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Identification of Defects in Fabric using Image Processing

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***Abstract* – Identifying the defects in the fabrics is a very important process in the textile manufacturing industries as it affects the quality of the fabrics manufactured by the industries. The main objective of this project includes reduction in the cost and improves the efficiency, to improve overall reliability and reduce the man power and to find the defective fabric and notify the workmen using an alert sound. Initially, the defects in the fabrics are found manually and only around 60% of the defects areidentified. As a consequence, there is an emerging need for the automation of identifying defects which will improve the quality of the fabrics and satisfy the customers. This proposed project is used to identify the defects in the fabrics by storing the images of the fabrics in a dataset which includes non-defective and defective images of fabrics in a grayscale format. Then, the images are extracted to the working platform software MATLAB. Once extracted, the images of the fabrics are pre-processed to resize images. If the reference and testing images are equal then there is no defect if they are not equal then the images are segmented using Adaptive K-means clustering algorithm and image representation is converted into matrix representation and the defected parts in the fabric images are identified. Finally, the defected parts are highlighted and shown and additionally the presence of the defects is notified using an alert sound using the system's speaker as a soundsource.**

***Keywords* – Fabrics, Defects, Image processing, Adaptive k-means clustering.**

I. INTRODUCTION

Fabric is a cloth or material produced by weaving together cotton, yarn or silk. The fabric has been anintegral part of everyone's life since prehistoric times. It was basically used for clothing purposes. It may also be used for cleaning or tying things together. Not only playing an inevitable role in human's life, but it also influences the economic growth of a country. The harvesting and processing of raw materials such as silk, cotton and the production of garments and the finished cloths play avital
role in economic systems. The development of fabrics has been evolved over the years. The technology of fabrics was continuously evolved from time to time from hand-held spindles to computers that help the users and tries to automate all the phases of cloth production from pattern design to loom operation. Improvisation in fabric technology helps to satisfy the customer and the utilization needs. Ensuring the quality of the fabric makes the manufacturing and production of the garments easy and efficient. There are several defects that need tobe identified in order to manufacture a good quality fabric. A fabric defect is any abnormality in the fabric that is unacceptable by the customers. Due to the increasing claim for good quality fabrics, the defected fabrics are rejected and the total price of a price drops down up to 45%-65% determined by the severity of the defects. As a consequence, there is a prerequisite to improving the quality of the fabrics to cut down the quantity of the rejected fabrics. To improve the quality, initially, it is obligatory to identify the defects present in it and it can be accomplished by automating the process of identifying the defects in the fabrics effectively using image processing.
Major defects that are described to be present in the fabrics include horizontal lines, holes, shade variation, dropped stitches and needle stitches.

II. LITERATURE SURVEY

Literature survey is defined as a text of a scholarly paper, which incorporates this data as well as substantive findings, also as theoretical and method contributions to a selected project.

Fabric Defect Detection Using Activation Layer embedded Convolutional Neural Network (2019)
Wenbin Ouyang, Bugao Xu, Jue Hou, and Xiaohui Yuan proposed a deep learning algorithm for the fabric inspection system using the techniques of image pre-processing, fabric motif determination, candidate defect map generation, and convolutional neural networks (CNNs). The high accuracy of defect segmentation on fabrics with intricate features and the imbalanced dataset

is because of the introduction of a novel pair wise-potential activation layer to CNN. At the pixel level, over 90% of the average precision and recall of detecting defects in the existing images are reached and the accuracy of counting the total defects from the available dataset exceeded around 98%.
The proposed PPAL-CNN was able to locate a defect area on a single yarn or in the fabric motif due to the introduction of the fabric defect probability map as a new activation layer of the CNN. The consistency of the 3-metrics (precision, recall, and F1-score) evaluations on both the 160-images and the TILDA dataset demonstrates that the proposed PPAL-CNN is reliable and robust with various fabric textures and images under different illumination conditions.
Fabric Defect Detection Using Local Homogeneity and Morphological Image Processing (2016)
A.Rebhi, S. Abid, and F. Fnaiech proposed an algorithm for fabric defect detection based on local homogeneity and mathematical morphology. The process consists of mainly two steps. Initially, a new homogeneity image denoted as (H-image) is constructed by computing the local homogeneity of each pixel. Then, for the H-image the classical histogram is calculated to choose an optimal thresholding value to produce a corresponding binary image, which will be used for mathematical morphology to extract the optimal size and shape of the structured element SE. Then, to detect the possible existing fabric defect, the image is subjected to a series of morphological operations with this SE. The results of simulation exhibit accurate defect detection with low false alarms

