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DETECTION OF FOREIGN FIBRES IN RAW COTTON USING HSI MODEL IN MATLAB

Yashika[1], Sanjay Jangra[2]
[1]M.Tech. (ECE), [2]Asst. Prof. Dept. of ECE, AITM, Palwal

Abstract: Contaminants present in cotton have a serious impact on the quality of cotton fiber, particularly in terms of the accuracy and strength of cotton fibers. Manual removal of cotton contaminants is labor-intensive and a slow process. Therefore, in the textile industry, it is necessary to automatically detect cotton contamination because the manual disposal of contaminants has low efficiency. The discovery of cotton contaminants is particularly challenging due to the large number of categories of pollutants that are ambiguous and ambiguous according to their characteristics, size, shape, location and location that are unpredictable as some pollutants enter the cotton fiber layer and become invisible, some of which are the same colour as cotton fibers. The digital image-based image processing algorithm provides accurate and effective detection of pollutants in real time. In this paper, we compare the colour model HSI and YCbCr in the detection and classification of contaminants. To detect different types of contaminants, the automatic threshold is used. After detection, the naïve work is used to distinguish between the different types of contaminants that operate according to the distinct principle extracted from various contaminants of cotton fibers. Shape descriptors such as stretch, rigidity, space, and orientation are used to distinguish categories of contaminants.

Keyword: Image Pixels, Template Matching Process, Convolution Neural network, Foreign Fibre

I. INTRODUCTION

Features of respective image template can be used Cotton is the most popular fabric in the world. It is a natural fiber that is harvested from the cotton plant and is used to make many fabric types. The quality of cotton fiber is degrading due to the presence of contaminants like plastic film, nylon straps, jute, dry cotton, bird feather, paper and various foreign fibers like silk, nylon, polypropylene etc. Contamination of raw cotton can take place at every step i.e. from the farm picking to the ginning stage. Since cotton is picked manually by rural women so human hair, contamination caused by cloth pieces and fabric sheet are the biggest cause of cotton contamination. In addition foreign fibers including cloth strips, plastic film, jute, hair, polypropylene twine and rubber are serious threat to the textile and cotton industry. Such contaminants have effect on cotton grade and can cause color spots in fabric, thus reduce the textile value as well. The blow room machinery [1] plays an important part in reducing the quantity of foreign particles in cotton but even this process can not remove all the contaminants and the leftover embedded pieces of contaminants can affect the quality of yarn and its value and the contaminants such as stones, metal pieces, and etc. causes disturbance to material flow especially affect production as well as quality of the machinery. In the manual process of cotton contamination detection, it is difficult to detect and classify the contaminants due to their unpredictable size, shape, material and position. So, automated instruments for detecting and removing foreign fibers in cotton are now developing to provide high performance and accuracy.

1.1 Challenges

There were several challenges encountered when attempting to develop our algorithm, because cotton images can demonstrate a wide degree of variation in both shape and texture. Appearance variations are caused by individual differences, the detection of foreign fibres due to changes in shape and size, as well as lighting variations. These issues are explained more in the following points:-

- The foreign fiber detection problem is particularly challenging as depends on many factors, some of them are visual and many others are non-visual such as size, shape, colours and. Numbers.
- The visual features that can help in evaluating shape, size, and colour are foreign fiber features are affected by position & orientation.
- The difficulty of acquiring large-scale databases, which covers enough template range with various image images of both pure cotton and foreign fibers, makes the estimation tasks more difficult to achieve.

1.2 Process Overview

Modern cotton processing is very industrialized Production line automation [1]. Crop cotton is separated into seeds and pine bark. One Certain cleaning and elimination of pollution can be Occurs during flushing. Cotton is usually cotton after ginning Classified by quality and some features Material length, strength and uniformity [2]

Figure 1: Selected Cotton is delivered in a cup for yarn production.

That's it we mainly target the yarn production level Application Sync Detection Computer Protection system. In the yarn production line, select cotton from the bow Automatic feeder, and moved by blowing through the sledge. Automatic pollution detection and removal the system is integrated on this line. Insert the camera constantly monitor the location of mobile cotton collection photo.

