REAL TIME VISION SYSTEM FOR THREAD COUNTING IN WOVEN FABRIC

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Abstract - *In garment manufacturing, an automatic sewing machine is desirable to reduce cost. To accomplish this, a high speed vision system is required to track fabric motions and recognize the warp and weft count with high accuracy. This letter presents an innovative framework for thread counting in woven fabric. Our framework includes a module for motion estimation using blob detection and feature matching. In this experiment, the proposed thread based texture tracking system is capable of tracking denim fabric with high accuracy.*

keyword*s*: blob detection, fabric quality, warp and weft count.

1. INTRODUCTION

Woven fabrics are highly structured materials, the appearance and mechanical features of fabrics are influenced by their structures. There are several parameters influencing their structures, such as the weave patterns, the linear density of yarns, and yarn counts. Accurate identification of these structural characteristics offers a tool for fabric appearance evaluation and quality control. In traditional textile industry, the work to analyze fabric structures still relies on manual operations with the help of magnifying glass and a teasing needle, which are very tedious and time consuming. Thus, an automatic analysis of fabric structural characteristics is desirable in order to reduce labor cost and testing time.

Weaving is a textile production method which involves interlacing a set of longer threads (called the warp) with a set of crossing threads (called the weft). This is done on a frame or machine known as a loom. Though the vast majority of weaving is mechanised, some weaving is still done by hand. Fabrics can be made in various strength and degrees of durability, from the finest gossamer to the sturdiest canvas. The factory system of machine weaving produces quantities of standardized material for mass consumption, though some of the finest silks, velvets, table linens, and carpets are still woven on handlooms. Woven fabrics are classified as to weave or structure according to the manner in which warp and weft cross each other.

The three fundamental types of weaving are plain, twill, and satin. The weave pattern known as the twill, shows a diagonal design made by causing weft threads to interlace two to four warp threads. Noted for their firmness and close weave, twill fabrics include gabardine, serge, drill, and denim. This experiment uses denim fabric as the input.

Typically, the inspection process relies strictly on the human eye and it is done after the fabric formation. Even with the well designed automated sewing machines the error cannot be completely reduced to zero. This human inspection system worked well when the amount of wages are small. Later by years, the automation in the production system made the amount of wages to be increased and productivity are faster than ever. Therefore, the traditional visual inspection for thread counting has no ability to cope with today requirements. Moreover, the traditional method are more prone to fatigue over time and inevitably causes small counting errors.

Because of these vast drawbacks of human inspection of counting threads in fabrics, and in order to increase accuracy, attempts are being made to replace the manual visual inspection by automated one that employs a camera and imaging routines to ensure the best possibility of objective and consistent evaluation of fabric quality. These systems are called as Fabric Automatic Visual Inspection (FAVI). These visual inspection not only offer advantage for thread counting but also offers wide potential advantages in analyzing major defects in fabric, to reduce cost of inspection and elimination of human errors. Therefore, automated visual inspection is gaining increasing importance in weaving industry.

2. LITERATURE SURVEY

Before 2008, few surveys of the automated visual inspection (AVI) system are available. Mostly the visual inspection is used for defect detection in woven fabric, which includes finding of weaving defect, oil spill detection, finding loops, missing yarns, thick warp, snag and knot.

But none covered the automatic visual inspection of thread counting, probably due to their wide coverage on inspection problem. Though, the area of defect detection has been a popular research topic for many years yet major techniques for defect detection in fabric are reviewed in recent papers with more or less complete lists of references. The defect detection problem can be identified into three major classical categories: statistical approach, frequency domain approach and model-based approach. Relatively new detection methods which

include learning approaches showed promising results and are worth considering.

The research work relevant to the automation of fabric defect detection is very vast and diverse. It is reasonable to believe that, the results of an automated inspection system rely on its implementation where, the better approach for defect detection is related to the expected defect types. Mainly, all researchers consider this task as texture segmentation and identification problem.

This survey focuses on the defect detection in fabric which are categorized into six approaches. They include statistical, structural, filter based, spectral based, model based and learning.

The statistical approaches includes Bi level and gray level thresholding, auto and cross correlation, Co-occurrence matrix, local linear transform, histogram properties and fractal dimensions.

