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SWT Approach For The Detection Of Cotton Contaminants

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ABSTRACT
Presence of foreign fibers' & cotton contaminants in cotton degrades the quality of cotton The digital image processing techniques based on computer vision provides a good way to eliminate such contaminants from cotton. There are various techniques used to detect the cotton contaminants and foreign fibres. The major contaminants found in cotton are plastic film, nylon straps, jute, dry cotton, bird feather, glass, paper, rust, oil grease, metal wires and various foreign fibres like silk, nylon polypropylene of different colors and some of white colour may or may not be of cotton itself. After analyzing cotton contaminants characteristics adequately, the paper presents various techniques for detection of foreign fibres and contaminants from cotton. Many techniques were implemented like HSI, YDbDR, YCbCR .RGB images are converted into these components then by calculating the threshold values these images are fused in the end which detects the contaminants .In this research the YCbCR , YDbDR color spaces and fusion technique is applied that is SWT in the end which will fuse the image which is being analysis according to its threshold value and will provide good results which are based on parameters like mean ,standard deviation and variance and time.

Keywords:- Cotton Contaminants; Detection; YCBCR,YDBDR,SWT Fusion, Comparison

I. INTRODUCTION

Cotton is a soft, fluffy staple fiber that grows in a boll, or protective capsule, around the seeds of cotton plants of the genus Gossipier in the family of Malvaceae The fiber is almost pure cellulose. Under natural conditions, the cotton bolls will tend to increase the dispersion of the seeds.

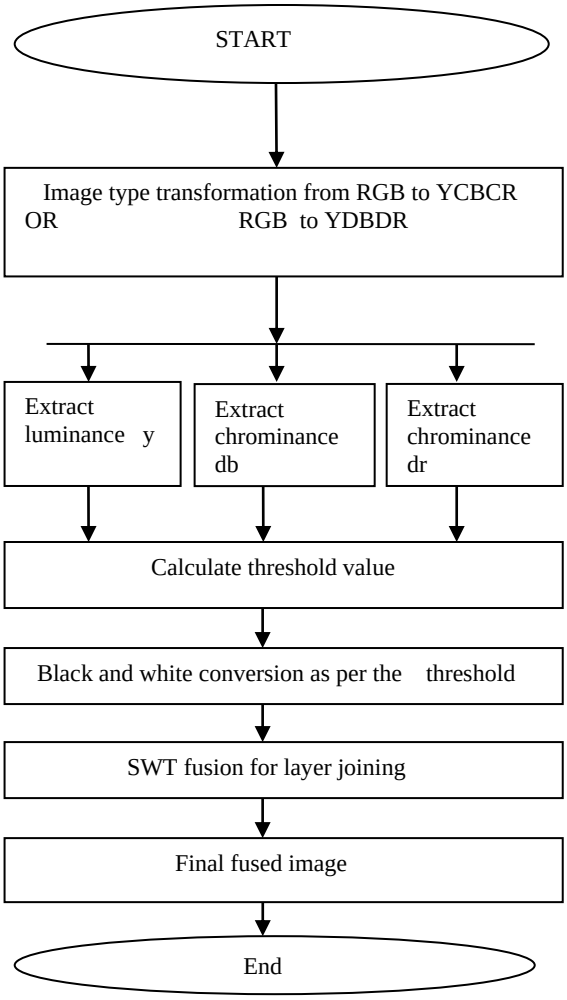
CONTAMINATION is the presence of a minor and unwanted constituent (contaminant) in a material, in physical body, in the natural environment, at a workplace, etc."Contamination" also has more specific meanings in science and in geology. In chemistry, the term usually describes a single constituent, but in specialized fields the term can also mean chemical mixtures, even up to the level of cellular materials.

The quality of cotton fibres is degrading due to the presence of contaminants like plastic film, nylon straps, jute, dry cotton, bird feather, paper and various foreign fibres like silk, nylon, polypropylene etc. [3]In addition foreign fibres including cloth strips, plastic film, jute, hair, polypropylene wine and rubber are serious threat to the textile and cotton industry. Such contaminants have effect on cotton grade and can cause colour spots in fabric, thus reduce the textile value as well. Basically Contamination is "the presence of extraneous and Undesirable substance in yarn which leads to impure the quality of final textile product". Contaminations at yarn stage are mainly categorized in three types:

1. Removal contaminations like dust, rust, mud and washable finish stains
2. Partially removable contaminations like loose fly spun, oil stain and grease stain.
3. Irremovable contaminations like bleached fibre. fibres having optical brightening agent and dyed fibre contaminations which get spun with the yarn.

