Detection & Classification of Fabrics Defects using Image Processing and Neural Network

Reethu Rajan, Sangeetha Gopinath
Dept. of Electronics and Communication
Royal College of Engineering and Technology
Akkikavvu , Thrissur ,India

***Abstract*:**

The textile industry is very concerned with quality, it is necessary to master good quality fabric rolls from the looms. The main objective of this work is to develop a system for the detection and classification of defects in a simple and efficient way using techniques of image processing. The most frequently detected defects are missing weft or warp threads, oil stains and holes. The system works according to four steps. It begin by capturing the image, then eliminate parasite information and increase the sharpness of the image by image analysis. After that, determine three parameters with characterize the mentioned defects (the rate of straight lines, the rate of dark areas and the rate of voids). Finally apply a neural network to recognize the category of defect present on the fabric.

***IndexTerms*—Fabric defects, image analysis, neural network, classification techniques.**

I. INTRODUCTION

Now a day textile business in one of the major business all over the world. Qualitymeasurement is an important aspect during the production of textile fabrics in loweringcosts and improving the finished product. Much of the fabric inspection is performedmanually by human inspectors. But certain defects are missed, and the inspection is conflicting , the output depending on the training and the skill level of the human inspectors and also the mental and physical conditions of the inspector. Hence the textile industry has been moving towards automated fabric inspection system. The fabric defect causes deterioration on the fabric pattern and there are various pattern faults. The yarns are weaved in the longitudinal direction of the fabric that is named as warp direction. If the yarns are weaved in the width-wise direction they are weft direction.The defects in warp and weft effects the quality of material. Fabric quality is consisting of two components, i.e., fabric properties and fabric defects. Fabric property depends on the raw material. Whereas a fabric defect can occur right from raw material selection to finishing stage, because of irregular input parameters with respect to material, machine and man. Any variation to the weaving process needs to be investigated and corrected. Manual defect detection in a Fabric quality control system is a difficult task to be performed by inspectors. The work of an observer is very tedious and time consuming. They have to detect small details that can be located in a wide area that is moving through their visual field. Wastage reduction through accurate and early stage detection of defects in fabrics is also an important aspect of quality improvement. The high cost, along with other disadvantages of human visual inspection has led to the development of automated defect inspection systems that are capable of performing inspection tasks automatically. The proposed system that monitors and detect missing threads, holes and oil stains on fabrics. It keep standard designs in database and check it with all fabrics. If the fabric we are checking and standard image of fabric is not match , fault is detected. The system use the neural network technique for analysis of the fabric fault. The extracted feature from the fault fabric is given to the neural network and then pass the test image to the algorithm with help of neural network, we will be able to analyze the fault.The different type of defects are shown in Fig.1.

Fig. 1.Examples of defects a) Missing thread b) Oil stain c) Hole

Objectives of the proposed system

- Develop a automatic system for the detection and classification of defects to improve the quality of textile fabrics.
- Focussing on processing the defective fabric parts.

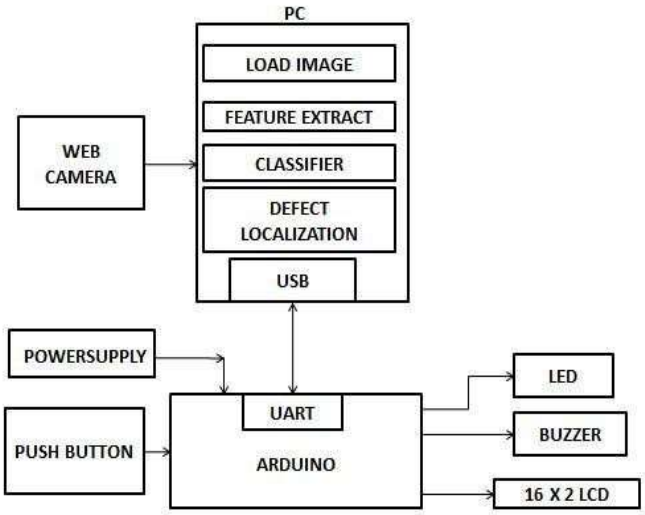
- Use image processing and neural network to identify holes, missing threads and oil stains on fabrics.

The neural network are designed and it is trained to detect the fabric faults.

