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FACULTY OF ENGINEERING

DEPARTMENT OF TEXTILE AND GINNINGENGINEERING

DEVELOPMENT OF A DEFECT DETECTION SYSTEM FOR A WOVEN POLYPROPYLENE BAG USING IMAGE PROCESSING

By

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FINAL YEAR PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF GINNING AND TEXTILE ENGINEERING FOR THE PARTIAL FULFILLMENT OF A BACHELOR OF SCIENCE IN TEXTILE ENGINEERING

DECLARATION

I KITAYIMBWA ZUBAIR declare that this research is my original work and it has never been presented to any academic institution for any reward.

Signature.....

Date.....23/05/2018.....

APPROVAL

This is to certify that this research under the title "**DEVELOPMENT OF A DEFECT DETECTION SYSTEM FOR A WOVEN POLYPROPYLENE BAG**" is being made under my supervision.

Supervisors;

Name: Dr. NIBIKORA ILEDEPHONSE

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Name: Mr. KASEDDE ALLAN

Signature: _____

Date: _____

ACKNOWLEGMENT

I thank Allah who has sustained me and enabled me to reach this stage of my education. If it wasn't His mercy, I wouldn't have reached on this.

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Lastly I thank my brother Bogere Ismail for being there for me may Allah reward his abundantly.

DEDICATION

I this research to my classmates and all 2018 finalists

LIST OF FIGURES

LIST OF ACRONYMS

ANN: Artificial Nuero Networks

C.V: Coefficient of Variation

CCD: Charge Coupled Device

CMOS: Complementary Metal Oxide Semiconductor

GSM: Grams per square meter

MATLAB: Mathematics Laboratory

PMD: Percentage Mean Deviation

ROIs: Regions of interest

TIC: Tesco Industries Company

TPI: Twist per Inch

USB: Universal Serial Bus

ABSTRACT

The main objective of the study was to develop a defect detection system for a woven polypropylene bag using image processing. the system is able to detect the hole defect, shrinkage defect and the missing end defect and therefore if implemented in industries, it can help to improve the
quality of the bags produced. Therefore, according to the results, the objectives that
were set have been achieved. For further research one should try to use other kinds of defects that come in the production woven polypropylene bags to expand on the system.

TABLE OF CONTENTS

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Polypropylene bag industry is a flourishing business in the Ugandan manufacturing scenario with a couple of industries having set ground here such as Africa Polysack, Luuka plastics, TIC Plastic etc. Polypropylene bags are used as packaging materials for various industries such as sugar, Fertilizers, Food grains, Sugar, Cashew nuts, Animal feeds, Barley, Salt, Seeds among others. Unlike other textile companies, the manufacturing quality is highly dependent in the skill of the operator, even though the machines are fully automatic. The industry runs on semi-automatic and automatic machines which have to be maintained by the operator at the optimum condition to produce defect free fabric. Maintenance is a tedious job and is often neglected by the operators leading to the production of defective fabric hence leading to a large number of rejects resulting in an expensive quality control that has to be set up for fabric recovery [1].

The reduction of fabric defects to a minimum is of prime importance from a quality perspective. A process quality control system includes testing & inspecting of fabric, analyzing the observations so made and then making the decisions to improve the performance of the system. As no manufacturing process is 100% defect-free, especially when considering the fabric manufacturing process, the success of the process is significantly highlighted by the success in detecting the objectionable fabric defects to maximum. The frequency and nature of the defects in fabrics determines the quality of the product in terms of grading as well as the price of the fabric.[2]

The defects at present are frequently examined by human inspectors in these companies and the major limitation here is the human perception may vary from individual to individual, high labor cost as well as the time being involved. Chances of missing out the defects by operators is common, mostly due to tiredness, boredom, inattentiveness, fatigue and lack of time and the inspection so done may not be reliable. Thus the method of inspection plays a

significant role in detection of objectionable faults and hence proper grading of fabrics. In order to have maximum benefit from the inspection process, the process should have high degree of accuracy.

Therefore, this gives a rise to the need of a defect detection system which will minimize or even eliminate the short comings suffered by manual inspection method in the production of woven polypropylene bags. The major components of this system include a digital camera along with a software module for identifying defects. The software module uses various image processing tools for enhancement of the images captured and then extracting the variability or the defects.

Image processing technique has been widely used in textile industry and other related industries to detect for defects in the fabric and has given positive results for instance;

S L et al., 2017 developed a fault detection system in fabrics using image processing where captured images with and without defects were loaded into a computer. He applied various MATLAB operations on image which is stored in database, after performing the preprocessing the detected image gives to a controlling system. It is easy to identify faults on fabric images & process by using this method.

Das et al., 2016 applied image processing techniques to detect for defects in jute fabric. He first took an image of faulty fabric as an input to identify the fault in fabric. Then convert it to gray scale image. After converting it into gray scale image he filtered it with the help of best suitable filter. This filtered image would be converted into binary image. And then histogram would be obtained to the faulty fabric image. At the last stage they obtained a grey threshold image as an output. He also said, "It is easy to identify faults on fabric images and process by using this method." This method gave a better result of about 95% of defects are detected compared to around 60% efficiency of manual inspection.

Furthermore Patel, Jain, & Dutta, 2013 applied the same technique and the method classified 85% of defect in fabric and located the defect in the normal fabric at an acceptable rate and provides 80% classification accuracy".

In 2015, Mayanja Augustine from the Department of Textile and Ginning Engineering, Busitema University, designed a system of 'offline detection of yarn faults using image processing' whereby images of standard counts were incorporated and coded in the system

by the use of a USB camera, so whenever an image of a given count was captured, it would be matched (compared) with a defect free image of the same count incorporated in the system.

1.2 STATEMENT OF THE PROBLEM

In Uganda's manufacturing scenario, most companies dealing in the production of woven bags use manual inspection to detect defects in the fabrics. However, manual inspection is characterized by high cost due to its labour intensive nature, the need of hiring much labor force to carry out the inspection from machine to machine running at a speed of 420-900ppm hence increasing the cost of operation of the company. In addition to recruitment of huge staff, efficient staff should be appointed without having any disability; Favorable conditions should be available for the work, that is, uninterrupted power supply and other favorable conditions demanded from management.

It is also found that even a highly trained inspector can only detect 60-70% of the defects at a speed of 15-20m/min.(Vans et al., 2010) Therefore Low accuracy of the system due to tiredness, boredom, inattentiveness, among others on part of the quality personnel and machine operators gives chance to many defects or faults to go unchecked.

Manual inspection is also a time consuming process since inspectors have to move from machine to machine all day and every time stopping them to check for defects hence delaying the production process.

Therefore, due to the problems associated with the existing system of inspection, a more advanced system which can go beyond human limitations and cost effective is needed to contribute to the production of quality products in these companies.

1.3 JUSTIFICATION OF THE STUDY

The study will help polypropylene bag manufacturers to reduce on the operating costs through reducing on the recurrent expenditure on many quality officers.

It will also improve on the accuracy of defect detection since manual inspection is characterized by low accuracy.

The study will also help to reduce on the time taken during inspection.

1.4 OBJECTIVES OF THE STUDY

- To determine the defects in woven polypropylene bags
- To develop a defect detection system for woven polypropylene bags
- To validate the defect detection system

1.7 SCOPE OF THE STUDY

My research will mainly focus on development of a defect detection system in woven polypropylene bag. The defects which will be considered at first will be missing picks and ends, holes and unequal mesh, shrinkage, poor weaving.

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