



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DIGITAL REPRODUCTION OF MALAY RELIC COMPONENTS  
OBTAINED FROM NON-CONTACT LASER-BASED REVERSE  
ENGINEERING SYSTEM**

This report is submitted in accordance with the requirement of the Universiti  
Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering  
Technology (Manufacturing) with Honours

by

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**FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING  
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**DIGITAL REPRODUCTION OF MALAY RELIC COMPONENTS OBTAINED  
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**UMI SYAZANA BINTI MOHAMAD ALI**

**A thesis submitted  
in fulfillment of the requirements for the Bachelor's Degree in Manufacturing  
Engineering Technology (Product Design) with Honours**

**Faculty of Mechanical and Manufacturing Engineering Technology**

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(Product Design) With Honours**

**Faculty of Mechanical and Manufacturing Engineering Technology**

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**Malaysia**

**2019**

## **DECLARATION**

I declare that this thesis entitled “Digital Reproduction Of Malay Relic Components Obtained From Non-Contact Laser-Based Reverse Engineering System.” 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**

This report is submitted to the Faculty of Mechanical Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a fulfilment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Product Design) with Honours.

The members of the supervisory is as follow:

“I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of degree in Bachelor of Manufacturing Engineering Technology (Product Design) with Honours.”

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Co-Supervisor Name : TS. DR. HAMBALI BIN BOEJANG

Date :

## DEDICATION

*To all my family especially my beloved parent, Mohamad Ali Bin Syed Merah, Saeena Beevi Binti Hj.Ajis Khan and My grandfather Hj. Ajis Khan. To all my siblings Umi Hani Waznah, Umi Syazwani, Nur Basyirah, Nur Hanisah, Nur Damia Khairunnisah and Nur salsabila, To my extraordinary supervisor Ts. Dr. Syahibudil Ikhwan Bin Abdul Kudus and my awesome Co-Supervisor Ts. Dr. Hambali Bin Boejang. To our FTKMP team staff and lab assistant En. Mohd Idain Fahmi Rosley, En. Mohd Rafi Omar, En.Kamarudin and En.Zulkifli for the endless knowledge and support during the whole scanning process until the fabrication of the prototype for this thesis.*

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## **ABSTRACT**

This report describe the details of the title “Digital Reproduction of Malay Relic Components Obtained From Non-contact Laser-based Reverse Engineering System”. The purpose of this projects is too able to compares at least two different types of non-contact (laser-based) reverse engineering machines that available in Faculty of Mechanical and Manufacturing Engineering Technology (FTKMP), which is used to determine the best device that produce STL data from scanned object. The Malay relic selected for this study is ‘SUNDANG RAJA MOHAMAD’ and the relic will be used in Reverse engineering (RE) process as well as will be fabricated using additive manufacturing technologies (AM). This research will be focusing on powder based process as it will be used in fabrication of scanned objects. Furthermore, this study shows the effective way of restoration and reproduction of the historical relic. 3D scanner can helps fix defects on certain objects as well as it captured data was very accurate to the actual object scan.



## **ABSTRAK**

Laporan ini dilaksanakan untuk mengkaji secara mendalam mengenai tajuk "Digital Reproduction of Malay Relic Components Obtained From Non-contact Laser-based Reverse Engineering System ". Tujuan projek ini juga adalah untuk membandingkan sekurang-kurangnya dua jenis mesin kejuruteraan terbalik yang tidak berkaitan (berasaskan laser) yang boleh didapati di Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan (FTKMP), yang digunakan untuk menentukan peranti terbaik yang menghasilkan data STL dari objek yang diimbas. Artifak Melayu yang dipilih untuk kajian ini adalah 'SUNDANG RAJA MOHAMAD' dan artifak tersebut akan digunakan dalam proses kejuruteraan "Reverse (RE)" dan akan difabrikasi menggunakan teknologi pengilangan tambahan (AM). Kajian ini akan memberi tumpuan kepada proses berasaskan serbuk kerana ia akan digunakan dalam fabrikasi objek yang diimbas. Tambahan pula, kajian ini menunjukkan cara pemulihan dan penghasilan semula artifak bersejarah yang berkesan. Pengimbas 3D boleh membantu memperbaiki kecacatan pada objek tertentu dan data yang ditangkap itu sangat tepat untuk mengimbas objek sebenar.

