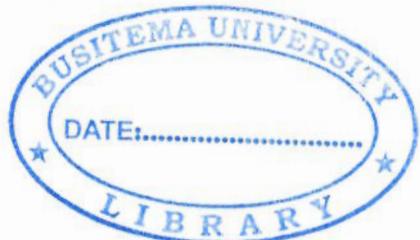


BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING



DEPARTMENT OF TEXTILE AND GINNING ENGINEERING

**PREDICTING FABRIC WEIGHT PER UNIT AREA OF KNITTED STRUCTURE
USING FUZZY LOGIC SYSTEMS**

BY

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**A Research Project Submitted to the Department of Textile and Ginning
Engineering in Partial Fulfillment of the Requirement for the Award of a
Degree of Bachelor of Science in Textile Engineering of Busitema University**

MAY 2015

DECLARATION

I ABAHO VICENT, hereby declare that each piece of information presented in this project is my own work and that to the best of my knowledge has never been submitted by any other person to any institution for an academic award of any kind. The content of this report is the result of research which has been carried out from different sources between the period of September and December

2015

Signature

date...01/07/2015.....



APPROVAL

I hereby do present this project report for approval as supervised for which it's being written. This is to certify that ABAHO VICENT registration number, BU/UG/2011/130 a 4th year student offering Bachelor of Science in Textile Engineering in the Faculty of Engineering at Busitema University, carried out the fore mentioned project.

Dr. Nibikora Ildephonse

Sign.....

Date.....

ACKNOWLEDGEMENT.

First of all, I thank the almighty God for the gift of life and for the knowledge and courage that has enabled me complete my project. Special thanks go to my supervisors, Dr. Nibikora Iidephonse, for his tireless expert guidance, continuous advice, and encouragement offered to me throughout the whole process of preparation of this research project. Thanks also go to Busitema University Ginning and Textile Engineering Department, not forgetting Dr. Nibikora Iidephonse who is the head of the department, for all the guidance and ideas rendered to me by Dr. Nibikora Iidephonse during identification of the research topic and preparation project. Lastly, I thank, all my friends for the ideas shared and all kinds of support rendered during identification of the project topic and during the preparation of the project. May the almighty God reward you.

DEDICATION

I dedicate this final year project report to all the people that have laid a hand in helping me throughout the compilation of this report.

ABSTRACT

The main purpose of this study is to develop a fuzzy model for the prediction of fabric GSM of cotton knitted fabrics as a function of yarn count and knitting stitch length. The most significant key factors yarn count and knitting stitch length affect the GSM of cotton knitted fabrics are very non-linear. Hence, developing a prediction model by using mathematical or statistical approach is very difficult task. Conversely, artificial neural network and neural-fuzzy models are trained using vast amounts of experimental data which are also time consuming process. Fuzzy logic (FL) methodology on the other hand, is a promising modeling tool which performs extraordinarily very robust in a non-linear complex field with least trial data. The prediction model was found to be valid by correlation analysis. The mean relative error, correlation coefficient and goodness of fit from the predicted values were found to be 4.56%, 0.995 and 0.999 respectively. The results show very good performance of the prediction model.

ACRONYMS

ANFIS= Adaptive Neuro-Fuzzy Inference System

ANN =Artificial Neural Networks

GUI=Graphical User Interface

FIS =Fuzzy Inference System

ASTM =American Standard Testing Methods.

BS=British Standard

GSM=Grams per Square Metre

MF=Membership Function

RMSE= Root mean square error.

MSE=Mean Square Error

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Knitting is a process of fabric manufacturing by interlocking series of loops of one or more yarns. Prediction of knitted fabrics properties is one of the most fascinating topics in the knit textile manufacturing due to the increasing demand of diversified product quality and costing. Recently, the demand of knitwear items especially cotton knitwear's like T-shirts, shirts, sweaters, blouses, underwear, casual wear, active wear and sportswear have increased rapidly due exclusive quality characteristics such as elasticity, drape, wrinkle resistance, softness and high comfort compare to woven fabric (*Ertugrul and Ucar, 2000*).

Knitting can be stated as a complex dynamic technological process. During the knitting process, yarn is exposed to tension; therefore the fabric is in a deformed state. The relaxation process starts after taking the fabric from the machine, which causes a change in the dimensions of knitted fabrics. Dimensional changes in knitted fabrics occur during the actual knitting process as well as in the process of dry and wet relaxation. Fabric shrinkage is a serious problem for knitwear, originating from dimensional changes in the fabric, particularly in the stitches (Doyle, 1953).

The Fabric GSM however, is one of the most important physical properties among all the qualities of cotton knitted fabrics. Basically, GSM (gm/m²) is the weight per unit area of fabrics and GSM is directly related to the fabric weight. For readymade garments, costing of a garment depends on the fabrics weight or fabrics GSM (*Shaikh et al, 2012*). The present textile knitting industry is facing tremendous challenge, due to the short life cycle of product development, increasing product diversity, high demand of product quality as well as product costing in

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