



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**TEXTILE ENGINEERING**

---

**FACULTY OF ENGINEERING**

**DEPARTMENT OF TEXTILE AND GINNING ENGINEERING**

**AN ANDROID APPLICATION FOR AUTOMATIC DETECTION OF YARN  
DEFECTS USING ANDROID STUDIO**

**BY**

**KAKOOZA GEOFREY**

**Reg. No.: BU/UG/2013/90**

**Email: geofkaks@gmail.com**

**Mobile: +256 702744126/787643428**



**Supervisors: DR. NIBIKORA ILDEPHONSE**

**MR. KASEDDE ALLAN**

**A FINAL YEAR PROJECT REPORT SUBMITTED IN PARTIAL  
FULFILLMENT OF THE  
REQUIREMENTS FOR THE AWARD OF A BACHELOR OF SCIENCE IN  
TEXTILE**

**ENGINEERING DEGREE OF BUSITEMA UNIVERSITY**

**2017**

## DECLARATION

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

.....  


KAKOOZA GEOFREY

BU/UG/2013/90

BUSITEMA UNIVERSITY LIBRARY
CLASS No.: .....
ACCESS NO.: <u>FF10468</u> .....

### APPROVAL

This is to certify that the project under the title “AN ANDROID APPLICATION FOR AUTOMATIC DETECTION OF YARN DEFECTS USING ANDROID STUDIO” has been made under my supervision and is now ready for examination.

Supervisors;

Name: Dr. NIBIKORA ILEDEPHONSE

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Name: Mr. KASEDDE ALLAN

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## **ACKNOWLEDGEMENT**

I would love to extend my gratitude to a number of persons with whose efforts have managed to progress and put a landmark in my education.

First and foremost, I would like to thank the almighty God for giving me the strength to carry on with my final year project research.

Sincere thanks go out to Busitema University, department of Ginning and Textile Engineering and most importantly my supervisors Dr. NIBIKORA ILDEPHONSE and Mr. KASEDDE ALLAN for the great work done (guidance and consultations).

I also acknowledge the love and care of my family and loved ones, for all the financial, moral, spiritual, and physical support.

Sincere gratitude will further go to all my relatives especially my lovely father Mr. MUYINGO RICHARD, my mother Mrs. NALUBEGA AGNES and my brothers and sisters plus my other relatives for the great love, moral and financial support in all aspects.

I would like at the same time to acknowledge the Busitema university Born Again Pentecostal church plus the Busitema University Christian Union for the great care granted unto me.

Lastly, to all my course mates with whom I studied with at Busitema University, thank you for the team cooperation.

## DEDICATION

With great honor, I greatly dedicate this report to the almighty GOD, who has enabled me be alive and able to understand the all the research I have carried out concerning my project

I also dedicate this report to my parents; Mr. Muyingo Richard and Mrs. Nalubega Agnes for their hard work, love and support to make me a successful creature through attaining cream education.

I dedicate this report to all the course-mates Asiku Geoffrey, Engola Felix, Ouma Isma, Alibet frances, Bwesigye Edward, Nabasirye Josephine and Aryek Jennifer and on top of that my best friend ojambo henry that have been so cooperative in whatever we put hands on and for the love they show me.

At the same time, I dedicate this report to the Busitema University born again Pentecostal church.

I dedicate this report to the Christian union Busitema University.

