BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF TEXTILE AND GINNING ENGINEERING

CLASSIFICATION OF WOVEN FABRICS USING PRINCIPAL COMPONENTS ANALYSIS (PCA)

BY

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DECLARATION

I TIGALANA DAN Reg. No BU/UG/2012/156 hereby declare that this project report is my original work and that the information contained in this report is out of my hard work and research, except where explicit citation has been made and it has not been presented to any Institution of higher learning for any academic award

15TH MAY, 2016

Signature Date

APPROVAL

This is to certify that the project under the title "*woven fabric classification System*" has been done under my supervision and is now ready for examination.

Supervisors;

Name: NIBIKORA Ildephonse

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Date: _____

Name: TUSIIMIRE Yvonne

Signature: _____

Date: _____

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ABSTRACT

Intelligent Analysis Systems (IAS) are gaining recognition in developing countries, Uganda inclusive. This report describes the various components of the development of a *woven fabric classification system*. Multi-dimensional set of data of fabric physical properties from 15 fabric samples was used as the input data to the system. The data was analyzed using PCA to extract the selected four PCs. Using the extracted PCs, k-means clustering was performed to obtain three fabric clusters (k=3) and thus fabric classes (A, B and C). The system was developed using a single layer feed forward backpropagation NN in the names of a perceptron. Training was done for 467 epochs and there after r-square was calculated to determine the performance of the modelling network. Linear regression was used for comparision of performance. Also the performance of linear regression was determined using r-square.The intelligent classification system has the potential of making the public textile market well balanced because the buyers/customers will not be exploited since they will be correct fabric classes to be purchased.

LIST OF ACRONYMS.

PCA.....Principal Component Analysis

PC.....Principal Components

SVD.....Singular Value Decomposition

ANOVA.....Analysis of variance

ICA.....Independent components Analysis

FA.....Factor Analysis

ED.....Eigen Decomposition

RP.....Random Projection

NMF.....Non-negative Matrix Factorization

NN.....Neural Network

AATCC.....American Association of Textile Chemists and Colourists.

ASTM.....American Association of Textile Material testing.

ISO.....International Standard Organisation

TABLE OF FIGURES

LIST OF TABLES

Table of Contents

CHAPTER ONE INTRODUCTION

1.0 INTRODUCTION

This chapter consists of the background of the study, problem statement, objectives of the study, justification, significance, scope and the limitations.

1.1 BACKGROUND

Fabric class is of prime importance in determining the suitability of a fabric for a specific end use. The fabric should possess a set of fabric properties or parameters to fulfil the requirements expected by the textile product. Textile fabrics are manufactured for many different end uses, each of which has different performance requirements. The overall fabric class comprises of three major components, namely physical properties, chemical properties and the visual appearance of the fabric. The chemical and physical structures of a fabric determine how it will perform and ultimately whether it is acceptable for a particular use. Fabric test methods have been designed to measure physical and chemical fabric properties. National and international organizations such as ISO, ASTM, and AATCC develop and publish standard test methods as well as standard performance specifications that are used to ensure product quality in the market place and to facilitate global trade (Collier and Epps, 1999).

In current fabric evaluation systems being used it can be found that subjective measurement techniques & objective measurement techniques are mainly used to evaluate fabric handle. In subjective measurement fabric is evaluated by hand feel & tactile sensation as demonstrated by (Luible et al. 2007). Because hand feel is subjective there may not be a consistent assessment and there are methods which are introduced to measure the fabric handle by fabric mechanical properties according to (Kawabata and Niwa, 1991). And also prevailing systems include measuring garment appearance quality as demonstrated by (Geršak, 2002) and fabric comfort to determine the wearability according to (Raj and Sreenivasan 2009).

Evaluating fabrics by testing & measuring the individual properties separately will not give an overall quantifiable measure of the class of a particular fabric. Because the influence fabric properties have on the fabric class may vary with the property analysed. A certain fabric may

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