Geometrical Modelling of Stitch class 504 and Jacquard Warp Knitted Fabric

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Abstract

This research revolves around the geometrical modelling of stitch class 504 and jacquard warp knitted fabric for the prediction of sewing thread consumption for the stitching of an article and for the prediction of yarn consumption in knitted structures and improvement of warp knitting simulation software i.e HZCAD respectively. The thread is a basic fundamental raw material for garment manufacturing industry. After considering thread's performance and appearance the major attention is to resolve the cost. The objective of this project is to develop a geometrical model for stitch class 504, to predict actual required thread consumption and its actual thread cost and to develop the garment. It was concluded that the derived geometrical formula predicted the thread consumption accurately up to 90.34%. In the same way the same geometrical modelling technique was applied on the jacquard wapr knitted favric for the prediction of the yarn consumption also the models were used to improve the warp knitting simulation software. In the industry these geometrical formula can save time and can be helpful in calculating the costing of thread/yarn. It will expand profit margin and save time.

Keywords: Geometrical Modelling; Jacquard Warp Knitted Fabric; Yarn Consumption Estimation; Formula Of Yarn Consumption; Sewing Thread Consumption; Stitch Class 504

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1 Introduction

Geometric modelling is known to be a branch of applied mathematics and computational geometry that studies ways and algorithms for the mathematical description of shapes [1]. Now-a-days most geometric modelling are performed with computers and for computer-based applications. Two-dimensional models are necessary in processors typography and technical drawing [1, 2].

The sewing thread is a key supplying unit for garment industry considering it as an important material. Purpose of sewing thread is to stitch garment or used for decorative purposes. Sewing thread significantly effect on garment production and on its quality [1]. After considering thread's performance and appearance then major attention is to settle its cost. Thread cost can be define as the cost of actual thread that used in garment production, thread wastages during sewing and unused thread in stock. If the thread is faulty it rises the production cost and causes more threads

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breakages [1]. So the usage of good quality sewing thread can increase the profit of the garment industry [2]. Moreover, seam failure might occur during garment life cycle by using inappropriate sewing thread for sewing. As more precise the sewing thread consumption is define the more garment quantities we make and more we avoid unused stock.

Different types of stitches are applied on a garment to perform a sewing operation [2]. According to International Organization for Standardization (ISO) 1991 class 504 is an over edge chain stitch with complex stitch structure whose geometry is underneath deliberation. This class is mostly used for joining two or more plies together and sergeing to stop fabric fraying [2].

The yarn is considered as a basic and important material of every fabric material. Yarn significantly affect the appearance, feel, texture, balance, proportion and quality of the warp knitted fabric. After yarn selection cost of the yarn is resolved. Yarn cost can be defined as the cost of actual yarn that is used in warp knitted fabric production, yarn wastages during winding, rewinding, warping, beaming, unused yarn in stock etc [2].

The objective of this project is to develop a geometrical models for stitch class 504 and simple jacquard warp knitted fabric. The models for stich class 504 was used for the prediction of the thread consumption for the making of the garment. The models for warp knitted fabric was then utilized to predict actual required yarn quantity and its actual yarn cost. There are large research available on yarn properties which effect yarn consumption [1, 3]. This paper will talk about the geometry of the warp knitting jacquard fabric, make a mathematical formula for it and check the accuracy of the formula.

2   Problem Formulation

Geometric models are typically distinguished from procedural and object-oriented models that outline the form implicitly by an opaque algorithmic rule that generates its appearance [4]. However, these distinctions are usually blurred: as an example, a digital image can be taken as a group of squares; and geometric shapes like circles are outlined by implicit mathematical equations [6, 7]. Also, a shape model yields a constant quantity or implicit model once its definition is truncated to a finite depth [8, 9].

A stitch is a configuration made from the intra-looping, inter-looping or interlacing of yarns(s) in a specific repeated unit on the material, in a material, through the material or without the material
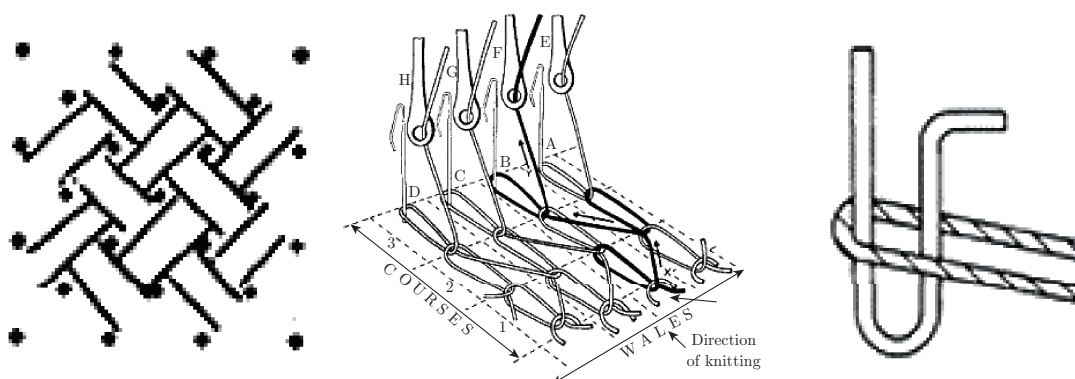

Fig. 1: Interlacing, interlooping and intralooping (left to right) [11]