The structural approaches includes primitive measurements, edge features, skeleton representation, morphological operations. The filter based approaches includes spatial domain filtering, frequency domain filtering, joint spatial/ spatial-frequency domain filtering.

The model based approaches includes Gauss Markov random field model, Textem model, Model based clustering. The learning approaches include Artificial neural networks.

3. EXISTING SYSTEM

The existing system for thread counting in woven fabric is use of magnifying glass and a teasing needle.

FIG 1 MAGNIFYING GLASS

The above FIG 1 shows the traditional way of counting threads in looms. This is placed on the woven fabric to check the thread count. This method is useful when the rate of productivity is less. Later by years the production of wages increased. So, analyzing thread count for large quantity of wages is difficult. Hence the automatic visual system is proposed for counting threads.

The purpose of counting threads is to maintain the count throughout the fabric. On the finished product the defect of thread count would cause the item to be a second. The second is a fabric with a conspicuous defect that affects the saleability.

The major problem of using the existing system is that it leads to human error in counting threads and also causes eye defects.

4. PROPOSED SYSTEM

The proposed system is based on the image processing techniques done in Matlab R2013a. The processing techniques are applied successfully to denim fabric tracking and thread counting.

The recognizing process depends basically on two factors. They include region detection and feature extraction. The algorithm used for yarn region detection is MSER. The algorithm used for feature extraction is SURF.

The first step of processing techniques is loading the test image(denim fabric, may be gray or rgb). The test image is resized(256x256) and converted to gray image. After this process, yarn regions are detected from both the test image and the trained image using MSER detection algorithm. The regions of test and train images are matched. From that, white regions(warp region) are extracted. Based on the centroids, the warp and weft count are done in a certain region. After that count is extended to full image.

SURF algorithm is used for extraction of features that is blob matching(autocorrelation of images).Detection and matching of weave patterns takes place. The result of warp and weft count is displayed in command window.

5. RESULTS AND DISCUSSION

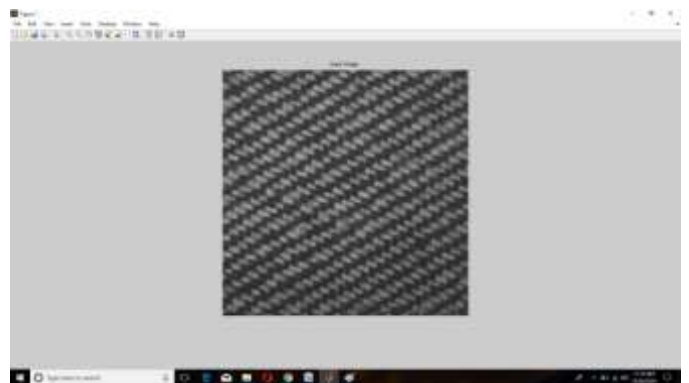The count of warp and weft in woven fabric is shown below with denim fabric as the input.

FIG 2 INPUT IMAGE

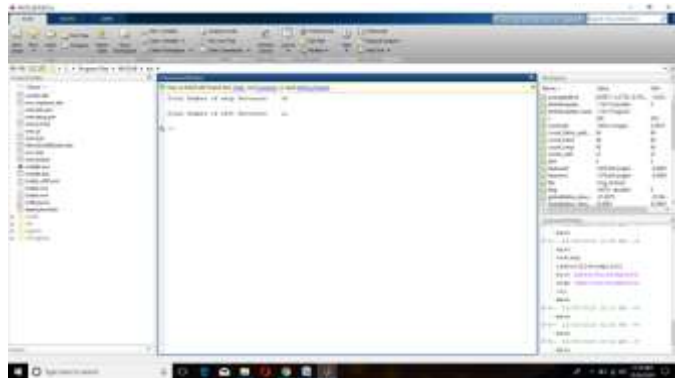The FIG 2 shows the denim fabric as the input image.

FIG 3 OUTPUT

The FIG 3 shows the output image.

The total number of warp patterns 43

The total number of weft patterns 21

6. CONCLUSION

This paper explains the working of automatic system of thread counting that uses the data sets as the input. This method is based on the image processing techniques. This technique is applied successfully to denim fabric tracking and thread counting. Another major step in the future is to develop a real time capturing of images of different fabrics and processing it to find the thread count.

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