RELATED WORKS

A method for fabric defect detection based on Butterworth filters is proposed. A group of Butterworth filters with multi-scale and multi-orientation are designed based onthe features of textured fabric with single color and simple structure. The image of fabric is processed by the filter group. This filtered images which characterize the fabric defect in different orientations and scales in the frequency domain. These filtered images are binarized and then fused in order to reconstruct the binary outputimage that separates the defect from the texture background[1]. Main approach of the paper is to recognize fabric defects in textile industry. The Fabricinspection system first acquires high quality vibration free images of the fabric. Thenthe acquired images are subjected to defect segmentation algorithm. The output of the

processed image is used as an input to the Artificial Neural Network (ANN) which uses back propagation algorithm to calculate the weighted factors and generates the desiredclassification of defects as an output. This research implements a textile defect detectorwhich uses computer vision technology with the combination of multi-layer or backpropogation neural networks to identify the classification of textile defects and detect [2].The system adopted back propagation neural network to detect the stitching defectsof a garment. Nine characteristic variables based on the spectral measure of the binaryimages were collected and input into a BP neural network to classify the sample images.The classification results demonstrate that the proposed method can identify one class of stitching defects effectively[3]. A new method to analyze the texture information on the fabric image with multiwindow for enhancing the defects feature is introduced. The feature information of defect is segmented by Cellular Neural Network and three terms of variables are defineto represent the feature. Using interlock fabric with the defects of hole, course mark, dropped stitch and fly as experiment materials, the experiment proved the acquired feature information involved adequate information of defects with less effect of noise and the result of classification by Artificial Neural Network was well performed[4].A new method for fabric defect image segmentation using improved Pulse Couple Neural Networks (PCNN) is proposed. According to different gray intensity between the area of defects and the area of no defects, PCNN neurons is used to implement segmentation. The iteration index of PCNN is controlled by the minimum cross entropy. And, segmentation evaluation criteria is also presented in this system. The validity tests on the developed algorithms have been performed with some fabric defect images. Four segmentation evaluation indexes, combined with a synthetic index, to measure the segmentation results[5]. The particle swarm optimization was applied in BP neural network training. It reasonably confirms threshold and connection weight of neural network, and improves capability of solving problems in realities. Meanwhile, PSO-BP neural network is applied into classification of fabric defect. The method of orthogonal wavelet transform was used to decompose monolayer from fabric image. And the sub-images of horizontal and vertical direction are extracted to represent respectively the textures of fabric in warp and weft. but its network training problems belong to high-dimensional optimization, which affects the algorithm precision because of shortcomings of long running time and local minimum value[6]. The system propose an object classification using a standard deviation value for classifying the defect on textile webs. First describe the method of image segmentation that applied in this study which is based on statistical technique. Further, focus on the features analysis where divide it into two phases; (1) learning phase and (2) analysis phase. Finally, have been tested the proposed algorithm into 5 (five) different types of textile webs with 500 images for each type of webs and figure out that this method is suitable for distort and small defect as in textile webs.[7] A method that presents an artificial neural network to detect local textile defects. Experimental results illustrate a high degree of robustness, clarity and accuracy for the detection of a variety of fabric defects. This investigates various approaches for automated inspection of textured materials using Gabor wavelet features. A new superior defect detection approach to detect a class of defects in textile webs is proposed[8].



I. PROPOSED METHOD

The block diagram of the proposed method is shown in the Fig. 2. Automatic fabric inspection and detection system is valuable for maintenance of fabric quality. Mainly there are four steps for detecting defects which includes load image, feature extraction, classification and defect localisation. This project provide an inspection process that aims to detect and classify defects in warp and weft using a computer program developed in Matlab that analyzes images of fabrics samples acquired using a scanner/camera. The fabric acquired images are transferred to a computer for analysis. Feature extraction stage is used for calculating and obtaining different parameters of the faulty region. The next stage is to classify the similar types of defects into a groups using an accurate classifier. The final stage is to recognize the defects of fabrics by using back propogation training algorithm.