II. DESIGN OF PROPOSED SYSTEM

Step 1: Get image from source.
Step 2: convert RGB image to any of , YDbDR, or YCbCR .
Step 3: Calculate the threshold value.
Step4: Black and white conversion as per the threshold calculated.
Step 5: Apply Stationary wavelet transform for fusion i.e. layer joining.
Step6: Final image with detected fault
Step 7 : Calculation of parameters
Step 8: Comparative analysis.



FLOW CHART OF COTTON CONTAMINANTS DETECTION ALGORITHM

III. SELECTION OF COLOR SPACE

There are different types of color spaces exist. All the color spaces are for different applications. Selecting the appropriate color space is the primary stage for color image processing. Proper color space can not only save calculation, but also avoid missing useful information as far as possible

A. RGB COLOR SPACE

RGB color space is the most fundamental and commonly used color space of image processing [1]
Color information initially collected by image acquisition devices is RGB value, which is also finally used by color display devices. RGB model uses three basic components values of R, G and B to represent Color. In this system, any color calculated is all within the RGB colorized cube. However, RGB color space has great shortcomings, the main one of which is that it is not intuitionist, so it is hard for us to know color's cognitive attributes expressed by a value from its RGB value. Then, RGB color space is one of the most uneven color spaces, as the visual difference between two colors cannot be expressed as the distance between two color points. In addition, the correlation between RGB is much high, and RGB space is sensitive to noise in low intensity area [1]

B. YCbCr COLOR SPACE

YCbCr, Y′CbCr, or YPb/Cb Pr/Cr, also written as YCBCR or Y′CBCR, is a family of color spaces used as a part of the color image pipeline in video and digital photography systems. Y′ is the luma component and CB and CR are the blue-difference and red. Difference Chroma components. Y′ (with prime) is distinguished from Y which is luminance, meaning that light intensity is non-linearly encoded using gamma correction. Y′CbCr is not an absolute color space; rather, it is a way of encoding RGB information.[13]. The actual color displayed depends on the actual RGB primaries used to display the signal. Therefore a value expressed as Y′CbCr is predictable only if standard RGB primary chromaticities are used.[15] 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)

C. YDbDr COLOR SPACE

YDbDr is composed of three components Y, Db and Dr .Y is the luminance, Db and Dr are the chrominance components. The three components created from an original RGB (Red, Green, and Blue) source. The weighted values of R,G and B are added together to produce a single Y signal, representing the overall brightness, or luminance, of that spot. The Db signal is then created by subtracting the Y from the blue signal of the original RGB, and then scaling, and Dr by subtracting the Y from the red, and then scaling by a different factor.
R, G, B, Y ∈ [0, 1]
Db, Dr ∈ [-1.333, 1.333]
RGB to Y Db Dr :
Y = + 0.299R + 0.587G + 0.114B Db = - 0.450R – 0.883G + 1.333B
Dr = - 1.333R + 1.116G + 0.217B

IV. SWT FUSION

After extracting the luminance and chroma components Stationary wavelet transform fusion is used for layer joining
Image fusion is defined as the process of combining two or more different images into a new single image retaining
Important Features from each image with extended information content. In this paper, we propose an image

fusion approach based on Stationary Wavelet Transform (SWT).

1. Decompose the two source images using SWT at One level resulting in three details sub bands and One Approximation sub band (HL, LH, HH and LL Bands).
2. Then take the average of approximate parts of Images
3. Take the absolute values of horizontal details of The image and subtract the second part of image From first.

D = (abs (H1L2)-abs (H2L2))>=0

4. For fused horizontal part make element wise multiplication of D and horizontal detail of first Image and then subtract another horizontal detail of second image multiplied by logical not of D from first.
5. Find D for vertical and diagonal parts and obtain The fused vertical and details of image.
6. Same process is repeated for fusion at first level.
7. Fused image is obtained by taking inverse Stationary Wavelet Transform.

V. EXPERIMENTS AND RESULTS

Different types of contaminants namely stones, hair, leaves, oil grease, metal wires; papers were selected for the experiments. Adequate samples of each contaminant were prepared and sample of pure contaminant was also prepared for detection. Firstly it was performed with , Ycb,cr then with Ydbdr, then comparison is done with parameters like mean, variance, standard deviation and time.

