

**GOLDEN RATIO, GOLDEN TRIANGLE AND GOLDEN SPIRAL
OF HILT KERIS DESIGNED BY USING EXTENDED CUBIC
B-SPLINE AND $\lambda\mu$ -B-SPLINE**

**NUR IZZATI BINTI MAHYUDIN
AIDATUL ANISA BINTI SAIFUL ZAMRI**

**Thesis submitted in fulfillment of the Requirement for Bachelor Science (Hons.)
Computational Mathematics in the Faculty of Computer and Mathematical
Sciences Universiti Teknologi Mara**

July 2019

DECLARATION BY CANDIDATE

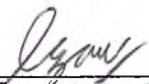
We certify that this report and the project to which it refers is the product of our own work and that any idea or quotation from the work of other people, published or otherwise are fully acknowledged to accordance with the standard referring practices of discipline.



Aidatul Anisa bt Saiful Zamri

2016299118

11 July 2019



Nur Izzati bt Mahyudin

2016289638

11 July 2019

ABSTRACT

Keris is known as something precious to Malay race in back then and even today. Hilt Keris have numerous design, so this research are utilized to help in finding the best design. Golden ratio, golden spiral and golden triangle are used to find the best design of hilt Keris based on its best value which are 1.6180339877. Extended cubic B-spline and $\lambda\mu$ -B-spline are used to interpolate the design of hilt Keris. In extended cubic B-spline, different value of parameter, λ are used while in $\lambda\mu$ -B-spline, another parameter is added which is μ , and these two parameter are changed in order to form various design of hilt Keris. The purpose of this research are to design two-dimensional hilt Keris using extended cubic B-spline and $\lambda\mu$ -B-spline, to implement golden ratio, golden triangle and golden spiral in the design of hilt Keris obtained from the B-spline methods and compare the result to come by which method that give the best design of hilt Keris. In this research, the parameter value, $\lambda = 3$ gives the best design since the value of golden ratio and golden spiral are approaching to the value of 1.6180339877 compared to the others.

TABLE OF CONTENT

	Page
DECLARATION BY THE SUPERVISOR	i
DECLARATION BY CANDIDATE	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
LIST OF TABLE	viii
LIST OF FIGURE	ix
LIST OF ABBREVIATION AND SYMBOL	xii
1.0 INTRODUCTION TO RESEARCH	
1.1 Introduction	1
1.2 Background of the Study	1
1.2.1 Overview of Golden Ratio, Golden Triangle and Golden Spiral	2
1.2.2 Overview of $\lambda\mu$ -B-Spline and Extended Cubic B-Spline	3
1.3 Problem Statement	4
1.4 Objectives	4
1.5 Significant of Project	5
1.6 Scope of Project	5
1.7 Project Benefit	6
1.8 Organization of Project	7

2.0 METHODOLOGY AND LITERATURE REVIEW

2.1 Introduction	9
2.2 Definition of Terms and Concepts	9
2.3 Literature Review	10
2.4 Methodology	20
2.4.1 Extended Cubic B-spline	20
2.4.2 $\lambda\mu$ -B-spline	22
2.4.3 Fibonacci element	29
2.4.3.1 Golden ratio	29
2.4.3.2 Golden spiral	30
2.4.3.3 Golden triangle	31
2.5 Conclusion	32

3.0 IMPLEMENTATION

3.1 Introduction	33
3.2 Research data	34
3.3 Research step	35
3.4 Measurement based on pattern and design of hilt <i>Keris</i>	61
3.4.1 Golden Ratio	61
3.4.2 Golden Triangle	66
3.4.3 Golden Spiral	71
3.5 Conclusion	76