Cartoon and Texture Decomposition for Fabric Images Based Color Transfer

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ABSTRACT

Stripes are periodic defects that are difficult to detect during production even by experienced human inspectors. Therefore, we introduce an image processing method for automatically detecting stripe defects in circularly knitted fabric. Its shows how a barely visible defect can be optically enhanced to improve manual assessment as well as how descriptor-based image processing and machine learning can be used to allow automated stripe detection. Image enhancement is performed by applying gabor and matched filters to histogram-equalized fabric images. Subsequently, we extract image information with different descriptors (LBP, GLCM, HOG) and feed these into random forest and SVM classifiers.The full pipeline is validated by training and testing it on three sets of fabric produced with different knitting machines and parameter settings. Results show that the proposed enhancement combined with a statistics-based descriptor such as GLCM or HOG allows to train both tested classifiers with good classification rates of up to 98.9%.

Keywords:*Image processing methods,Filters,Fuzzy C Means algorithm(FCM),Support Vector Machine(SVM) classifiers.*

1.Introduction

An image may be definedas a two-dimensional function,where x and y are spatial (plane) coordinates,and the amplitude of f at any pair of coordinates (x,y) is called the intensity or gray level of the image at that point.whenx,y and the intensity values of f are all finite,discrete quantities the image is called a digital image.The field of digital image processing refers to processing digital images by means of a digital computer.Note that a digital image is composed of a finite number of elements,each of which has a particular location f(x,y) and value.These elements are called picture elements,imageelements,pels, and pixels,pixel is the term used most widely to denote the elements of a digital image.

Image processing is the study of any algorithm that takes an image as input and returns an image as output. There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

2. Literature Survey

In the textile manufacturing industry, fabric defect detection becomes a necessary and essential step in quality control. The investment in this field is more than economical when reduction in labor cost and associated benefits are considered. Moreover, the development of a wholly automated inspection system requires efficient and robust algorithms. To overcome this problem, in this paper, we present a new fabric defect detection scheme which uses the local homogeneity and neural network. Its first step consists in computing a new homogeneity image denoted as -image. The second step is devoted to the application of the discrete cosine transform (DCT) to the -image and the extraction of different representative energy features of each DCT block. These energy features are used by the back-propagation neural network to judge the existence of fabric defect. Simulations on different fabric images and different defect aspects show that the proposed method achieves an average accuracy of 97.35%.In textured images, discontinuities represent generally an important feature such as boundaries. It is known that the local homogeneity analysis is the method to detect these discontinuities. Moreover, due to their nonparametric nature and their ability to describe complex decision regions, neural network is one of the best classifiers used for defect detection. In this paper, a new approach for fabric defect detection based on the local homogeneity analysis and neural network is proposed.In this paper a novel method is proposed to solve the problem of fabric defect detection, which is based on the local homogeneity analysis and the feed-forward neural networks. A DCT transform based feature extraction method beside the PCA was used. The performance of this algorithm has been extensively evaluated by using images of the PARTNER Textile Texture Database. The comparison with other existing algorithms reported in literature highlights the effectiveness of the proposed approach. The average accuracy of block condition was 97.35%; the results show that the proposed algorithm is a strong technique for fabric defect detection. The algorithm presents some drawbacks, namely, the arbitrarily choice of the windows size of the mask used to compute the -image. This in its turn affects intensively the defect detection of the algorithm. Indeed if the mask size is chosen relatively large (such as) this will homogenize even some different regions and then this will cause some false alarms. If the mask size is chosen relatively small (such as or) this will induce a poor homogenization and, therefore, similar areas (especially in stochastic textures) will be considered as different areas and may be seen as defects by the algorithm.

3. Proposed System

Block diagram: The block diagram consists of fundamentals of image processing techniques.

