

MANUFACTURING DEFECT DETECTION IN TEXTILE INDUSTRY USING NEURAL NETWORK

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ABSTRACT

Quality scrutiny is an important aspect of contemporary industrial manufacturing. In textile industry production, automate fabric inspection is important for maintain the fabric quality. For a long time the fabric defects inspection process is still carried out with human visual inspection, and thus, insufficient and costly. The augmentation of fully computerized trap inspection system requires stout and capable fabric defect detection algorithms. The detection of local fabric defects is one of the most intriguing problems in computer vision. Texture scrutiny plays an important role in the automated visual examination of texture images to detect their defects. With the increasing customer demand on fabric variety in fashion market, fabric texture becomes much more diverse, which brings great challenges to accurate fabric defect detection. Therefore, an image processing method for automatically detecting minute scratches in fabrics without human help is introduced to reduce the cost and time waste caused by defects. In this a fabric inspection model, consisting of image preprocessing, image segmentation and image classification, is developed to address the fabric defect detection problem in the apparel industry, especially for fabric with complex texture and tiny defects. The information gathered in classification step is serially sent to microcontroller. If any defects are detected then LCD will be displayed indicating defect send alerting SMS, calls to the authority person and buzzer will be alarmed.

Keywords: Fabric Defect Detection (FDD), Medium filter, Wavelet transform, neural network

INTRODUCTION

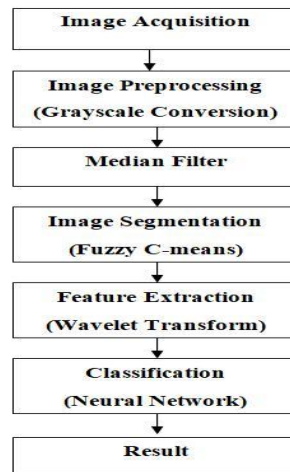
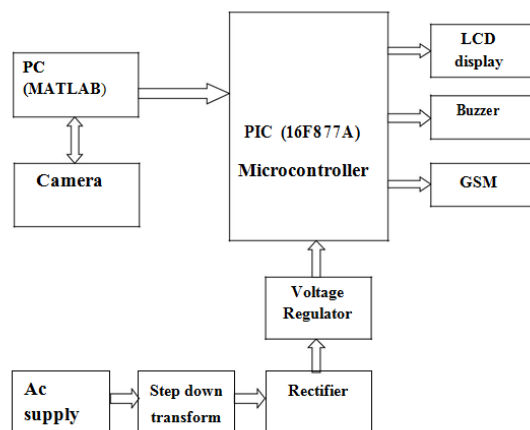
Defect recognition of cloth material is an imperative procedure to manage the eminence of the fabric brand. Different types and categories of fabric product are manufactured by fabric materials in Textile Corporation. Appearance of fabric is referenced by the fabric texture. Textile fabric is the coordination of natural and synthetic fabrics. Synthetic fabric is moderately new for textile industry. It is continuously growing up the development in textile industry. Quality control is increasing day by day and it is an important factor in industrial production. In this regarding textile industry is not an exception. Quality control plays an important role in inspection of fabric. Different categories of weaves are used to fabricate the different fabric consistency. Fault analysis helps to figure out the defects properly, and give indication to appropriate characteristic. If any fault is founded then area of defect and category should be indicated. This is very highly needed in textile industry for manufacturing a good quality cloth. Quality assertion of product is considered as one of the most imperative focuses in the industrial invention. So is textile industry too. Textile product quality is seriously degraded by defects. Manual inspection is time consuming and the level of accuracy is not satisfactory enough to meet the present demand of the highly competitive international market. Hence,

expected quality cannot be maintained with manual inspection. Automated, i.e. computer vision based fabric defect inspection system is the solution to the problems caused by manual inspection[1,2,4].

Automated fabric defect check up system has been attracting widespread attention of the researchers of many countries for years. Therefore, computerized scrutiny of fabric defect becomes an ordinary way to improve fabric quality and reduce labor costs. In the textile and apparel industry, fabric quality inspection plays an important role, as defects on the fabric surface can significantly influence the quality of garments, and thereby impact the benefits of companies. Traditionally, fabric inspection is accomplished by human visual checking, which suffers from high labour cost and low efficiency. Their performance is also unreliable due to human error caused by fatigue and the fact that very small defects are difficult to be identified. Applications of artificial intelligence techniques can offer an efficient and low-cost approach for decision-making in fashion industry. As a result, automated fabric inspection techniques which can be integrated into the existing inspection machine are in increasing demand. Moreover, with the fast development of textile industry, fabric texture becomes more and more diverse and complex. Due to the improvement of weaving techniques, defects are much smaller on such fabric surface, which makes the fabric inspection task much harder. Therefore, it is of paramount significance to develop new automated fabric inspection models which are of higher detection accuracy and efficiency[3,5]. This work presents a novel defect detection model using dictionary learning and image restoration techniques. A novel detection model, which is based on non-locally centralized sparse representation, is developed for fabric inspection. Considered as stochastically distributed noise, fabric defects can be detected by restoring the testing fabric images with the utilization of de-noising techniques. The proposed detection model includes four main parts: preprocessing, filtering, and defect segmentation[6]. In the detection model, gray-level transformation is first applied as a preprocessing step in order to reduce the embedded noise caused by the digital imaging device and enhance the contrast between fabric defects and the background. As the training data, non-defective image patches are divided into C clusters by Fuzzy C-means clustering in the segmentation. In each cluster, a compact sub dictionary will be obtained through Wavelet transform. Based on the conventional regression model, the sparse representation accuracy is improved by exploiting the rich amount of non-local feature redundancies of the images. Finally, defects can be successfully segmented from the residual image of the testing image and the corresponding restored image[7,8].

