

Image Processing Based Automatic Mesh Quality Analyser

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Abstract— This Paper presents automatic wire mesh Quality analyser. Generally meshes are used in large applications like blood filtering, saline filtering, vehicles etc., In these applications due to mesh defects leads to great loss. So examining the quality of the meshes is very important, because meshes may be defected at the time of manufacturing (or) they may be damaged due to continuous usage. So meshes require regular quality analyser, by doing it manually is time consuming and also requires skill persons. This project is an attempt to develop an automated system which can identify the defects in the meshes and gives quality report and also statistical report of a wire mesh by using region properties and morphological operations [1].

Keywords: Mesh, Region properties, Morphological operations.

I. INTRODUCTION

In the weaving industry a variety of meshes are manufactured, using both metallic and non-metallic materials, for a wide variety of filtration applications. These include oil exploration, blood filtering, saline filtering, manufacture of paper and also in vehicles. In all these areas the quality of the mesh determines the quality achievable with that particular product. For example in the medical applications, the quality and specification of the meshes used in filtering the blood and saline, defects in meshes leads to threat to life.

At present the quality of the mesh is monitored at several stages of the manufacturing process to keep selected parameters within specified limits. This involves stopping the process stopping the Process approximately every half hour, manually assessing the mesh quality, and taking remedial action, as necessary. There is a need to replace these manual checks with an automatic system that can continually monitor the mesh as it is being manufactured. This paper is an approach to get the quality report of mesh, they may be defected at the time of manufacturing or they may be damaged after continuous usage. The approach adopted here therefore, is to use image processing techniques. Early experiments [3] in 1990 GS Virk, PW Wood and ID Durkacz proposed an automatic system that usually comprising of CCD camera, frame-grabber, pc and

Suitable lighting is arranged. Images of mesh can be captured by using CCD camera and frame grabber. Using this system it is possible to determine the mesh parameters continuously i.e. strand diameter, strand concentration, permeability and stacking based on that quality of mesh is determined; this project also based on image processing techniques but in this project approach presented here is different from early experiment [3].

Here we use 12 megapixel camera [7] to automate the project and MATLAB software. Images of metallic or non metallic mesh can be captured through webcam automatically and processing image through the MATLAB program and final we acquire quality report of a wire mesh and also we get the statistics report of wire mesh i.e. length width, area, number of objects deformed, exact and defected etc. Quality report of an wire mesh image contains different marking that indicates object in the wire mesh are deformed, defected and exact based on areas of object.

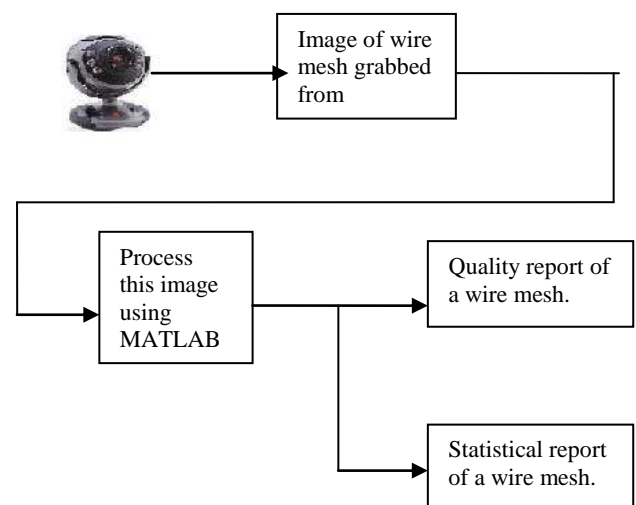


Fig1: Quality report and statistical report of wire mesh

II. APPROACH

Project Requirements:

- i. MATLAB software
- ii. Different types of meshes
- iii. Pc
- iv. 12 mega pixel web camera

In the following we present our approach for automatically getting quality report and statistics of each part of wire mesh. Firstly by running MATLAB program webcam automatically capturing the image of mesh, captured image is processed in the following ways to yield the quality report and statistics of each part of mesh.

A. *Thresholding*

The image is thresholded [1] using a predetermined threshold value. That is, for each pixel, if its grey scale value is greater than the threshold it is set to 255 (white), otherwise it is set to 0 (black), where black pixels represent parts of strands.

B. *Morphological Operations*

It performs morphological operations on binary image. In these morphological operations[1] we use thicken and fill operations. Thicken operation thickens objects by adding pixels to the exterior of objects until doing so would result in previously unconnected objects being 8-connected. This option preserves the Euler number and fill operation fills isolated interior pixels (individual 0's that are surrounded by 1's), such as the center pixel in this pattern.

```
Example    1 1 1
for fill   : 1 0 1
operation  1 1 1
```

C. *Region Properties*

Measure properties of image regions (blob analysis). Regionprops [1] measures a set of properties for each labeled region L. L can be a label matrix or a multidimensional array. When L is a label matrix, positive integer elements of L correspond to different regions. For example, the set of elements of L equal to 1 corresponds to region 1; the set of elements of L equal to 2 corresponds to region 2; and so on. The return value STATS is a structure array of length max(L(:)). The fields of the structure array denote different measurements for each region, as specified by *properties*.