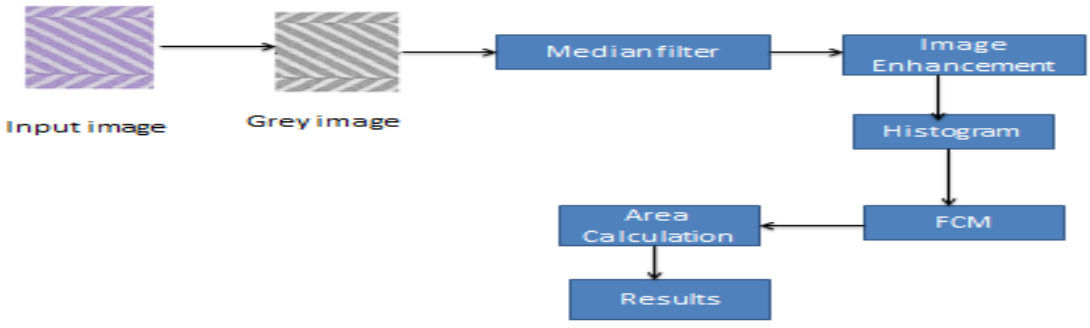

Fig 1.1 Block diagram for decomposition for fabric images

The decomposition for fabric images includes both image enhancement and image segmentation techniques which is shown in the figure 3.1

The term digital image processing generally refers to processing of a two dimensional picture by a digital computer.The 3-D RGB image is converted into 2-D grey image.The median filter is a nonlinear filtering technique,often used to remove noise from an image or signal.Such noise reduction is a typical preprocessing step to improve the results of later processing.A histogram is a graphical representation of the distribution of data.It is an estimate of the probability distribution of a continuous variable(quantitative variable) and was first introduced by Karl Pearson.A histogram output obtained from the overall processing is used for drawing the conclusions for the classification of the faults.Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis.Forexample,you can remove noise,sharpen,or brighten an image,making it easier to identify key features.Expanded form of FCM is Fuzzy c-Means.Fuzzy c-means(FCM) clustering algorithm is one of the most commonly used unsupervised clustering technique in the field of medical imaging.FCM is a method of clustering which allows one piece of data to belong to two or more clusters.Image Segmentation is the process that subdivides an image into its constituent parts or objects.The level to which this subdivision is carried out depends on the problem being solved,i.e.,the segmentation should stop when the objects of interest in an application have been isolated. Feature extraction techniques are applied to get features that will be useful in classifying and recognition of images.Feature extraction techniques are helpful in various image processing applications e.g.character recognition.

A. Preprocessing techniques

Preprocessing techniques are needed on colour, grey-level or binary document images containing text and/or graphics. In character recognition systems most of the applications use grey or binary images since processing colour images is computationally high. Such images may also contain non-uniform background and or watermarks making it difficult to extract the document text from the image without performing some kind of preprocessing, therefore; the desired result from preprocessing is a binary image containing text only.