1.2.1 Image processing system suitable for analysis

Algorithm for collecting images. Whenever pollution It is found that, usually, a portion of the cotton is removed from the flow By using a series of high-speed air guns placed on the flow line. Detailed timing of cotton flow and contaminants Need to remove contaminants The least waste of cleaning cotton. The purified cotton is passed through the post-spinning quantity Map, drawings and rotation levels. All the friends Contaminants can cause the yarn to be fragile and self-respecting Color or thickness, or other serious defects. Finally, the coiled yarn is sent to fabric production. Any remaining contaminants at this stage will make the material worse quality.

1.3 Similar work on foreign fibres detection

We can classify computer processing methods Cotton pollution test about. Two: Color / Intensity Method and Texture / Edge Creation method. Based on color / intensity detection method External fabric made of cotton with pixel value. Texture / Edge Method-based approaches attempt to analyze alien content primarily through the use of methods The differences in texture and foreign body surface were compared Go to cotton. Cleaning usually has a strong structure Made of blurry cotton candles. This leads to fruit texture, and sharp edges around contaminants. Most methods are available some pictures are pre-processed. After the main deal in the steps, the usual threshold determines which pixels belong to it Contaminants. Post-processing steps such as Morphological filters, area increase, and connection Parts analysis and so on are also commonly used reference. [6] One is given A good overview of the system starting with the sensor Inspiration, blowing away foreign objects. Short the review also found [7]. Research has taken place the efficiency of different wavelengths [8] [9]. Before Cotton fabric can be very diverse, a wide range The strategy may need to cover all categories The actual system of contaminants.

1.4 SELECTION OF COLOR SPACE

A. RGB Color Space

The RGB color model is the most basic and the most used hardware for image processing. The color formation, which was originally collected by the Image Capture Apparatus, is the RGB value that is also used in the fiber vessel. The RGB Models uses the three basic components of R, B and G for representation of the color. In this system, all colors are justified in the RGB color bar. The RGB color range, however, has a major disadvantage; the most important is that it is not intuitive, so it is difficult to know the value of a cognitive property of its RGB value. This is one of the RGB color controls one of the non-uniform colors, since the visual difference between the colors is not expressed as the distance between the two colors. In addition, the correlation between RGB is high, and RGB space is sensitive to noise in low intensity field.

B. HSI Color Space

HSI means hue, satisfaction and strength. The HSI model differentiates extra components from image screens into the image image. Therefore, it is a tool for assisting imaging with a variety of genres and genres and culture for people. Therefore, it is a tool for assisting imaging with a variety of genres and genres and culture for people.

C. YCbCr Color Space

External cotton fiber analysis algorithm in the following model compares HSI and YCbCr color. The advantage of the YCbCr model is that it can work with chromium lighting and exposure, in particular by using useful information from the original image as much as possible. The original image is in the form of RGB, so the color scheme must change. There are many colors, where luminance and crumbling components are separated, such as YCbCr, HSV and Lab, etc. The sheet accepts the YCbCr color scheme. We translate the pixel value of RGB space into luminance Y, the blue crown Cb and Red Cr complimentarily in the YCbCr bed.

The conversion formula used is:

$Y = 16 + (65.481 R + 128.553G + 24.966B)$

$Cb = 128 + (-37.797 R – 74.203 G + 112.0 B)$

$Cr = 128 + (112.0 R – 93.786 G - 18.214 B)$

II. LITERATURE SURVEY

Tingting Xie, Yalin Gu, Tao Sha and Yapeng He studied on A Method for Detection of Foreign Body in Cotton Based on RGB Space Model in the year 2011, They said that to identify outside items in the base of the perplexing channel and the cotton layer, a discovery strategy in light of the RGB spatial model was proposed in this article. Concentrate the qualities of cotton bottoms and standard channels to make a spatial example of cotton. The model is then used to process genuine 24-bit shading pictures from an outside material gathering gadget. The consequences of the re-enactment demonstrate that this technique can beat the intricate foundation of the channel and the obstruction of heterogeneous optical strands in the genuine workplace, and can viably recognize remote items. Kadir A. Peker, Gokhan Ozsari Studied on Contaminant and Foreign Fiber Detection in Cotton Using Gaussian Mixture Model, as indicated by him Cotton tainting and outside material discovery Gaussian Mixture show Cotton inquire about is an essential material for the generation of an assortment of textures. It is important to expel the contaminants from the wellsprings of cotton before turning the strands to the yarns. This influences the nature of the item by any outside issue that may bring about inadmissible silk or cotton material and may harm the item. Distinguishing and expelling outside issue and contaminants in cotton is an essential innovation in the cutting edge material industry. PC picture handling and PC vision frameworks have been acquainted with distinguish remote issue in cotton filaments. They portray the

