A STUDY OF DESIGN AND DEVELOPMENT OF "*SONGKET*" WEAVING AUTOMATIC MACHINE

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A Study of Design and Development of "*Songket*" Weaving Automatic Machine

Thesis submitted in accordance with the requirements of the University Teknikal Malaysia Melaka for the Degree of Bachelor of Engineering (Honors) Manufacturing (Robotic and Automation)

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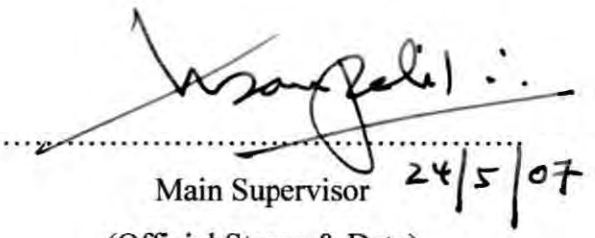

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DECLARATION

I hereby, declare this thesis entitled "A Study of Design and Development of "*Songket*" Weaving Automatic Machine" is the results of my own research except as cited in the reference.

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DEDICATION

To my beloved mother
Madam Fatimah binti Abdullah

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ABSTRACT

"*Songket*" is a traditional hand woven cloth of the Malays and its beauty lies on the design of the "*songket*" motifs intricately woven on the cloth. With the modern technology now, "*songket*" are still manufacture with the traditional method and traditional machine. Using the traditional machine, it takes a long time to manufacture the "*songket*". Because of that the price of the "*songket*" is expensive. In order to making the "*songket*" process fast and still with the high quality, it is need to design and development the new "*songket*" weaving machine with using the automation technology. With the development the direct labor cost are reduce too. To design and the development the automatic "*songket*" weaving machine, a study about the process making traditional machine are did. The study was including with the "*songket*" pattern and working mechanism traditional weaving machine. An exploratory design for "*songket*" weaving automatic machine, the systems are developing from an existing version. Structures, mechanisms, and systems modeling are useful and used to introduce the flow of overall process for the design of "*songket*" weaving automatic machine. The new concept in design and development of "*songket*" weaving automatic machine is the application of automation part for the machine mechanism, the machine will design and develop are still with the traditional working mechanism but use with the automation system and automation component likes dc motor, pulley, belt and other components are related.

ABSTRAK

Songket adalah merupakan satu fabrik tenunan tangan warisan melayu dan kecantikan dan keunikan songket adalah terletak pada motif tenunan yang rumit yang terdapat pada songket. Dengan zaman yang berteknologi, songket masih di hasilkan dengan menggunakan kaedah tradisional dan mesin tradisional. Dengan menggunakan mesin tradisional, masa yang diambil untuk menyiapkan songket adalah panjang. Kerana itulah harga songket adalah mahal. Oleh itu untuk mempercepatkan proses menghasil kan songket tetapi dengan kualiti yang tinggi, satu rekabentuk dan pembangunan mesin songket diperlukan dengan penggunaan teknologi automasi. Dengan pembangunan mesin baru ini, kos buruh dapat dikurangkan. Untuk merekabentuk dan membangunkan mesin songket automatik ini, pembelajaran cara penghasilan songket dengan menggunakan mesin tradisi adalah perlu. Pembelajaran adalah termasuk paten songket yang dihasilkan dan mekanisma yang berlaku pada mesin tradisional dalam menenun songket. Dalam mendalami rekabentuk, analisis, dan proses untuk mekanisma mesin songket, sistem-sistem dimajukan seperti daripada yang digunakan sekarang. Struktur, mekanisma, dan sistem permodelan amat berguna untuk mewujudkan pergerakan keseluruhan proses dalam penghasilan rekabentuk mesin songket automatik. Pembaharuan dalam rekabentuk dan pembangunan mesin songket automatik ini adalah penggunaan alatan automasi untuk mekanisma mesin yang di rekabentuk, mesin yang direkabentuk adalah masih menggunakan mekanisma kerja seperti mesin tradisional tetapi mesin yang direkabentuk adalah menggunakan sistem automasi dan alatan automasi untuk membolehkannya bergerak secara automatik.

