UNIVERSITI TEKNIKAL MALAYSIA MELAKA

REPRODUCTION OF BATIK PATTERN USING REVERSE ENGINEERING FOR HERITAGE PRESERVATION

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BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (BMMV) WITH HONOURS

2023

Faculty of Mechanical and Manufacturing Engineering Technology

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A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Mechanical Engineering Technology (BMMV) with Honours

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2023

DECLARATION

I declare that this thesis entitled “REPRODUCTION OF BATIK PATTERN USING REVERSE ENGINEERING FOR HERITAGE PRESERVATION” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology with Honours.

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Date : 19 January 2023

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DEDICATION

I dedicated this thesis to my beloved parents, Ms Rohana binti Sabki and Mr Mohamad Zahir bin Ahyat. I would like to express the deepest appreciation to my supervisor, Ts. Dr. Suriati binti Akmal, who have been my source of inspiration and educate me. I will always appreciate my co-supervisor, Dr. Hambali Bin Boejang, Profesor Madya Ir. Ts. Dr. Mohd Hadzley bin Abu Bakar and Pn. Ruzy Haryati Binti Hambali who helped me develop my technology skills and guide me. I also dedicated this thesis to my lovely siblings and friends who always stood by me and supported me throughout the process. A million thanks to whom that are involve in this thesis.

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ABSTRACT

Every country has its own handicrafts. In Malaysia, it is famous for its batik designs that get attention and are greatly appreciated by every Malaysian. The main source of batik is located in Java, Indonesia. The term batik is believed to be derived from the Javanese word "ambatik" or "tritik". The ending "tik" in each word translates to creating small dots. In Malaysia, the origin of batik is not clearly known but some researchers believe that batik came through trade relations between the Malay Kingdom in Jambi (Sumatra) and the coastal city of Java. The business of making batik was first introduced in Kelantan in the 20th century which is in 1911. Malaysian batik has four types namely rainbow batik, block batik, screen batik and canting batik. The problem faced by batik artisan is the production of batik patterns is still drawn manually by hand. For block batik, the batik pattern still uses paper that is easily lost before transferring the pattern to the block using copper sheets. Batik designs that are made cannot be stored properly and do not last long. Besides, the use of expensive materials apart from the manufacturing process takes a long time to complete one design of batik mold. Therefore, this paper aims to design a batik mold for the stamping process using Adobe Illustrator software and tracing tools. Secondly, fabricate batik mold using a laser cutting machine. Lastly, to test and validate the stamping quality on fabric using the fabricated molds. The method used in this project study is the use of Adobe Illustrator software that was learned to draw and create designs and to use tracing image tools to reproduce patterns from existing molds. By applying reverse engineering techniques, reproduction of batik designs using existing molds can be produced with the used of laser cutting machine. Two types of materials are used in reproducing this fabricated batik molds. To test the effectiveness of the fabricated molds produced, self-test by using applicable materials and test by experts with help of a batik artisan from Warisan Maju Timur Batik in Terengganu were done. As a result, both types of material can be used to reproduce batik molds using laser cutting techniques and successfully remade. however, improvements still need to be made to improve the quality based on the study from experts. The contribution from this project is can help maintain and save the batik design that has been designed so that it does not disappear, help pleasant the batik design designer to re-edit the design that has been drawn and could helps to reduce human effort to produce batik mold which takes a long time to complete.