## LIST OF FIGURES

<b>Figure 1:</b> <i>problem of expressing yarn evenness</i> .....	11
<b>Figure 2:</b> visual examination method .....	11
<b>Figure 3:</b> Uster evenness tester .....	13
<b>Figure 4:</b> Block diagram of the working of the application .....	19
<b>Figure 5:</b> The gui at the opening of the app <b>Figure 6:</b> Gui for displaying of the results .....	20
<b>Figure 7:</b> The gui while taking the photo of yarn .....	20
<b>Figure 8:</b> The Sequence of Operation (Algorithm) .....	21
<b>Figure 9:</b> The Original image .....	22
<b>Figure 10:</b> The Gray scale image .....	22
<b>Figure 11:</b> Background extraction .....	23
<b>Figure 12:</b> The Binary image .....	23
<b>Figure 13:</b> Thresholded image .....	23
<b>Figure 14:</b> Graph of thick places against yarn samples of ring spun yarn .....	27
<b>Figure 15:</b> Graph of thin places against yarn samples of ring spun yarn .....	27
<b>Figure 16:</b> Graph of neps against yarn samples of ring spun yarn .....	28
<b>Figure 17:</b> Graph of thick places against yarn samples of rotor spun yarn .....	29
<b>Figure 18:</b> Graph of thin places against yarn samples of rotor spun yarn .....	29
<b>Figure 19:</b> Graph of neps against yarn samples of rotor spun yarn .....	30

## **ABSTRACT**

The developed application was expected to be acceptable because of its accuracy, much lower cost, mobility and user friendliness. The application is equally useful for coloured yarns with change of background. The system was used to furnish diameter variation excluding hairs as irregularity measure. But the capacitive tester included mass of hairs in irregularity measurement. Hence, it showed a better representation of unevenness.

It also provided a tester free of electromagnetic interference and radio frequency interference and it was of a much lower price than its commercial counterpart as someone can just share it to you.

## **LIST OF TABLES**

<b>Table 1:</b> Tested defects in Ring Spun Yarn .....	26
<b>Table 2:</b> Tested defects in Rotor Spun Yarn .....	28



## **LIST OF ACRONYMS**

**USB:** Universal Serial Bus

**TPI:** Twist Per Inch

**PMD:** Percentage Mean Deviation

**C.V:** Coefficient of Variation

**U.S.A:** United States of America

**JVM:** Java Virtual machine

**CCD:** Charge Coupled Device

**CMOS:** Complementary Metal Oxide Semiconductor

**MATLAB:** Mathematics Laboratory

**LBP:** Local Binary Patterns

## Table of Contents

DECLARATION.....	i
APPROVAL.....	ii
ACKNOWLEDGEMENT.....	iii
DEDICATION.....	iv
LIST OF FIGURES.....	v
LIST OF TABLES.....	vi
LIST OF ACRONYMS.....	vii
CHAPTER ONE.....	1
INTRODUCTION.....	1
1.1. BACKGROUND OF THE STUDY.....	1
1.2. PROBLEM STATEMENT.....	3
1.3. OBJECTIVES OF THE PROJECT.....	3
1.3.1. Main objective.....	3
1.3.2. Specific objectives.....	3
1.4. SCOPE OF THE STUDY.....	4
1.5. JUSTIFICATION OF THE STUDY.....	4
CHAPTER TWO.....	5
LITERATURE REVIEW.....	5
2.1. KEY WORDS.....	5
2.2. YARN COUNT AND YARN DIAMETER.....	5
2.3. YARN QUALITY.....	6
2.4. YARN FAULTS.....	6
2.4.1. Frequently occurring faults.....	7
2.4.2. Hairiness.....	7
2.4.3. Seldom occurring faults.....	7
2.5. IRREGULARITY.....	7
2.5.1. Types of yarn Irregularity.....	8
2.5.2. Causes of Irregularity.....	9
2.5.3. Expression of Irregularity.....	10
2.5.4. Measurement of Irregularity.....	11