Robust Fabric Defect Detection Algorithm Using Entropy Filtering and Minimum Error Thresholding (2016)

Mohammed S. Sayed proposed a new fabric defect detection algorithm which is based on entropy filtering and minimum error thresholding. The proposed algorithm has four steps of implementation and the first step starts with Entropy filtering. Texture segmentation among texture filters is done by using Entropy filtering. Texture segmentation is to segment an image into regions according to the regional texture. The regions with similar textures that are long to the same object or class of objects is generated by the process. Entropy is a statistical measure of randomness. According to the entropy equation proposed, the entropy filter generates a texture image where each output pixel contains the entropy value of the surrounding neighborhoods window around the corresponding pixel in the input image. Then, the Estimation of the threshold using the minimum error thresholding algorithm is taken place. In this algorithm, the threshold is estimated automatically from the entropy filtered image and applied on it. Then, get a binary image by applying the threshold on the Entropy filtered image. To remove small objects that have an area smaller than a certain threshold and can be erroneously considered as defects morphological processing is used

Fabric Defect Detection Algorithm Using Morphological Processing and DCT(2013)
Mahmoud Abdel Aziz, Ali S. Haggag, and Mohammed S. Sayed proposed a new algorithm for fabric defect detection
in the textile industry. To detect the fabric defects automatically, the proposed algorithm uses morphological processing and Discrete Cosine Transform (DCT). The main idea of the algorithm is the detection of the difference between the defected and the defect-free areas of the same image of the monitored fabric production line. There are no inputs to the algorithm except the live textile captured image. Therefore, no comparison with pre-captured defect- free images can be made. The algorithm depends on using
Robust fabric defect detection and classification using multiple adaptive wavelets (2005)
X. Yang, G. Pang and N. Yung proposed a system for fabric defect detection and classification using wavelets. The disadvantages of using a single wavelet have been tried to overcome by using multiple adaptive wavelets. For every different fabric defect, a specific adaptive wavelet was designed to enhance the defect region at one channel of the wavelet transform, so that the defect region can be detected by using a simple threshold classifier. A new approach for the classification of defects with correspondence to the multiple adaptive wavelets is due to the efficiency of the multi-scale edge responses to defect regions.

The use of multiple adaptive wavelets yields better performance on defect detection and classification, especially for defects that are not clearly detected by the single adaptive wavelet approach. To identify the defects over 56 images containing eight classes of fabric defects, and 64 images without defects the proposed algorithm can be used.
Defect Detection in Textured Materials Using Gabor Filters (2002)

Ajay Kumar and Grantham K. H. Pang proposed a multichannel filtering approach for the detection of fabric defects. The real-time implementation of this approach requires additional digital signal processor (DSP) hardware despite the several efforts taken to reduce the computational time. There is an increasing demand for low-cost web inspection systems that can run on a simple PC. Such PC- based systems can perform only limited real-time computations. In order to ease the computational load is to reduce the search space. Due to the nature of the weaving process, most of the fabric defects occur either in the vertical or horizontal direction. Thus, the search space should be reduced from a 2-D image to one-dimensional (1-D) signals, obtained from horizontal and vertical projections of pixel values. In this project, an efficient method of fabric defect detection using only the imaginary part of the Gabor function is described.

III. CONCLUSION

The project work has been implemented in a complete working model using the image processing tool MATLAB. The programming in the MATLAB has been comprehended during the implementation. This work includes the study of identification of defects using image in various applications across different fields. The design and verification of Automatic defect identification in the fabrics was made successfully. The main advantage of the current proposed

system is cost efficient, improves reliability and reduces the labour work. Hence, such systems are very much favorable for the textile industries to reduce the utilization of manpower. Therefore, such systems are once implemented on a large scale can bring significant reduction of the cost caused by manual defect identification. The other advantage of the system is it is very simple and can be easily understood so it paved the way for the scope for further improvements

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