Proposed System:

In this block diagram first stage is image acquisition for capturing image; this captured image is fed to preprocessing stage. In preprocessing four steps take place first is image conversion that is RGB image is converted into gray level, second is filtering process to remove unwanted noise, and third is image enhancement for brightness or contrast, finally histogram for graphical representation which is based on amplitude and intensity value. Image segmentation is used to segment the image in order to exactly locate where the defect had occurred. Final stage is feature extraction.

FLOW DIAGRAM**Fig 1 Flow chart****Fig 2 Block diagram**

The information gathered from software part is given as input to the microcontroller. Through GSM immediate message is send to concern department manager, LCD will be displayed indicating how much area, width, dimension etc the defects had occurred and finally buzzer will be alarmed for the alerting purpose to everyone about the defects.

IMAGE ACQUISITION

The first stage of any vision system is the image acquisition. In this process, first we take the image of the background where the towel is kept for processing and saved. The image of the background is captured when the towel is placed on the conveyor belt. Here the further processing is done in the form of do-while loop i.e. First the process is undertaken and then the conditions are checked. Thus, the image of the background when the towel was placed is subtracted from the background image saved previously. A threshold is set to select the proper image of the towel. And if

the threshold level of the image captured is equal or greater than the threshold level set before, than only the image of the towel is processed further. Thus on subtraction if we do not get the proper image the image is recaptured followed by the further process.

PREPROCESSING

Image preprocessing simply way that resize the image, histogram equalization& noise removing .In the images the noise is unsystematic alteration in the energy of an image that can be simply removed by using different filtering approaches.

3.4.2.1 Gray Image

In photography & computing, a grayscale /grayscale digital image is an image in the value of each pixel is a single trial, it carryjust intensity information. Images of this sort, also called black-and-white, are unruffled exclusively of shades of gray, untrustworthy from black at the weakest intensity to white at the strongest. Grayscale images are dissimilar from one-bit bi-tonal black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white (also called bi-level or binary images). Grayscale images have lots of shades of gray in stuck between Grayscale images are frequently the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. Infrared, visible light, ultraviolet, etc.), and in such cases they are monochromatic proper only a given frequency is captured. But also they can be synthesized from a full color image; see the section about converting to grayscale.

FILTERING

Filtration is a technique for modify/ enhancing an image. The image filtering is helps to a mixture of applications, such as smoothing, sharpness, noise removal, and edge detection. A filter is simply defined as a small array that can be useful to each pixel of images and its neighbor's pixel of an image.

Median Filter

The key idea of the median filter is to run from end to end the signal entry by entry, replacing each entry with the median of neighboring entries. The pattern of neighbors is called the "window", which slides, entry by entry, over the entire signal. For 1D signal, the most obvious window is just the first few preceding and following entries, whereas for 2D .signals such as images, more complex window patterns are possible (Note that if the window has an odd number of entries, then the median is simple to define: it is just the middle value after all the entries in the window are sorted numerically shown in fig 3.

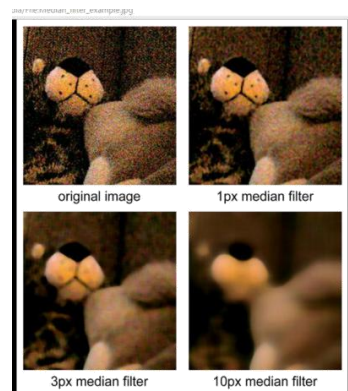


Fig 3 Median filter example

SEGEMENTATION

Segmentation in image processing is simply means dividing the image into multiple segments. Each pixel of an image has same characteristics. Then faulty pixels can easy to be finding by image segmentation. Threshold portioning the pixels in foreground and background parts of image, fault can be easily detected.

FEATURE EXTRACTION

Providing the input data into the group of features is called Feature Extraction of image. Image characteristic gives the useful information about an image and rejects the rest.