The proposed system that monitors and detect missing threads, holes and oil stains on fabrics. In this system, we are using PC, controller for processing all action, LCD for displaying the defect type and buzzer for indication. We will keep standard designs in database and check it with all fabrics. If the fabric we are checking and standard image of fabric is not match or any fault is detected. Buzzer will give indication of fault detection. LCD will display the defect type. The system will going to use the neural network technique for the analysis of the fabric fault. System will extract the feature from the fault fabric , give the result to the neural network and when pass the test image to the algorithm with help of neural network ,the system will be able to analyze the fault. This project is helpful for detecting the defects of fabrics to improve the quality. Hence Gathering the results from defect analysis has proved useful in textile industries.

A. Preprocessing Stage

It is the first stage of detection. It removes all the artifacts such as noise from the input image. Image preprocessing stage consist of collection of techniques that are used to improve the visual appearance of an image or used to convert the image to a form.

B. Feature Extraction Stage

Second stage of the proposed method is feature extraction. Feature Extraction is a stage in which various methods can be employed for capturing visual content of images for indexing and retrieval purpose. There can be number of features defined from an image and there are methods for calculating each of these features. The features which are better suited for a particular application are selected for further analysis. The aim of feature extraction is to obtain useful information from an image. In the case of fabric defect detection, defected and non- defected texture are characterized, identified and analysed. Features are very importance to most fabric defect detection systems because they possess a close relationship to the detection accuracy of the fabric defect detection method.

C. Classification Stage

Image classification is most important part of image analysis. Classification is nothing but group the similar types of object and dissimilar type of object into a different partition, with the aim to providing a easy way for image analysis. The classification stage gives the end result of the entire fabric defect detection process by reporting whether the fabric is defected or defect free. Using neural networks as a classifier requires two phases namely, a training phase and a testing phase. In the training phase, the neural network makes the proper adjustment for its weights (W) to produce the desired results.

D. Defect localization

Defects of fabrics are recognised by using back propogation training algorithm.

Neural Network-Neural networks have been developed as generalization of mathematical models. It able to solving difficult problems such as pattern recognition and classification. A neutral network consists of a group of simple elements called neurons which process the input information. These neutrons are connected to each other carrying the signals between them. There is a weight for each connection link which acts as a multiplication factor the transmitted signal

. An activation function is applied to each neurons input to determine the output signal . In neural networks classifier requires two phases a training phase and a testing phase. In the training phase, the neural network makes the proper adjustment for its weights to produce the desired response. When the actual output response is the same as the desired one, the network has completed the training phase. In the testing phase the neural network classify a new set of images and its success is evaluated. In this system the neural networks were trained by the backpropagation algorithm to detect and classify the fabric defects. The feature vectors were used as the input vectors to the Neural Network. The Elements of Neural Network is shown in Fig. 3.

- For extracting different parameters of defects.
- Classification of defects as hole, oil stains, missing threads.
- Finding the accuracy, specificity and performance chara of the proposed method.
- Comparing the results of the proposed with existing methods.

IV. CONCLUSION

In this work, a new intelligent fabric defect inspection model was presented. The recognizer acquires digital fabric images by image acquisition device and converts that image into binary image. The output of the processed image is used as an input to the Neural Network (NN) which uses back propagation algorithm to calculate the weighted factors and generates the desired classification of defects as an output . The proposed method is practicable and applicable in textile production factories for defect detection and classification.

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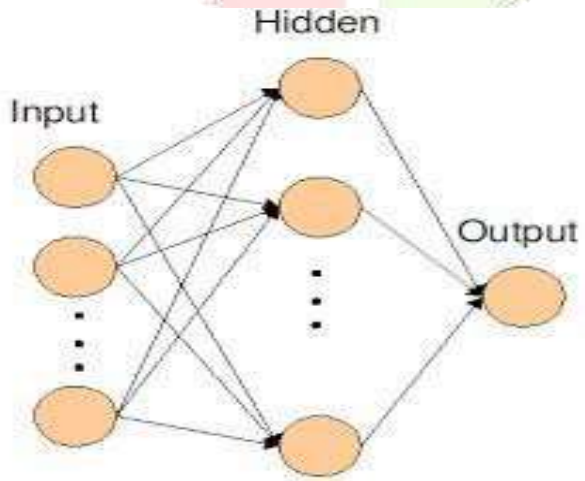

Fig. 3. Elements of Neural Network

II. RESULT AND ANALYSIS

The proposed method improve the accuracy with the help of NN. The work is under progress. We are currently working with feature extraction stage. Following are the area that covers the results and analysis related works of this project.

- To detect the defects without errors.

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