

**DESIGNING 3-DIMENSIONAL ROLLER COASTER LOOPS BY
USING UNIFORM EXTENDED CUBIC B-SPLINE**

MUHAMMAD ALI ADRI BIN MAZWIN

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

July 2018

DECLARATION

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


.....

MUHAMMAD ALI ADRI BIN MAZWIN

2015419484

6 JUNE 2018

ABSTRACT

Roller coaster is one of the attraction to the public. This research purpose is designing a smooth roller coaster loops using mathematics method which is B-spline method as one of the alternative in designing a smooth roller coaster loops. This research is using extended cubic B-spline method with degree 4, 5 and 6 with $\lambda=0.5, 1$ to design 2-Dimensional and using sweep surface translation method to design 3-Dimensional roller coaster loops. The G force value from each loops design are calculated to compare in order to determine the best Roller coaster loops design. The result from this research shown that by using extended cubic B-spline method with degree 5 and $\lambda=0.5$ is the best way to design roller coaster loops because it has the most accurate G-force value with the real roller coaster loop compared to others.

TABLE OF CONTENT

CONTENTS	PAGE
DECLARATION	i
ACKNOWLEDGEMENT	iii
TABLE OF CONTENT	iv
LIST OF TABLE	vii
LIST OF FIGURE	ix
ABSTRACT	xii
1.0 INTRODUCTION TO RESEARCH	
1.1 INTRODUCTION	1
1.2 BACKGROUND OF STUDY	1
1.3 PROBLEM STATEMENT	2
1.4 OBJECTIVE	3
1.5 SIGNIFICANCE OF PROJECT	3
1.6 SCOPE OF PROJECT	4
1.7 PROJECT BENEFITS	4
1.8 ORGANIZATION OF PROJECT	5
2.0 METHODOLOGY AND LITERATURE REVIEW	
2.1 INTRODUCTION	7
2.2 DEFINITION AND TERM OF CONCEPT	7
2.3 LITERATURE REVIEW	8

2.4	METHODOLOGY	10
2.4.1	B-SPLINE	10
2.4.2	EXTENDED CUBIC	11
2.4.3	G-FORCE	21
2.4.4	SWEEP SURFACE	22
2.4.5	TRANSLATION	22
2.5	CONCLUSION	25
3.0	IMPLEMENTATION	
3.1	INTRODUCTION	26
3.2	RESEARCH DATA	26
3.3	RESEARCH STEP	26
3.4	CONCLUSION	64
4.0	RESULT AND DISCUSSION	
4.1	INTRODUCTION	65
4.2	RESULT AND DISCUSSION	65
4.2.1	RESULT OF TWO-DIMENSIONAL	66
4.2.2	RESULT OF THREE-DIMENSIONAL	69
4.2.3	RESULT G-FORCE IN THE LOOP OF THE CURVES	72
4.3	CONCLUSION	75
5.0	CONCLUSION AND RECOMMENDATION	
5.1	INTRODUCTION	76