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FABRICS DEFECTS DETECTION USING NEURAL NETWORK

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ABSTRACT

Quality is an important aspect in the production of textile fabrics. The textile industry is very concerned with quality. Automatic fabric inspection and detection is valuable for maintenance of fabric quality. The aim of the proposed system is to design a defect detection system using image processing techniques. Inspection process is very important for textile industry. Defects decrease the profits of manufacturers and cause undesirable loses. Therefore, to reduce loses manufactures initially started to employ experts to detect the currently available defects on the fabrics. However, human experts have some drawbacks such as tiredness, boredom, and inattentiveness which cause to reduce the detection of faults. Because of that reason, textile industry started to develop new methods. Fortunately, the computer technologies with new developments in software and hardware have been applied to textile industry to increase the effectiveness of defect detection system. This method represents an effective and accurate approach to automatic defect detection. It is capable of identifying all defects. Because the defect-free fabric has a periodic regular structure, the occurrence of a defect in the fabric breaks the regular structure. Therefore, the fabric defects can be detected by monitoring fabric structure. To improve the efficiency of the technique and to overcome the problem of detection errors, further filtering operation is implemented.

KEYWORDS: Fabric defects, image analysis, neural network, classification techniques.

I. INTRODUCTION

Quality control is an important factor in industrial production which is increasing day by day. Fabric faults or defects are responsible for nearly 85% of the defects found by the garment industry. Quality measurement is an important aspect during the production of textile fabrics in lowering costs and improving the finished product. Much of the fabric inspection is performed manually by human inspectors. Many defects are missed, and the inspection is inconsistent, 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 effect the quality of material. The most frequently detected defects are missing weft or warp threads, oil stains and holes.

FABRIC DEFECTS

In the manufacture of fabrics, many problems can affect the textile. Among these anomalies, we find missing warp or weft threads, oil stains and holes. As shown in figure 1, we will focus on these three defects because they are the most frequently encountered. To detect and identify numerically these defects, they should be treated case by case. To do this, we tried to find the characteristics that permit us to assign each type of defect to

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its appropriate category. The work aims to extract measurable parameters that can give us an idea of the texture of the processed image in each case of defect.

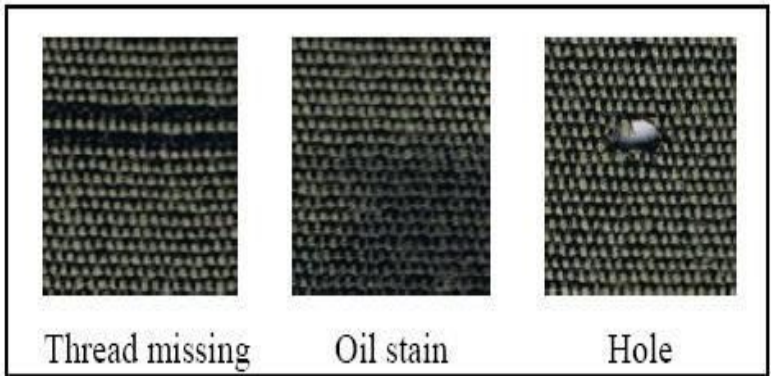

Fig. 1. Examples of defects a) Missing thread b) Oil stain c) Hole

AI. LITERATURE REVIEW

A traditional method aims at investigating a novel solution to the problem of defect detection from the images of woven fabric. Automated visual inspection systems are an attractive alternative to human visual inspection in the textile industry, especially when the quality control of products in the industry is a significant problem. The development of an automated web inspection system requires robust and efficient fabric defect detection techniques. For the detection of fabric defects, the pre-processed image is decomposed into its bit planes. The lower order bit planes are found to carry significant information of the location and shape of defects [1].

A novel method refers to the four common seen defects of stretch knitted fabrics: laddering, end-out, hole and oil spot. First of all, wavelet transfer is applied to obtain its wavelet energy to take them as defect features of this image, and then the back-propagation neural network (BPNN) was used to carry out the defects classification of the fabrics. In addition, by using the Taguchi method combined with BPNN had improved the deficiency of BPNN, which requires overly time consuming trial-and-error to find the learning parameters, and therefore could converge even faster, having an even smaller convergence error and better recognition rate. Experimental results have proven the final root-mean-square error convergence of the Taguchi-based BPNN was 0.000199, and the recognition rate can reach 96.5% [2].

The system adopted back propagation neural network to detect the stitching defects of a garment. Nine characteristic variables based on the spectral measure of the binary images 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].

Fabric defect detection is one of the key steps in fabric defect image segmentation, which determines subsequent defect analysis and identification accuracy. Conners and Siew et al. [4, 5] used grey level co-occurrence matrix characteristics such as entropy, second moment and contrast measure to process defect images. Zhang et al. [6] had summarized in great detail fabric defect detection methods based on Markov random field, mathematical morphology, cross correlation characteristics of the texture or defect features. In addition, Jasper et al. [7,8] proposed fabric defect detection methods based on fast Fourier transform, Gabor transform, wavelet transform, and so on. These mentioned methods can effectively detect certain type of defect, but, their detection capabilities are limited to do the common fabric defects. And, some of them are not suitable for real-time defect detection because of a large amount of computation and storage.

BI. MATERIALS AND METHODS

Software Details

The architecture of the system is shown in Figure 2. Mainly there are four steps for detecting defects which includes load image, feature extraction, classification and defect localization. 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 analyses 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. GLCM method is used for this stage. The next stage is to classify the similar types of defects into a group using an accurate classifier. The final stage is to recognize the defects of fabrics

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by using back propagation training algorithm.