A. PERFORMED WITH YCBCR

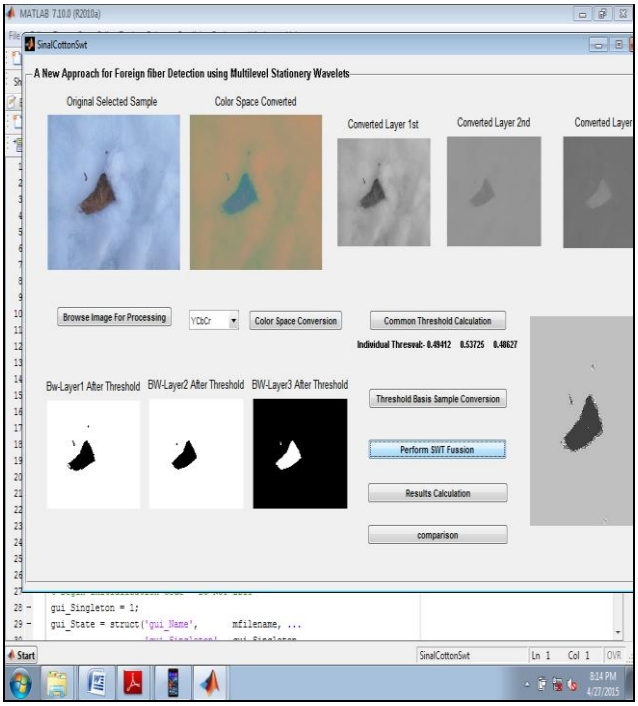


Figure 1

PARAMETERS	PERFORMED WITHYCBCR
STANDARD DEVIATION	14.69
MEAN	158.2
VARIANCE	870.5
TIME	0.06335

Table 1

B. PERFORMED WITH YDBDR

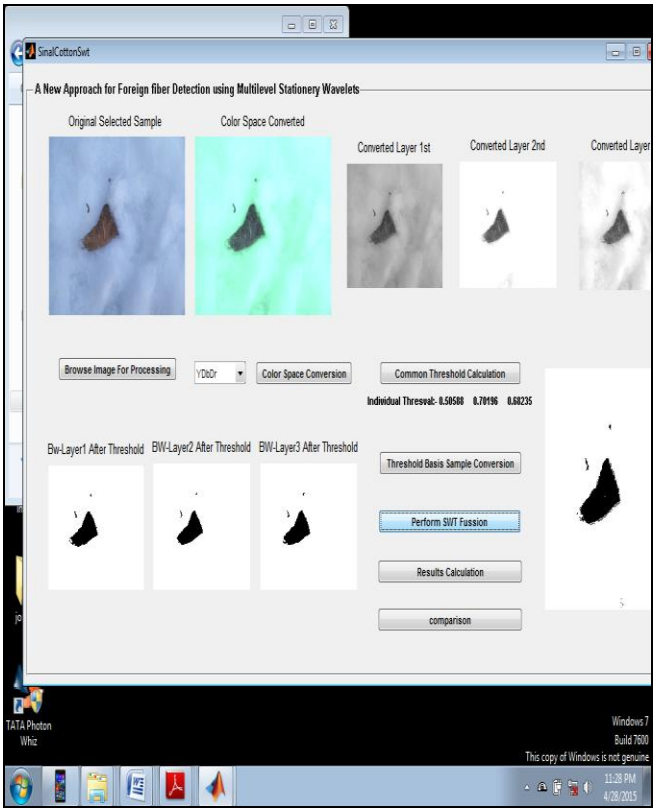


Figure 2

PARAMETERS	PERFORMED WITH YDBDR
STANDARD DEVIATION	27.33
Mean	222.9
Variance	3502
Time	0.03634

Table 2

C. COMPARISON

We compare the two color spaces on the basis of four parameters like mean ,variance,standard deviation and time. That show that YDBDR is on higher side and YCBCR is lower .

MEAN- Figure show that Ycbcr is lower side.Ydbdr is higher side

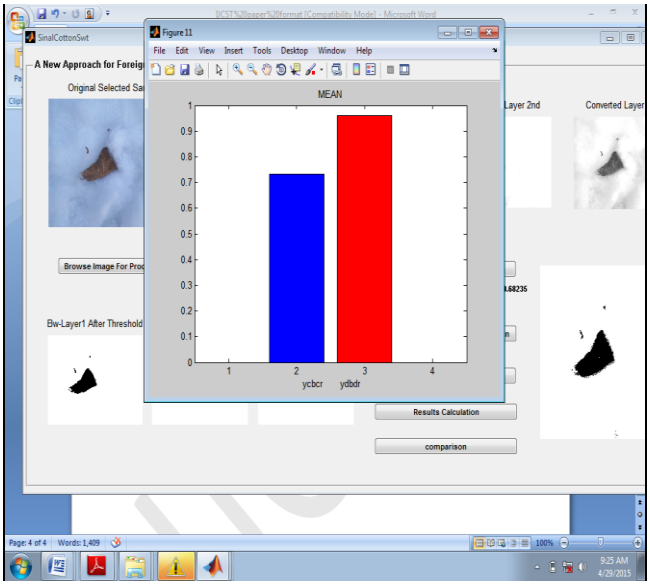


Figure 3 Graph showing the comparison of Mean

VARIANCE- Figure show that variance of ycbcr is least as compared to Ydbdr.