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LIST OF ABBREVIATIONS

CAD	-	Computer Aided Design
CADD	-	Computer Aided Design and Drafting
CAID	-	Computer Aided Industrial Design
DC	-	Direct Current
FME	-	Faculty of Manufacturing Engineering
PSM	-	Projek Sarjana Muda
QFD	-	Quality Function Deployment
RM	-	Ringgit Malaysia
UTeM	-	Universiti Teknikal Malaysia Melaka

LIST OF SYMBOLS

g	-	Gravity
h	-	Hour
m	-	Meter
mm	-	Millimeter
s	-	Second
%	-	Percentage
/	-	Divide

CHAPTER 1

INTRODUCTION

Weaving is an ancient textile art and craft that involves placing two sets of threads or yarn made of fiber called the warp and weft of the loom and turning them into cloth. This cloth can be plain in one color or a simple pattern, or it can be woven in decorative or artistic designs, including tapestries. There are many kinds of weaves, starting with a basic single layer plain weave and evolving into infinitely complex weave structures. Many traditional weave patterns are well known to weavers by their traditional names such as overshot and twill. (R.Brown, 1978, The weaving, spinning and dyeing book)

The majority of commercial fabrics, in the West, are woven on computer-controlled Jacquard looms. In the past, simpler fabrics were woven on other dobby looms and the Jacquard harness adaptation was reserved for more complex patterns. Some believe the efficiency of the Jacquard loom, and the Jacquard weaving process makes it more economical for mills to use them to weave all of their fabrics, regardless of the complexity of the design. However, an industrialist weaving large runs of simple plain weave fabric may need to be convinced of the logic of investing in Jacquard machines, when a much lower cost loom would suffice. (M. E. Pritchard, 1956, A short dictionary of weaving)

With the Malaysian cultured, the most famous of the weaving textile is "*songket*" weaving. The majority of the weaving for the "*songket*" in Malaysia is still made with the traditional machine. "*Songket*" weaving was introduced into the Malay Peninsula by the influx of Indian and Arab traders between the thirteenth centuries to sixteenth centuries through the port of Malacca. "*Songket*" is the famous hand woven in Malaysia. "*Songket*" are produced with the weaving technique with zig zag arrangement between the "*pakan*" yarn and the "*metalik*" yarn and produced the delicate and nice pattern.

1.1 History of Weaving

The origin and development of woven cloth is closely tied to the history of mankind. Thousands of years ago the skills are developed necessary to turn the raw materials around us into cloth for clothing and shelter. Weaving, the lacing together of threads and yarns to form cloth has developed over thousands of years of discovery and experimentation. Coarse fabric, made from grasses and leaves, was the first step toward the development of the textiles that was used today. There are some indications that weaving was already known in the Paleolithic. 20,000 to 30,000 years ago early man developed the first string by twisting together handfuls of plant fibers. Preparing thin bundles of plant material and stretching them out while twisting them together produced a fine string or thread. The ability to produce string and thread was the starting place for the development of weaving, spinning, and sewing. Stone age man's early experiments with string and thread lead to the first woven textiles. Threads and strings of different sizes were knotted and laced together to make many useful articles. Finger weaving, the lacing and knotting together of threads by hand, is still used today by many weavers. (Text & Textile, An Introduction to Wool-Working for Readers of Greek and Latin)

During the early Neolithic Era simple weaving looms were developed. Simple weaving looms are man made tools to hold the warp in vertical threads snugly in order

allowing the weaver to insert the weft threads. The two early weaving looms ar xe the horizontal ground loom and the warp weighted loom. This loom is made from large wooden poles tied together in a rectangular shape. The poles can be mounted on a wall or dug into the ground to make a freestanding loom. The warp in vertical threads is tied to the top pole. At the bottom of the frame the warp threads are tied together in groups and secured to clay or stone weights. The weaver places the weft threads through the warp by hand while standing in front of the loom. The horizontal ground loom is a simple arrangement of sticks and poles driven into the ground. The weaver measures out the length and width needed for weaving the cloth and drives the sticks firmly into the ground. The warp in vertical threads are wound onto the sticks and tied in place. The weaver works the weft in horizontal threads, by hand, through the stretched out warp. The ground loom is still used today by the Bedouin weavers of the Near East. (A. Hecht, The Art of the Loom)

