will call the template  $T(x_t, y_t)$ , where  $(x_t, y_t)$  represent the coordinates of each pixel in the template. We then simply move the center (or the origin) of the template  $T(x_t, y_t)$  over each  $(x, y)$  point in the search image and calculate the sum of products between the coefficients in  $S(x, y)$  and  $T(x_t, y_t)$  over the whole area spanned by the template. As all possible positions of the template with respect to the search image are considered, the position with the highest score is the best position. This method is sometimes referred to as 'Linear Spatial Filtering' and the template is called a filter mask.

In this simple implementation, it is assumed that the above described method is applied on grey images: This is why Grey is used as pixel intensity. The final position in this implementation gives the top left location for where the template image best matches the search image.

```
minSAD = VALUE_MAX;
```

```
// loop through the search image
for ( size_t x = 0; x <= S_cols - T_cols; x++)
{
    for ( size_t y = 0; y <= S_rows - T_rows; y++)
    {
        SAD = 0.0;
```

```

// loop through the template image
for ( size_t j = 0; j < T_cols; j++ )
    for ( size_t i = 0; i < T_rows; i++ ) {

        pixel p_SearchIMG = S[y+i][x+j];
        pixel p_TemplateIMG = T[i][j];

        SAD += abs( p_SearchIMG.Grey - p_TemplateIMG.Grey );
    }

// save the best found position
if ( minSAD > SAD ) {
    minSAD = SAD;
    // give me min SAD
    position.bestRow = y;
    position.bestCol = x;
    position.bestSAD = SAD;
}
}
}

```

One way to perform template matching on color images is to decompose the pixels into their color components and measure the quality of match between the color template and search image using the sum of the SAD computed for each color separately.

## V.CONCLUSION

Fabric fault detection system can detect the fabric faults. This system will be capable of detecting fabrics defects with more accuracy. Human inspection does not achieve desired result because human visual inspection is tedious, tiring involving observation, attention experience to detect faults correctly. Currently the faults are inspected manually. The faults have been collected then should be written down and recorded on a fault analysis card or chart. It will be easy to identify faults on fabric images and process by using this method. Faults such as hole, scratch, fading and other faults on fabrics can be identified and processed. 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.

## REFERENCES

1. M. A. Aziz, A. S. Haggag, and M. S. Sayed, "Fabric defect detection algorithm using morphological processing and dct," in 2013 1st International Conference on Communications, Signal Processing, and their Applications (ICCSIPA). IEEE, 2013, pp. 1-4.
2. S. Priya, T. A. Kumar, and V. Paul, "A novel approach to fabric defect detection using digital image processing," in 2011 International Conference on Signal Processing, Communication, Computing and Networking Technologies. IEEE, 2011, pp. 228-232.
3. C.-S. Cho, B.-M. Chung, and M.-J. Park, "Development of real-time vision-based fabric inspection system," IEEE Transactions on Industrial Electronics, vol. 52, no. 4, pp. 1073-1079, 2005.
4. A. Javed, A. U. Mirza et al., "Comparative analysis of different fabric defects detection techniques," International Journal of Image, Graphics and Signal Processing, vol. 5, no. 1, p. 40, 2013.
5. M. Richardson and S. Wallace, Getting started with raspberry PI. " O'Reilly Media, Inc.", 2012.



6. Swaroop, Paridhi, and Neelam Sharma. "An overview of various template matching methodologies in image processing." *International Journal of Computer Applications* 153.10 (2016): 8-14.
7. Brunelli, Roberto. *Template matching techniques in computer vision: theory and practice*. John Wiley & Sons, 2009.
8. Çelik, Halil Ibrahim, Mehmet Topalbekitoglu, and L. Canan Dülger. "Real-time denim fabric inspection using image analysis." *Fibres & Textiles in Eastern Europe* (2015).