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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.

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DEDICATION

I dedicate this report to my lovely brother Mr. WAMUKO Robert, my sister-in-law Miss. NDANGIRE Rose, my father Mr. WAMUKO TIGAWALANA Godfrey and all my relatives for their hard work, great love, moral and unconditional support to make me a successful creature through attaining cream education.

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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 comparison 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

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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 (Lujble 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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