identification technique utilizing Gaussian blended models and criteria in view of the likelihood of the pixel. The proposed approach yields promising outcomes. Ling Ouyang, Hongtao Peng, Dongyun Wang,Yongping Dan, Fanghua Liu studied on Supervised Identification Algorithm on Detection of Foreign Fibers in Raw Cotton, in the year 2012. In this study they said that A mathematical model of gray space for cotton and foreign fibers has been established. Grayscale images, design recognition algorithms and simulation processing. Our approach basically applies to real-time, image processing and algorithm design. Image processing and recognition algorithms need to be further optimized to improve recognition accuracy and real-time. Dongyun Wang, Hongtao Peng, Yongping Dan, Fanghua Liuand Liusong Wang studied on Algorithm on Detection and Identification of Foreign Fibers in Raw Cotton in the year 2011, as indicated by them Foreign filaments in the extent of cotton are little, yet the nature of the texture has a genuine effect. Manual evacuation of heterogeneous filaments, wasteful. With a specific end goal to fulfill the exactness and genuine - time necessities, a machine vision - based question acknowledgment technique is proposed. Conventional recognizable proof calculations are for the most part unpredictable, computationally concentrated, and poor progressively. A scientific model is built up as indicated by the attributes of various fiber pictures. Picture preparing additionally enhances basic picture capacities and plots the usefulness of heterogeneous filaments. This calculation is utilized to recognize remote strands in cotton, and the calculation is straightforward and viable. Chengliang Zhang, Xianying Feng, Lei Li, Yaqing Song studied on Detection of Foreign Fibers in Cotton on the Basis of Wavelet in the year 2010 agreeing them Widespread sinewy cotton fiber lengths influence the nature of cotton generation and the picture preparing framework in light of the eye of the motor gives successful measures to address this issue. The acquaintance of strips with identify outside strands in cotton has incredible potential and great flag and picture preparing highlights. In this paper, the procedure of contamination is isolated into three stages: picture change, tweaking picture and post-handling pictures. The initial step, the shading picture organize is adjusted to the RGB list, which is a rundown of the picture wavelet examination. One-dimensional change mode has been proposed to enhance the picture. Second, the best tree investigation structure is the main looking at PC. By advancing entropy, by evacuating repetitive data, a two-dimensional bundle wavelet lessens the first multiplier by around 90% and spares 99.13% of the vitality. What's more, form new symbolism as customizable waveforms. At long last, the picture was pardoned by utilizing the suitable Wiener channel, and afterward the picture was binarized after the preparing of the bundle. The impacts of picture execution demonstrate that parcels are a viable method to analyze fiber strands. Jia Dong Yao and Ding TianHuai studied on Detection of Foreign Fibers in Cotton Using NIR Optimal Wavelength Imaging in the year 2004, concurring this exploration The best wavelength of close infrared VIR has been resolved for the discovery of a lot of outside filaments in cotton. The best wavelength imaging framework with picture handling calculations has likewise been created. The outcomes demonstrate that this technique makes it conceivable to adequately recognize outside strands that are hard to sort at exhibit. Chen Yajun, Zhang Erhu, Kang Xiaobing studied on Divisional Velocity Measurement For High-Speed Cotton Flow Based on Double CCD Camera and Image Cross-Correlation Algorithm in the year 2013. This article examines the technique for estimating speed in another modern assessment framework. In view of the double CCD camera, a technique for estimating speed of the fast cotton fragment in light of the cross-connection strategy is proposed without changing the structure and the extra cost of the framework. Joined with the genuine utilization of remote strands, the adequacy of the test framework has been tried. Trial comes about demonstrate that this strategy can adequately explain the weaknesses of the regular ultrasonic sensor speed estimation technique, which can be utilized to accomplish rapid cotton stream speed and enhance the situating exactness of the cotton. Zhang Qing, Yang Jiancheng, Teng Teng, Wang Huaqing, Yang Kai1, and Qin Jianfeng studied on Design of Raw Cotton Foreign Fibers Detecting and Clearing On Line System, in the year 2012,This report finished the innovative work of the online location arrangement of different crude cotton strands. The model is finished, the discovery impact is great, hair and other little bits of material identification rate of at least 90%, the littlest recognizable size: 6mm2 sheet, straight 1mm. The framework has a high location limit and is tried before opening. Along these lines, the framework can be connected to the real generation for our material organizations keeping in mind the end goal to make a specific level of financial advantages.