During the Neolithic Era mankind developed great skill in weaving cloth. Every household produced cloth for their own needs. Weaving cloth remained an activity associated with the family unit for thousands of years. Cloth weaving became a mechanized industry with the development of steam and water powered looms. The invention of the fly shuttle removed the need to have a weaver place the weft in vertical thread into the warp in horizontal threads by hand. A fly shuttle is a mechanical device using ropes and pulleys to deliver the weft in horizontal thread into the warp in vertical threads. The weft yarn is wound on to a bobbin and it is placed in a fly shuttle. A fly shuttle is a long, narrow canoe-shaped instrument, usually made of wood, which holds the bobbin. After the shuttle is loaded with the weft-filled bobbin, the weaver places the shuttle onto the shuttle race, a small, narrow shelf that the shuttle glides along as it goes in and out of the weft. The weaver pulls on a rope attached to the fly shuttle mechanism and this propels the shuttle across the weft. The invention of the fly shuttle increased the volume of cloth production and forced technological advancement in the spinning industry to supply larger amount of yarns.

The early 1800s saw the development of the Jacquard Machine. This revolutionary machine used a punch card mechanism to operate the loom and is credited as the basis of modern computer science. This complicated machine was added to the top of the weaving loom. A series of card with holes punched in them is continuously run through the machine. The Jacquard Machine is able to move individual warp threads up and down according to the pattern of holes punched into the cards. Cloth woven on a loom with a Jacquard Machine can have very intricate patterns. Today most of our textile needs are supplied by commercially woven cloth. A large and complex cloth making industry uses automated machines to produce our textiles. However, there are artisans making cloth on hand looms, in home studios or small weaving businesses, who keep alive the skills and traditions of the early weavers. (A. Hecht, The Art of the Loom)

1.2 Project Objective

i. To study with using the traditional method to making the *"songket"* and use the application in to the new design of weaving songket machine.

ii. To design and development the *"songket"* automatic weaving machine for increased the productivity of the one of the Malaysian heritage, *"songket"* weaving.

1.3 Project Scope

i. Study and research with the traditional machine that is used to making the *"songket"*.

ii. Making research with the basic pattern of the *"songket"* that is having in Malaysia.

iii. Design the modern machine with use the automation part for weaving the *"songket"*.

1.4 Problem Statement

"Songket" is the one of the Malaysian heritage that has invaluable. The art of the "*songket*" are from the delicate and conscientious hand woven. With the traditional method, its take much time to making the *"songket"*. With the traditional method to finish a "*songket*" its take one or two weeks to finished it. Because the work to make the "*songket*" is complex and take long time, so the prices of the "*songket*" are high too. With the modern technology, any approach is development to reduce all the dearth about to making *"songket"*, in time, labour and cost aspect. With the development machine the quality of the *"songket"* are still in high performance.

1.5 Rational of Project

From the problem statement, the rational of the project are;

i. To change the traditional machine that is used now for weaving the "*songket*" with new technology machine with use the automation system.
ii. To reduce the production time of the "*songket*", *"songket"* can produce in large volume in short time
iii. Reduce the labour cost. With use the automation an operator can control in more machines.
iv. To increase the production of the "*songket*" but still the *"songket"* produce with in high quality but in low cost.

CHAPTER 2

LITERATURE REVIEW

2.1 Traditional "*Songket*" Weaving Machine

Study about how to make the songket with used traditional method. The method will explained step by step start from the coloring yarn, spinning, "*menganing*", rolled, "*menyapuk*", "*mengarat*" and weaving.

2.1.1 Colouring the Yarn

Yarn that used is from the Chinese silk that called spunsilk. The spunsilk is soft and stinky. The process to color the yarn is used with warm water. The yarn must soak for one day and then rinse with the softener. The color that used is followed with the patterns that want. The example that used is called ramazol. The yarns that are finished rinse are basked at the cloudy area. It is for maintenance the quality of the yarn color that produces. The process is taken two or three day to finish.

2.1.2 Spinning

Figure 2.1 Spinning Process

The dried yarn will separate with use the spinning machine. The traditional tool that uses to make the process is called *"rahak"* and *"weng"*. The yarn will roll at the component that call end feed shuttle or *"peleting"*.

2.1.3 *"Menganing"*

Figure 2.2 *"Menganing"* Process