WAVELET TRANSFORM

Wavelets are used in medical image processing for making the compression, transmission and analysis of medical images in an easier manner. Wavelet transforms are basically small waves, called wavelet that has varying frequency and limited duration. The exercise of Wavelet transformation is to examine an image into different view at different resolution scales & allows to retrieve the image attributes clearly. Wavelet transform analyses the signal by a group of orthogonal functions in the form of $\Psi_m, n(X)$, that is computed from translation & dilation of the mother wavelet Ψ . These orthogonal functions are shown below,

$$\Psi_{m,n}(x) = 2^{-\frac{m}{2}} \Psi(2^{-m} x^{-n}) \quad (1)$$

m and n are real numbers in this equation. Equation 2 & 3 are used as analysis & synthesis formulas respectively.

$$C_{m,n} = \int_{-\infty}^{+\infty} f(x) \psi_{m,n}(x) dx \quad (2)$$

$$f(x) = \sum_{m,n} C_{m,n} \Psi_{m,n}(x) \quad (3)$$

Coefficients of this transform are obtain recursively. A synthesis of j is shown in equation 4.

$$f(x) = \sum_k C_{0,k} \phi_{0,k}(x) = \sum_k k C_{j+1,k} k^{\phi_{j-D}} d_{j+1,k} \Psi_{j+1,k}(x) \quad (4)$$

Neural Network

ANN known as Artificial Neural Network is a Neural Network that has a natural tendency for storing experimental results. They can provide suitable solutions for complex problems. The major benefit of neural networks is that from the available data a model for a system can be developed. In neural networks, classification of image is done by extracting the features. This helps in achieving the accuracy of classification. The basic architecture consists of three types of neuron layers: input, hidden, and output. In some cases, the activation values of the units undergo a relaxation process such that the network will evolve to a stable state in which these activations do not change anymore.

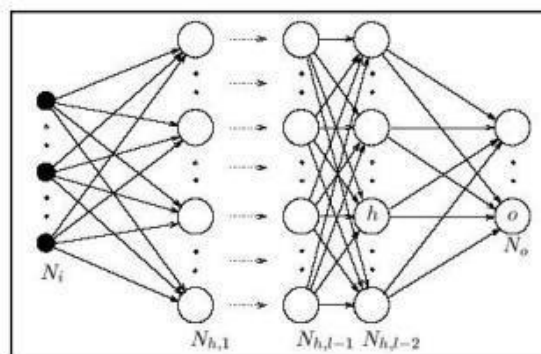


Fig 4 Architecture of Feed Forward Neural Network

Although back propagation can be applied to networks with any number of layers, just as for networks with binary units it has been shown that only one layer of hidden units success to approximate any purpose with finitely many discontinuities to arbitrary precision, provided the activation functions of the secreted units are non-linear. In most application a feed-forward network with a single layer of hidden units is used with a sigmoid activation function for the units shown in fig 4.

EXPERIMENTAL RESULTS

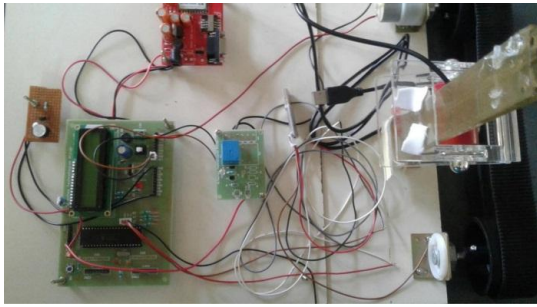


Fig 5 Experimental setup

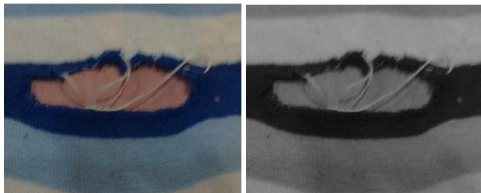


Fig (6): INPUT IMAGE Fig(7): RESIZED IMAGE

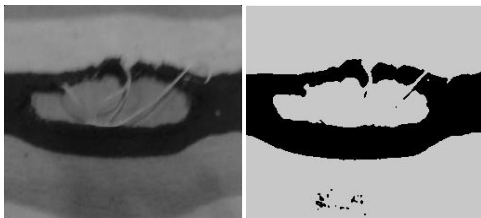


**Fig (8): FILTERED IMAGE
SEGMENTATION**

Fig (9):