III. TEMPLATE MATCHING PROCESS

A template matching process uses pixels, samples, models or textures as pattern. The recognition function computes the differences between these features and the stored templates. It uses correlation or distance measures. Although the matching of 2D images was the early trend, nowadays 3D templates are more common. The 2D approaches are very sensitive to orientation or illumination changes. One way of addressing this problem is using Elastic Bunch Graphs to represent images. Each subject has a bunch graph for each of its possible poses. Image features are extracted from the test image to form an image graph. This image graph can be compared to the model graphs, matching the right class. The introduction of 3D models is motivated by the potential ability of three dimensional patterns to be unaffected by those two factors. The problem is that 3D data should be acquired doing 3D scans, under controlled conditions. Moreover, in most cases requires the collaboration of the subject to be recognized. Therefore, in applications such as surveillance systems, this kind of 3D data may not be available during the recognition process. This is why there is tendency to build training sets using 3D models, but gathering 2D images for recognition. Techniques that construct 3D models from 2D data are being developed in this context.

IV. TEMPLATE MATCHING ALGORITHM UNDER CONVOLUTION NEURAL NETWORK

One of the basic ways to match a template is to use a wrapper mask (template) designed specifically for the specific functionality of the search image we want to detect. The technology can be easily executed on gray images or edge images. Where the image structure matches the mask structure, the package output is higher, with larger image values multiplied by larger mask values.

A pixel in the search image with coordinates (x_s, y_s) has intensity I_s (x_s, y_s) and a pixel in the template with coordinates (x_t, y_t) has intensity $I_t(x_t, y_t)$. Thus the absolute difference in the pixel intensities is defined as Diff (x_s, y_s, x_t, y_t) = | $I_s(x_s, y_s) - I_t(x_t, y_t)$ |.

$$\mathrm{SAD}(x,y) = \sum_{i=0}^{Trows} \sum \mathrm{Diff}\,(x+i, y+j, i, j)$$

The mathematical representation of the idea about looping through the pixels in the search image as we translate the origin of the template at every pixel and take the SAD measure is the following:

$$\sum_{x=0}^{\mathrm{Sraws}} . \sum_{y=0}^{Scols} \mathrm{SAD}(x,y)$$

S_{rows} and S_{cols} represent the rows and columns of the search image, T_{rows} and T_{cols} represent the row and column in the template respectively. In this method, the lowest SAD estimates the best location of the template within the search image. This method is easy to implement and understand, but it is one of the slowest methods. To achieve fast and reliable exams, we integrated nervous networks.

V. SIMULATION WORK

This paper test contains some cotton images on strange elements of different shape and size. Several images were tested through the simulation model and the size of the image does not depend on the execution time. This depends on the location of foreign fibers and the number of their appearance. The discovery of excellent cascading images reveals strange elements at all times.

VI. CONCLUSION

Cotton pictures were collected from cotton factory. Contaminants present in cotton affect the quality of cotton fibers, so it is necessary to detect cotton contaminants and classify contaminants. We use image processing tools to detect and classify various contaminants of cotton fibers. The research presents the application and analysis of HSI approaches and color spaces to detect and classify foreign contaminants and fibers from cotton. The HIS comparison chart clearly shows the time needed to detect and classify contaminants. Several experiments have been conducted on different cotton images with different contaminants such as bark, leaves, hair and nylon. Etc. The time spent in the full algorithm in the HSI color space is also smaller compared to the Ycbcr color space, as shown in the graph above. For classification, the texture properties of the images are extracted and the Bayes classification algorithm is used to classify the different types of contaminants such as bark, leaves, hair and nylon. It has been shown that training the model with a large amount of test data and with a quick training algorithm would greatly improve the system's accuracy and thus its reliability. The study showed that the error rate for this work is close to zero.

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