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ABSTRAK

Setiap negara mempunyai kraftangan sendiri. Di Malaysia, ia terkenal dengan rekaan batik yang mendapat perhatian dan amat dihargai oleh setiap rakyat Malaysia. Sumber utama batik terletak di Jawa, Indonesia. Istilah batik dipercayai berasal daripada perkataan Jawa "ambatik" atau "tritik". Pengakhiran "tik" dalam setiap perkataan diterjemahkan kepada mencipta titik-titik kecil. Di Malaysia, asal usul batik tidak diketahui dengan jelas tetapi sesetengah pengkaji percaya bahawa batik datang melalui hubungan perdagangan antara Kerajaan Melayu di Jambi (Sumatera) dengan kota pesisir pantai Jawa. Perniagaan membuat batik mula diperkenalkan di Kelantan pada abad ke-20 iaitu pada tahun 1911. Batik Malaysia mempunyai empat jenis iaitu batik pelangi, batik blok, batik skrin dan batik canting. Masalah yang dihadapi oleh tukang batik ialah penghasilan corak batik masih dilukis secara manual menggunakan tangan. Bagi batik blok, corak batik masih menggunakan kertas yang mudah hilang sebelum memindahkan corak ke bongkah menggunakan kepingan tembaga. Rekaan batik yang dibuat tidak dapat disimpan dengan baik dan tidak tahan lama. Selain itu, penggunaan bahan mahal selain proses pembuatan mengambil masa yang lama untuk menyiapkan satu-satu reka bentuk acuan batik. Oleh itu, kertas kerja ini bertujuan untuk mereka bentuk acuan batik untuk proses pengecapan menggunakan perisian Adobe Illustrator dan alatan pengesanan. Kedua, membuat acuan batik menggunakan mesin pemotong laser. Akhir sekali, untuk menguji dan mengesahkan kualiti pengecapan pada fabrik menggunakan acuan fabrikasi. Kaedah yang digunakan dalam kajian projek ini ialah penggunaan perisian Adobe Illustrator yang dipelajari untuk melukis dan mencipta reka bentuk dan menggunakan alat imej pengesanan untuk menghasilkan semula corak daripada acuan sedia ada. Dengan mengaplikasikan teknik kejuruteraan terbalik, penghasilan semula reka bentuk batik menggunakan acuan sedia ada boleh dihasilkan dengan menggunakan mesin pemotong laser. Dua jenis bahan digunakan dalam menghasilkan semula acuan batik rekaan ini. Bagi menguji keberkesanan acuan fabrikasi yang dihasilkan, ujian kendiri menggunakan bahan terpakai dan ujian oleh pakar dengan bantuan tukang batik dari Warisan Maju Timur Batik di Terengganu telah dilakukan. Hasilnya, kedua-dua jenis bahan boleh digunakan untuk menghasilkan semula acuan batik menggunakan teknik pemotongan laser dan berjaya dibuat semula. namun, penambahbaikan masih perlu dilakukan untuk meningkatkan kualiti berdasarkan kajian daripada pakar. Sumbangan daripada projek ini adalah dapat membantu menyelenggara dan menyelamatkan rekaan batik yang telah direka agar tidak hilang, membantu menyenangkan pereka reka bentuk batik untuk mengedit semula reka bentuk yang telah dilukis dan dapat membantu mengurangkan usaha manusia untuk menghasilkan. acuan batik yang mengambil masa yang lama untuk disiapkan.

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ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

First and foremost, I would like to thank and praise Allah the Almighty, my Creator, my Sustainer, for everything I received since the beginning of my life. I would like to extend my appreciation to the Universiti Teknikal Malaysia Melaka (UTeM) for providing the research platform.

My utmost appreciation goes to my main supervisor, Ts. Dr. Suriati binti Akmal, Universiti Teknikal Malaysia Melaka (UTeM) for all her support, advice and inspiration. Her constant patience for guiding and providing priceless insights will forever be remembered. Also, to my co-supervisor, Dr. Hambali bin Boejang, Profesor Madya Ir. Ts. Dr. Mohd Hadzley bin Abu Bakar and Pn. Ruzy Haryati binti Hambali Universiti Teknikal Malaysia Melaka (UTeM) who constantly supported my journey.

Last but not least, I would also like to thank my beloved parents for their endless support, love and prayers. Finally, thank you to all the individual(s) who had provided me the assistance, support and inspiration to embark on my study.

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LIST OF SYMBOLS AND ABBREVIATIONS

UNESCO	-	United Nations Educational Scientific and Cultural Organization
ICH	-	Intangible Cultural Heritage
RE	-	Reverse Engineering
SVG	-	Scalable Vector Graphic
PNG	-	Portable Network Graphic
2D	-	Two-Dimensional
3D	-	Three-Dimensional
Ai	-	Adobe Illustrator
CAD	-	Computer-aided Design
CAM	-	Computer-Aided Manufacturing
CAE	-	Computer-Aided Engineering
CIM	-	Computer-Integrated Manufacturing
mm	-	milimetre

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CHAPTER 1

INTRODUCTION

1.1 Background

Each country has its own unique handicraft works of art. In Malaysia, it is famous for its batik design which gets the attention and is highly appreciated by every Malaysian (Lias et al., 2020). The uniqueness of this batik art is seen in each motif produced because it has its own meaning. Malaysian batik is different from other batiks because it prioritizes floral motifs and the use of brighter colors (Halina et al., 2019). Batik is a typical textile technique that has become well-known for its application in textiles all around the world (Rosman et al., 2021). Because batik has been a part of international trade's cultural interchange, it has been possible to spread batik techniques and applications to other Southeast Asian countries (Sharifah et al., 2017). Nowadays, the art of batik is increasingly forgotten, especially by teenagers.

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The use of batik-based clothing is still used today. In Malaysia, the Prime Minister of Malaysia, the Most Honourable Dato 'Sri Ismail Sabri bin Yaakob declared 3 December every year as Malaysian Batik Day. On that day, all Malaysians are encouraged to wear Malaysian Batik clothes. Similarly in Indonesia which prioritizes the use of batik in their country. The production of batik that still uses old technology makes the production of batik not so fast. Batik processing today uses traditional methods (Aisyah et al., 2018a).