For Example STATS = regionprops (L, I, properties) measures a set of properties for each labelled region in the 2-D or N-D greyscale image I. L is a label matrix

that identifies the regions in I and must have the same size as I. Properties can be a comma-separated list of strings, a cell array containing strings, the single string 'all', or the string 'basic'. The following properties can be calculated on N-D label matrices: 'Area', 'boundingbox', 'centroid', 'filledArea', 'FilledImage', 'Image', 'PixelIdxList', 'PixelList', and 'SubarrayIdx'

D. *Mesh parameters calculation*

The final processed image indicates the each part of the mesh with different marks, that specifies deformed and the cutting spots of wire mesh. The final report also specifies the length, width of each extracted part of image that will be processed using Bounding Box in region properties and also specifies how many wire mesh image parts are deformed and cutted, and exact ones.

III. RESULTS

Figure1, Figure2, figure3,figure4 and figure5 shows the Original image, binary image, complemented image of Binary image, morphological operations applied on Binary image and finally we get the quality report of Wire mesh.



Fig1 indicates Original image of mesh

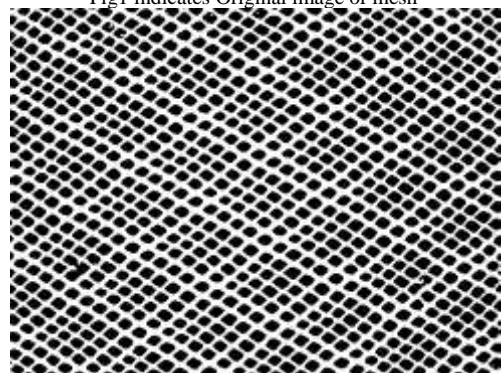


Fig2 indicates Binary image of wire mesh

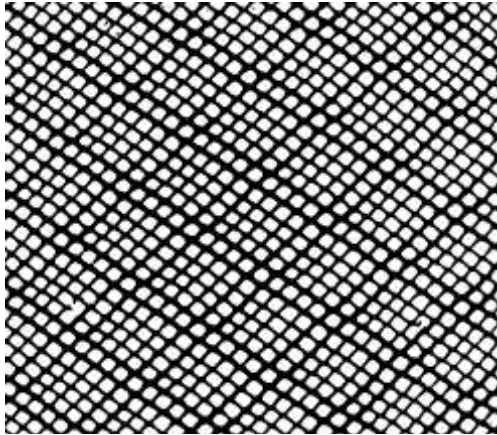


Fig3 indicates complemented image of Binary image of wire mesh

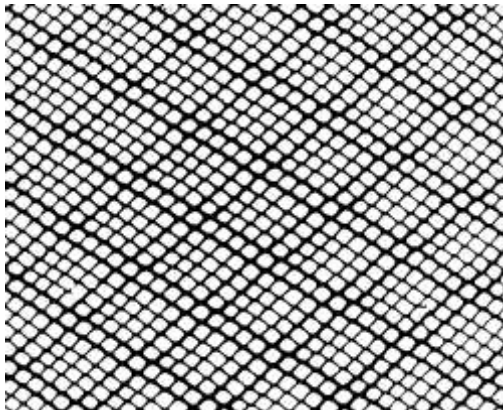


Fig4 indicates morphological operations performed on binary image of wire mesh

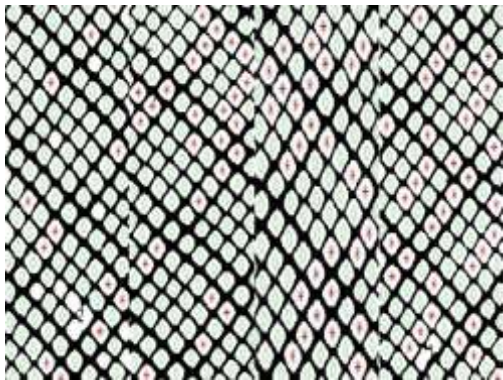


Fig 5 indicates the final image specifying deformed, Exact and cutted spots of each parts of an image

TABLE1 INDICATES STATISTICAL REPORT OF WIRE MESH

Mean of all object width's	20.62
Mean of all object height's	16.52
Mean of all object area's	224.95
Max area	713
Min area	4
No. of objects deformed	650
No. of objects Exact	186
No .of objects defected	2

TABLE 2 INDICATES LENGTH, WIDTH AND AREA OF SOME OBJECTS IN WIRE MESH

Length	Width	Area
15	14	187
14	14	188
13	14	172
13	15	185
13	14	176
12	16	179
12	15	167
12	15	171
12	15	166
12	15	175
13	15	176
12	16	183
12	14	167
12	15	178
13	14	174

IV. CONCLUSION

This project is an attempt to develop an automated system which can identify the defects in the wire mesh and gives the quality report. We implement entire project using MATLAB image processing toolbox [5].

V. FUTURE SCOPE AND ENHANCEMENT OF PROJECT

At present this project is implemented with one static camera and five types of wire mesh products, further work can be done by introducing few more types of wire mesh products and efficient magnifier. Usage of magnifier is to produce better clarity image, where web camera unable to produce clarity image by capturing image directly.

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