2.6. JAVA PROGRAMMING/ ANDROID STUDIO PROGRAMMING.....	14
2.7. IMAGE PROCESSING IN TEXTILE .....	16
2.7.1. <i>Introduction of image processing</i> .....	16
2.7.2. <i>Image</i> .....	16
2.7.3. <i>Image quality</i> .....	17
CHAPTER THREE.....	18
METHODOLOGY .....	18
3.0. INTRODUCTION.....	18
3.1. DATA COLLECTION .....	18
3.2. DATA ANALYSIS.....	18
3.3. SYSTEM DESIGN.....	18
3.4. TOOLS AND MATERIALS USED .....	19
3.5. IMAGE PROCESSING UNIT.....	20
3.5.1. <i>GUI designing</i> .....	20
3.5.2. <i>Input of count</i> .....	22
3.5.3. <i>Conversion of count to average diameter</i> .....	22
3.5.3. <i>Scaling of the average diameter</i> .....	22
3.5.4. <i>Image acquisition</i> .....	22
3.6. SYSTEM IMPLEMENTATION.....	24
3.7. PARAMETERS OF DETECTION PROCESS.....	24
CHAPTER FOUR: .....	25
TESTING, RESULTS AND DISCUSSION.....	25
4.1. TESTING AND VALIDATION .....	25
4.1.1. <i>Unit testing</i> .....	25
4.1.2. <i>Integration testing</i> .....	25
4.1.3. <i>Application testing</i> .....	25
4.2. RESULTS .....	25
4.2.1. <i>calculations for obtaining the results</i> .....	25
4.2.2. <i>Interpretation of results</i> .....	30
CHAPTER FIVE:.....	31
CONCLUSION AND RECOMMENDATIONS.....	31
5.1. CONCLUSION .....	31

<b>5.2. RECOMMENDATIONS.....</b>	<b>31</b>
<b>REFERENCES.....</b>	<b>32</b>
<b>APPENDICES.....</b>	<b>33</b>

## CHAPTER ONE

### INTRODUCTION

#### 1.1. BACKGROUND OF THE STUDY

Quality assurance for yarn is one of the most concerns taken for the production of a quality fabric in return. This is as a result of the day to day growth 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.

However, Yarn quality is being affected by a number of defects which exist in the yarn after the manufacturing process (spinning). These defects may be as a result of drafting irregularities and immature fibers 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. Therefore, it is necessary to reduce the defects to a minimum level possible.

A number of methods are available for measuring yarn evenness and these include;

**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.

**Gravimetric method** (cutting and weighing method).

**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.

On addition to the defects of yarn, Hairiness is also a booming parameter for yarn quality evaluation. **Hairiness** refers to the degree to which a yarn has fibres or 'hairs' protruding from its main body. It occurs because some fibre ends protrude from the yarn body, some looped fibres arch out from the yarn core and some wild

## REFERENCES;

1. S.B. Zakhour, S. Kannan, and R. Gallardo, *The Java® Tutorial: A Short Course on the Basics*, 5th ed., Addison-Wesley, 2013. Online: <http://proquest.safaribooksonline.com.proxy.lib.ohio-state.edu/book/programming/java/9780132761987>
2. C. Collins, M. Galpin, and M. Kaeppler, *Android in Practice*, Manning, 2011. Online: <http://proquest.safaribooksonline.com.proxy.lib.ohio-state.edu/book/programming/android/9781935182924>
3. B. Goetz, T. Peierls, J. Bloch, J. Bowbeer, D. Holmes, and D. Lea, *Java Concurrency in Practice*, Addison-Wesley, 2006.
4. ASTM D 1425 Test method for unevenness of textile strands using Zellweger Uster capacitance testing equipment.
5. Furter R, *Evenness Testing in Yarn Production*, Parts 1 and 2, Textile Institute and Zellweger Uster AG, Manchester, 1982.
6. A.Fabijjaska, L.Jackowska-Strumillo, (2012), 'Image processing and analysis algorithms for yarn hairiness determination, *Machine Vision and Application*' vol.23, pp 527-540.
7. 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.
8. 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.
9. 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.
10. V.Caryalhó, N.Goncalves, F.Soare, M.Belsley, R.Vasconcelos, (2011) 'An overview over yarn parameterization Methods', vol.2, pp 18-24.
11. 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.
12. Zhang Y. F. and Bresee R. R.: 'Fabric defect detection and Classification Using Image Analysis, *Textile Research Journal*', Vol. 65, pp. 1-9.
13. Wood E., (1991), 'Applying Fourier and Associated Transforms to Pattern Characterization in Textiles', *Textile Research Journal*, 60, pp. 212-220.
14. B.C. Goswami, J.G. Martindale, F.L. Scardino, (1997), 'Textile Yarns-Technology, Structure and Applications, John Wiley and Sons', New York.