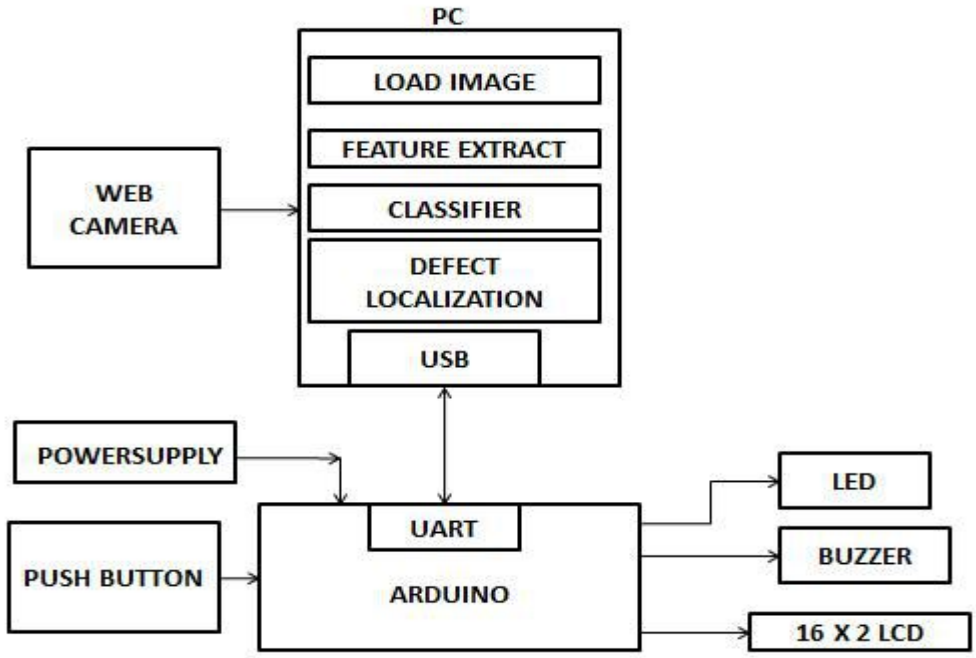

Fig. 2. Block diagram of proposed system

Image Acquisition

The first stage of any vision system is Image acquisition. Camera used for this application is web camera.

Image preprocessing

Image preprocessing stage consists of collection of techniques that are used to improve the visual appearance of an image or used to convert the image to a form.

Feature Extraction

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 and analysed. The relationships or the differentiations define helpful information that is used as features. 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.

Classification

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.

Defect localization

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

Neural Network

Neural networks have been developed as generalization of mathematical models. The neural network we used is a multilayer perceptron based on the retro-propagation algorithm and contains three layers: an input layer, a hidden layer and an output layer. The neurons in the output layer is delegated as 1st neuron of the output layer is to Hole type fault, 2nd neuron of the output layer is to missing thread fault, 3rd neuron of the output layer is to oil stain and 4th neuron of the output layer is for No fault (not defected fabric). The output range of the each neuron is in the range of [0 ~ 1].

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Hardware Details

Image processing system usually uses a scanner or a web camera with high resolution linear scanning. In our case, the fabric acquired images are transferred to a computer for analysis. The extracted data are provided as input to a neural network.

Micro Processor

Arduino ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family.

Web camera

Image processing system usually uses a scanner or a web camera with high resolution linear scanning. In our case, the fabric acquired images are transferred to a computer for analysis.

LCD

LCD is used in this system to display whether the system is best, good or bad.

LED

This system consists of two LED's. One blinks when defective material arrives and other for non-defective material.

Buzzer

When defective material arrives , the buzzer alerts.

AI. RESULTS AND DISCUSSION

Following are the area that covers the results and analysis related works of this project.

- Real time defect detection on material
- Quality measurement
- Extracting different parameters of defects.
- Classification of defects as hole, oil stains, missing threads.
- Finding performance characteristics of the proposed method.

BI. 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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V. REFERENCES

[1] S.Priya, T. Ashok kumar, Dr. Varghese Paul, "A Novel Approach to Fabric Defect Detection Using Digital Image Processing" Proceedings of 2011 International Conference on Signal Processing, Communication, Computing and Networking Technologies (ICSCCN 2011), 2011.

[2] Brendon J.Woodford Nikola K. Kasabov and C.HowardWearing, "Defect Detection using image processing", 11th IEEE International Conference on Computer and Information Technology, 176 - 180, 2011.

[3] Te-Li Su, Hua-Wei Chen, Gui-Bing Hong, Chih-Ming Ma, " Automatic Inspection System For Defects Classification Of Stretch Knitted Fabrics" Proceedings of the 2010 International Conference on Wavelet Analysis and Pattern Recognition, Qingdao, 11-14 July 2010.

[4] R. Conners, C. Harlow, "A theoretical comparison of texture algorithms," IEEE Trans on Pattern Analysis and MachineIntelligence, 2(3), pp. 204-222, 2008.

[5] L. H. Siew, R. M. Hodgson, E. J. Wood, "Texture measures for carpetwear assessment," IEEE Trans on PAMI, 10, pp. 92-105.

[6] Zhang Y. F., R. R. Bresee, "Fabric defect detection and classification using image analysis," Textile Research Journal, 65(1), pp. 1-9, 2000.

[7] Jasper, S. J. Gamier, H. Potlapalli, "Texture characterization and defect detection using adaptive wavelets," Optical Engineering, 35(11), pp. 3140-3149, 1996.

[8] W. J. Jasper, H. Potlapalli, "Image analysis of mispicks in woven fabric," Textile Research Journal, 65(11), pp. 683-692, 1995.

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