Fig (10): CLUSTER 1 Fig (11): CLUSTER 2

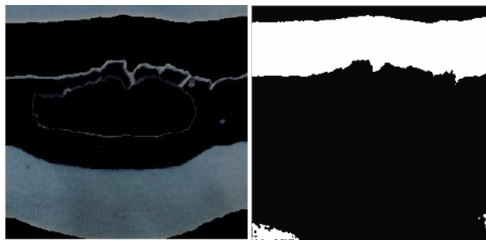


Fig (12): CLUSTER 3 **Fig (13): CLUSTER 4**

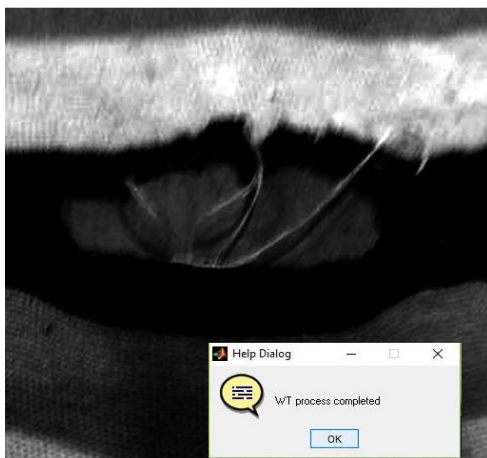


Fig (14): WAVELET TRANSFORM

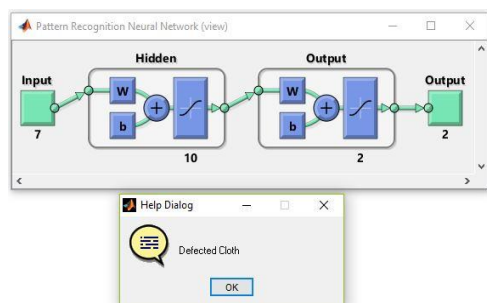


Fig (15): NEURAL NETWORK

In this proposed system(fig5) initially image is converted into gray scale and then filtered by adding some 0.05% noise to it in order to get clear image Fig (6-9). We are using two important methods for defect detection in textile industries. The first part is fuzzy c-mean, which is the method of clustering which allows one piece of data to belong to two or more clusters. The process of

organizing objects into groups whose members are similar in some way. A cluster is therefore a collection of objects which are similar between them and are dissimilar to the object belonging to other cluster Fig (10-14). Second part is neural network that is involved in the classification stage in order to produce exact output regarding area, length, width of the defected cloth Fig (15). By using this two method we get nearly 97% accuracy for the defected part.

CONCLUSION

In this proposed system initially image is converted into gray scale and then filtered by adding some 0.05% noise to it in order to get clear image. We are using two important method for defect detection in textile industries first part is fuzzy c-mean which is the method of clustering which allows one piece of data to belong to two or more cluster, process of organizing objects into groups whose members are similar in some way. A cluster is therefore a collection of objects which are similar between them and are dissimilar to the object belonging to other cluster. Second part is neural network that is involved in the classification stage in order to produce exact output regarding area, length, width of the defected cloth. By using this two method we get nearly 97% accuracy for the defected part. In this project, we proposed a method for automatically detecting defects in textile industry via fuzzy c-mean clustering categorize to reduce the manpower.

REFERENCES

1. Dr. AntoBennet, M, SankarBabu G, Natarajan S, "Reverse Room Techniques for Irreversible Data Hiding", Journal of Chemical and Pharmaceutical Sciences 08(03): 469-475, September 2015.
2. Dr. AntoBennet, M, Sankaranarayanan S, SankarBabu G, "Performance & Analysis of Effective Iris Recognition System Using Independent Component Analysis", Journal of Chemical and Pharmaceutical Sciences 08(03): 571-576, August 2015.
3. Dr. AntoBennet, M, Suresh R, Mohamed Sulaiman S, "Performance & analysis of automated removal of head movement artifacts in EEG using brain computer interface", Journal of Chemical and Pharmaceutical Research 07(08): 291-299, August 2015.
4. Dr. AntoBennet, M "A Novel Effective Refined Histogram For Supervised Texture Classification", International Journal of Computer & Modern Technology, Issue 01, Volume 02, pp 67-73, June 2015.
5. Dr. AntoBennet, M, SrinathR, RaishaBanuA, "Development of Deblocking Architectures for block artifact reduction in videos", International Journal of Applied Engineering Research, Volume 10, Number 09 (2015) pp. 6985-6991, April 2015.
6. A. C. Bovik, M. Clark, and W. S. Geisler, "Multichannel texture analysis using localized spatial filters," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 12, no. 1, pp. 55-73, Jan 1990.
7. N. Dalal and B. Triggs, "Histograms of oriented gradients for human detection," in Computer Vision and Pattern Recognition, 2005. CVPR 2005. IEEE Computer Society Conference on, vol. 1. IEEE, 2005, pp. 886-893.
8. R. M. Haralick, K. Shanmugam, and I.H. Dinstein, "Textural features for image classification," Systems, Man and Cybernetics, IEEE Transactions on, no. 6, pp. 610-621, 1973.