B. Results

Fig 1.2 Original image

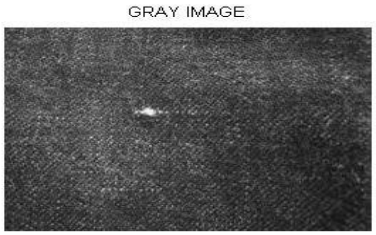

Fig 1.3 Gray image

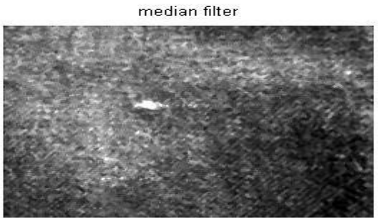

Fig 1.4 Median filter

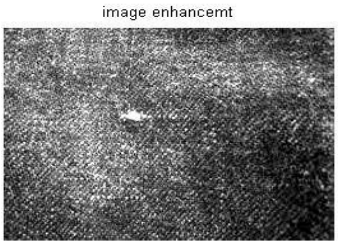

Fig 1.5 Image enhancement

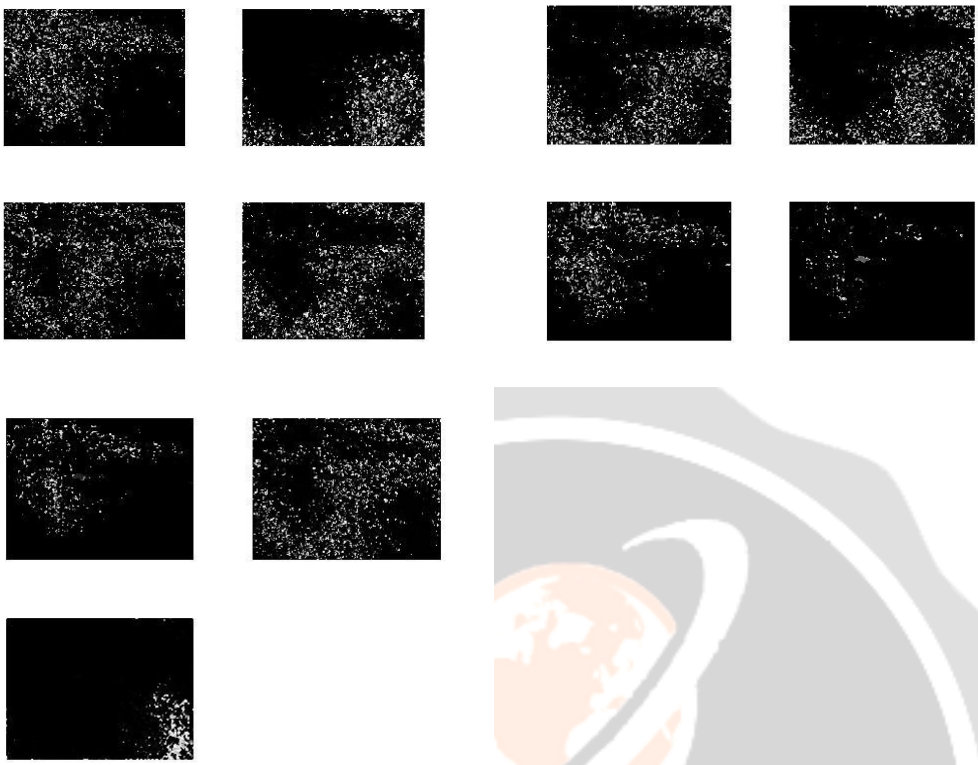

Fig 1.6 Image segmentation using FCM algorithm

Fig 1.7 Conversion of binary image

Fig 1.8 Convert into white pixel using Holesfill

```
numberofpixels =
         50246

TruePixels =
    116

black =
         50130

white =
    116

AREA = 2.843367 cm
```

Fig 1.9 Area calculation

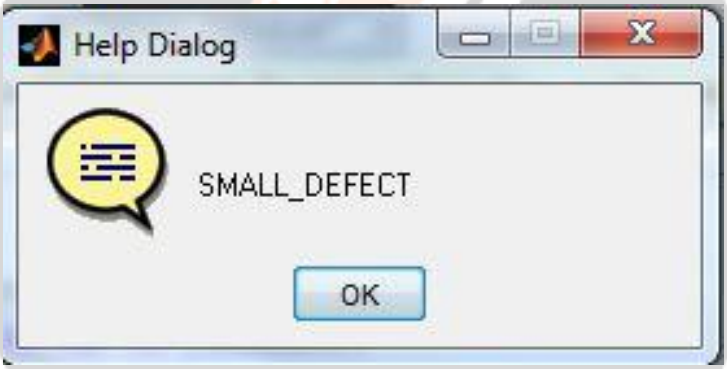

Fig 1.10 Defects

Conclusion

In this paper it is easy to identify faults on fabric images & process by using this method. The manual textile quality control usually goes over the human eye inspection. Human visual inspection is tedious, tiring & fatiguing task, involving observation, attention & experience to detect correctly the fault occurrence. This system is capable of detecting fabrics defects with more accuracy & efficiency. We presented a method for automated enhancement and detection of subtle periodic defects such as stripes in knitted fabric. It was shown that the suggested pipeline allows both a visual enhancement of defect appearance for manual inspection as well as training of a machine learning-based classifier for detecting defects automatically. The method shows excellent classification rates on the current samples.

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