To facilitate the work to produce a more creative and interesting design with new technology for storage, reverse engineering is used to reproduce the design and create a database to maintain the design so that it is not lost. The term reverse engineering (RE) in mechanical engineering is the process of reconstructing an existing object (Lucy, 2019). It involves the disassembling of specific parts of larger products and also enables to identify of how a part was designed that can recreate it (Brian Hess, 2019). This process can be done either virtually or physically. Reverse engineering requires the skills of a person, a device, or a piece of software to implement it. Therefore, this reverse engineering requires several processes to make it. The process of doing this reverse engineering begins by capturing data from existing ones. Then refined into a final part using the detailed dimensions from the scan files. Lastly, it is ready to be manufactured or can improve first (Lucy, 2019).

1.2 Problem Statement

The production of batik patterns is still painted manually by hand. Just like the batik patterns that have been produced long ago, especially for the type of batik painting. For the block batik type, the batik pattern will be drawn or sketched first before making the mold. For example, entrepreneurs and sellers of batik block nests in Kelantan drew batik patterns only using paper and pen. Figure 1.1 shows the apparatus used to make block batik mold.

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Figure 1.1 Apparatus block batik mold (Azri, 2021)

Figure 1.2 Mold making for block batik design (Azri, 2021)

Probably, the east coast areas such as Kelantan and Terengganu will face the monsoon season every year. These states will face major floods that hit every time at the end of the year. Therefore, the batik pattern that has been produced on the paper is feared not to be saved and will disappear immediately in the event of this natural disaster. This will cause losses for those who faces it. This is because, the batik pattern is something that is valuable from the aspect of its making as well as the outpouring of ideas on the batik pattern. Batik pattern that are made cannot be stored properly and do not last long.

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Figure 1.3 Copper pieces used to shape the mold (Azri, 2021)

To make the mold, copper pieces was used. The production of block batik patterns using these copper pieces is quite expensive. This is because the material used is a high quality material and lasts longer. This material also does not rust. The making of this batik block nest will also take a long time because it requires a high level of accuracy and focus. The longest period to make this batik block nest takes a week or even a month depending on the level of complexity of the pattern. Therefore, a study was done to facilitate the process of making this batik block nest.

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1.3 Project Objectives

The main purpose of this research is to transform the batik patterns into appropriate software. In order to do so, the objectives are as follows:

i. To design batik mold for the stamping process using Adobe Illustrator software and tracing tools.

ii. To fabricate batik mold using a laser cutting machine.

iii. To test and validate the stamping quality on fabric using the fabricated mold.

1.4 Scope of Project

The following are the scopes of this research:

i. Literature research of the history of Malaysian batik.

ii. Recognizing the types of Malaysian batik along with the design and meaning of the design on batik.

iii. Tracing and drawing batik patterns using an appropriate software which is Adobe illustrator to get a smooth result.

iv. To produce new batik mold by applying reverse engineering (RE) technology techniques using laser cutting machine.

v. To make an analysis by testing the fabricated molds that have been produced.

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1.5 Outline of Thesis

The reproduction of batik pattern using reverse engineering is divided into five chapter, each of which contains and elaborates on a different topic such as Introduction, Literature review, Methodology, Results analysis and, Conclusion. The following is a full description of the thesis outline for each chapter:

Chapter 1: The thesis introduction. The thesis' clarification will be given in general terms. The objectives will be described in detail. It is supported by an explanation of the scope of research.

Chapter 2: The literature review written in this thesis has facts and info based on past researches, such as history of batik and types of batik. All theories are written based onlegitimate researches from journals and articles.

Chapter 3: The methodology for this project will discuss about an overall planning of this project. Parameters involved also stated in this chapter.

Chapter 4: The outcome and analysis. This chapter shows the design created using appropriate software. This chapter also discusses the analysis and comparison of using two different materials.

Chapter 5: This chapter will give conclusion and recommendation for the entire project.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter conducts a background research and literature review for the entire project by conducting research using articles and journals. This chapter will be focused on the histories of batik, types of batik, motifs of batik, and also the application of reverse engineering in this research. It will be easier to understand the whole project with the help of literature review and will be able to learn more about the research.

2.2 History of Batik

Batik comes from Indonesia. The main source of batik is located in Java, Indonesia. The term batik is believed to have been derived from the Javanese word "ambatik" or "tritik". The ending "tik" in each of those words translates to "creating small dots". Then, the word batik itself came into being. In the true sense, batik means to paint dots either in the form of flowers or other motifs on the surface of the fabric and so on using wax batik was recognized by the United Nations Educational Scientific and Cultural Organization (UNESCO) as an Intangible Cultural Heritage (ICH) at the UNESCO conference in Abu Dhabi. The establishment of batik in Indonesia has a unique history that has spanned 700 years since the reign of Prince Wijaya from the Majapahit Kingdom in 1294 to 1309 (Shaharuddin et al., 2021). The history of batik in Indonesia is closely related to the development of the Majapahit kingdom and the spread of Islamic teachings in Java. There is a famous village called Laweyan in the Solo district. The village is closely related to the fall of the Majapahit Kingdom into the hands of the Islamic Government, namely Demak, Pajang, and Mataram,

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