FACULTY OF ENGINEERING

DEPARTMENT OF TEXTILE AND GINNING ENGINEERING

YARN DEFECT DETECTION SYSTEM USING IMAGE PROCESSING

BY

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DECLARATION

I solemnly, do hereby, declare to the best of my knowledge that the contents of this proposal was done by only me save for a few references indicted therein, and I would like to point it out that, no one has ever presented or duplicated this proposal or with any of its contents at any institute of higher learning.

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APPROVAL

This is to approve that this proposal has been fully and consistently worked on and submitted to the department of textile and ginning engineering under the supervision of the undersigned supervisors;

SURPERVISORS

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LIST OF ACRYNOMNS

MATLAB	Matrix Laboratory
TPI	Twist per Inch
GUI	Graphical User Interface
USB	Universal Serial Bus
PMD	Percentage Mean Deviation
CV	Coefficient of Deviation
CCD	Charged Coupled Device
CMOS	Complementary Metal Oxide Semiconductor
LBP	Local Binary Patterns
UNBS	Uganda National Bureau of Standards
BMP	Bitmap
Cdf	Cumulative Density Function
JPEG	Joint Photographic Experts Group
PNG	Portable Network Graphics
TIFF	Tagged Image File Format
RGB	Red Green Blue
Ne	English Count

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ABSTRACT

The purpose of this project is to develop an off-line yarn defect detection system by a computerized system based on image processing software. After the yarn is produced, it is wound onto the bobbin package, different yarn bobbins are sampled and sent to the quality inspection department to test for yarn evenness. Yarn defect detection is an important index of quality control in textiles since the unevenness of yarns increases the end breakage rate during post spinning which will ultimately reduce the productivity. In addition, yarn unevenness/defects affect the quality of appearance of textiles.

Methods of yarn defects detection include; Human Visualisation, Gravimetric method, and Electronic capacitive testers (Uster Tester). The Gravimetric method is rarely adopted in general tests because of large computation, slow and laborious. The Human Visualisation is associated with drawbacks such as; results are subjective in nature, tiredness and boredom. The Electronic Capacitive Tester helps get rid of the influence of man-made factors and fast so, it is applied widely to detect yarn defects. However, it has certain limitations such as high cost, testing values are affected by the testing conditions especially the atmosphere state or humidity.

The development in computer technology using image processing (MATLAB) introduces a cost effective yarn defect detection system with few components (i.e. computer, USB Web camera, and Blackboard). The described method in this project represents an effective and accurate approach to detection of yarn defects. In this work, edge detection and scaling techniques are implemented to examine the structural regularity of yarn structures. To improve the efficiency of the technique and overcome the problem of detection errors, parameters of the detection process should be maintained constant. Basing on the methods and materials employed in this project, provide a promising stage for the development of an off-line cost effective defect detection system.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Yarn quality is a growing concern in almost all textile firms in the whole World. This is as a result of the growing size of the textile industry which has in turn led to increased competition for market of the manufactured textiles since quality yarn is the main determinant of the fabric quality.

The yarn quality is being affected by a number of defects which exist in the yarn after the manufacturing process (spinning). The defects may be as a result of drafting irregularities and immature fibres in the raw material. These defects cause yarn breakages during post spinning operations and cause up to 35% loss of the income generated from fabric (Mazharul et al., 2014). Therefore, it is necessary to reduce the defects to a minimum level possible.

It should be noted that the number of fibres in a cross section is an important property of a yarn and the variation of this number along the yarn is the fundamental measure of irregularity. A number of methods are available for measuring yarn evenness and these include; (1) Visual examination method, where the yarn is wound onto the black and a human being compares the blackboard against ASTM spun yarn standard photographs (Grade A, Grade B, Grade C, Grade D and Grade E). However, the results of this method are subjective in nature. (2) Gravimetric method (cutting and weighing method). (3) Electronic capacitance method (USTER Tester 3 or 4), whereby the yarn is passed through a parallel condenser in a continuous fashion and the change of capacitance is monitored electronically, however, this method is associated with inaccuracy of results due to damping of yarn surface hairs, high purchase cost and does not consider variations in relative humidity (A. Sengaputa et al., 2005).