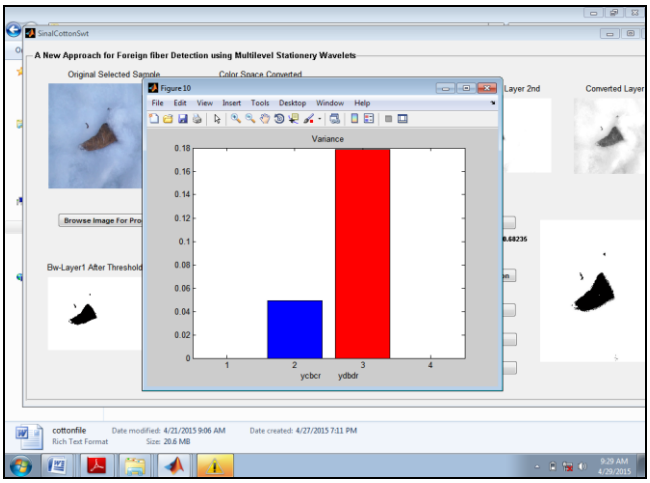


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Figure 4 Graph showing the comparison of variance

STANDARD DEVIATION – Figure show that standard deviation of YDBDR is higher than YCBCR

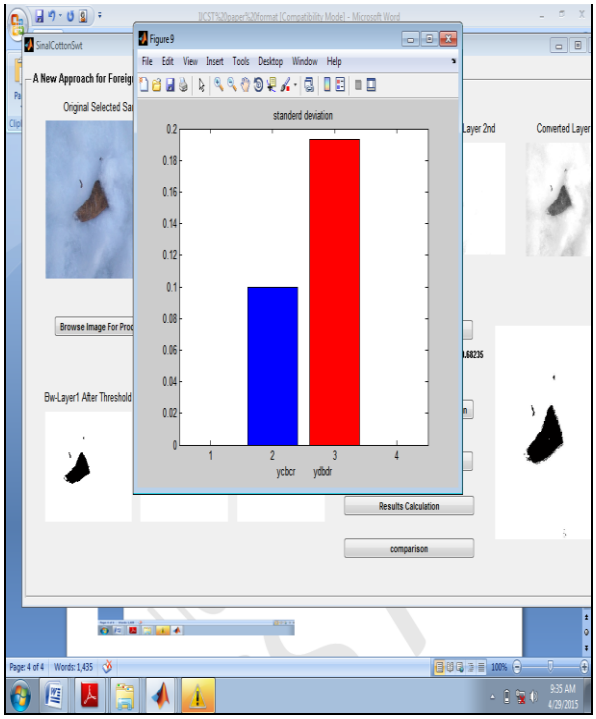

Figure 5 Graph showing the comparison of Standard deviation

TIME- Figure show that YDBDR takes less time as compared to YCBCR

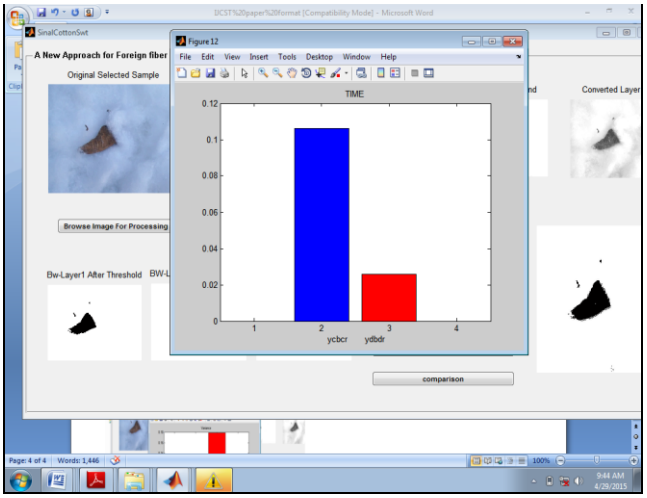

Figure 6 Graph showing the comparison of Time

VI. CONCLUSION AND FUTURE SCOPE

The paper presents the implementation and comparitive analysis of YCBCR and YDBDR Color Spaces for the detection of foreign fibres and cotton contaminants .one of the main objetive of this paper is to detect the contaminants from the cotton with more clearity which was not possible with normal fusion method.so again this implemented with SWT fusion .Graph show the comparision between the two color spaces on the basis of parameters like mean, variance, standard deviation and time. Various experiments has been carried out on different images of cotton having different contaminants like grass, bark insects, fibers of different materials and colors like red, green, black, yellow etc. the performance of this algorithm USING SWT fusion proves that contaminants are clearly visible in these color spaces the performance of this algorithm in YDbDr color space is also better than other previously implemented algorithms. Furthermore it can be implemented with neural networks and other fusion methods.

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