Hairiness is also an important parameter for yarn quality evaluation. It is the measure of protruding fibres extended over the yarn surface. Carvalho et al., (2008) used coherent optical signal processing technique for hairiness measurement and found out standard deviation of the hairiness, coefficient of variation of hairiness and also did spectral analysis based on Fast Fourier Transform. He also continued to use photo diodes for detection of yarn diameter and hairiness and the parallel plate capacitive sensor for mass measurement and incorporated the whole

References

1. V.H. Cavalho, P.J. Cardoso, M.S. Belsley, R.M. Vasconcelos, F.O. Soares, (2008*), Yarn diameter measurement using coherent optical signal processing*, IEE Sens.J.8(11), pp 1785-1793.
2. M. Kunzaki, (2008), *The Algorithms of the Yarn Shape detection and Calibration of Protruding Fibre Length*, MEMSTECH.
3. Behera, B. K. (2004) '*image-Processing In Textiles*', Textile Progress, 35: 2, 1 — 193.
4. R.C. Gonzalez. R.E, Woods, and F.A.Sijai., (1992) '*Digital Image Processing*'. Addison Wesley. Reading, MA. USA. 3rd edition.
5. P Behnam & M Akbar, (2005), '*development of appearance grading method of cotton yarns for various yarns*' RJTA vol.9.
6. D Yuvaraj & RC Nayar, (2002), '*A simple yarn hairiness set up using image processing techniques*' Indian Journal of Fibre & Textile Research vol.37, pp 331-336.
7. Dr Yehia El Mogahzy, (1993), '*Understanding the Fiber-to-Yarn Conversion System*, Part II: Yarn Characteristics, pp 1, 13-16.
8. A.Fabijjaska, L.Jackowska-Strumillo, (2012), '*Image processing and analysis algorithms for yarn hairiness determination, Machine Vision and Application*' vol.23, pp 527-540.
9. Ms. Shubhada.K. Nagrale, Mr. S.T.Bagde, (2013.), '*Application of Image Processing For Development of Automated Inspection System*', International Journal of Computational Engineering Research, Vol. 3.
10. J. G. Campbell, C. Fraley, D. Stanford,F. Murtagh A. E. Raftery, (1999) '*Model based method for fault detection*', Vol.10, P.No.339-346.
11. Application Handbook for Uster Evenness Tester.
12. D.Yuvaraj, R.C.Nayar, (2012), '*A simple yarn measurement set up using image processing techniques*', Indian journal, Fibre Text.Res.37, pp 331-332.
13. V.Carvalho, N.Goncalves, F.Soare, M.Belsley, R.Vasconcelos, (2011) 'An overview over yarn parameterization Methods', vol.2, pp 18-24.
14. B.P.Saville, (1999), 'Physical testing of textiles', Wood head Publishing Ltd., U. K.
15. J. E. Booth, 1961, '*Principles of Textile Testing*', Heywood Books, London.

16. Y. Wang, Q. Chen and B. Zhang, (1999) '*Image enhancement based on equal area dualistic sub-image histogram equalization method*', IEEE Trans. on Consumer Electronics. 45(1): 68-75.

17. Zhang Y. F. and Bresee R. R.: *'Fabric defect detection and Classification Using Image Analysis, Textile Research Journal'*, Vol. 65, pp. 1-9.

18. Wood E., (1991), '*Applying Fourier and Associated Transforms to Pattern Characterization in Textiles'*, Textile Research Journal, 60, pp. 212-220.

19. B.C. Goswami, J.G. Martindale, F.L. Scardino, (1997), *'Textile Yarns-Technology, Structure and Applications, John Wiley and Sons'*, New York.

20. J.G. Vachtsevanos, M. Mufti, and J. L. Dorrity, (1998) '*Method and apparatus for analyzing an image to detect and identify defects'* US Patent No. 5, pp 815,198.

21. Shirley Radack, The System Development Life Cycle (SDLC).