## TABLE OF CONTENT

<b>Chapter</b>	<b>Content</b>	<b>Page</b>
	<i>Declaration</i>	
	<i>Approval</i>	
	<i>Dedication</i>	
	<i>Abstract</i>	<i>i</i>
	<i>Abstrak</i>	<i>ii</i>
	<i>Table of content</i>	<i>iii</i>
	<i>List of Table</i>	<i>vii</i>
	<i>List of Figure</i>	<i>viii</i>
	<i>List of Appendices</i>	<i>xvi</i>
	<i>List of Abbreviations</i>	<i>xvii</i>
	CHAPTER 1	
	INTRODUCTION	
<b>1.0</b>	Background	<b>1</b>
<b>1.1</b>	Research Objectives	<b>3</b>
<b>1.2</b>	Research Scope	<b>3</b>
<b>1.3</b>	Thesis Structure	<b>3</b>
<b>1.4</b>	Summary	<b>6</b>
	CHAPTER 2	
	LITERATURE REVIEW	
<b>2.0</b>	Introduction	<b>7</b>
<b>2.1</b>	Reverse Engineering	<b>7</b>
<b>2.1.1</b>	Contact And Non-contact Method	<b>8</b>
<b>2.1.1.1</b>	Contact Method	<b>8</b>
<b>2.1.1.2</b>	Non-Contact Method	<b>10</b>
<b>2.1.2</b>	Introduction To Re Non-Contact Devices (3d Scanner)	<b>15</b>
<b>2.1.2.1</b>	Application Of 3d Scanner	<b>17</b>
<b>2.1.2.2</b>	Advantages And Limitation Of 3d Scanner	<b>18</b>
<b>2.1.3</b>	Process Chain Of Re	<b>19</b>

<b>2.1.4</b>	<b>Post Processing Of Captured Data</b>	<b>20</b>
<b>2.1.5</b>	<b>Advantages And Limitation Of Re</b>	<b>21</b>
<b>2.2</b>	<b>Historical and Cultural Heritage</b>	<b>22</b>
<b>2.2.1</b>	<b>Historical Artifact In Melaka</b>	<b>23</b>
<b>2.2.2</b>	<b>Product Background of Artifact</b>	<b>26</b>
<b>2.2.3</b>	<b>Issues in Artifact</b>	<b>27</b>
<b>2.2.4</b>	<b>Method Use in Historical Restoration and Preservation</b>	<b>29</b>
<b>2.3</b>	<b>Additive Manufacturing</b>	<b>30</b>
<b>2.3.1</b>	<b>Classification of Am System</b>	<b>31</b>
<b>2.3.2</b>	<b>Advantages and Disadvantages of AM</b>	<b>32</b>
<b>2.3.3</b>	<b>Am Process Chain</b>	<b>33</b>
<b>2.3.4</b>	<b>Classification Of Am Technologies</b>	<b>36</b>
<b>2.3.4.1</b>	<b>Laser Sintering (LS)</b>	<b>37</b>
<b>2.3.4.2</b>	<b>Laser Sintering (LS) Capabilities</b>	<b>38</b>

## **CHAPTER 3**

### **METHODOLOGY**

<b>3.0</b>	<b>Introduction</b>	<b>40</b>
<b>3.1</b>	<b>Flow Chart of the Methodology</b>	<b>41</b>
<b>3.2</b>	<b>Structure of the experiment</b>	<b>42</b>
<b>3.3</b>	<b>Data Collection</b>	<b>43</b>
<b>3.3.1</b>	<b>Primary Data</b>	<b>43</b>
<b>3.3.2</b>	<b>Secondary Data</b>	<b>43</b>
<b>3.4</b>	<b>Experimental work</b>	<b>44</b>
<b>3.5</b>	<b>Selection of scanned object</b>	<b>44</b>
<b>3.6</b>	<b>RE Process selection</b>	<b>45</b>
<b>3.7</b>	<b>Experimental procedure</b>	<b>46</b>
<b>3.7.1</b>	<b>Pre-processing</b>	<b>46</b>
<b>3.7.2</b>	<b>Scanning procedures</b>	<b>46</b>
<b>3.7.3</b>	<b>Post-processing</b>	<b>47</b>
<b>3.7.4</b>	<b>Data Conversion</b>	<b>47</b>
<b>3.8</b>	<b>Prototype Fabrication</b>	<b>48</b>
<b>3.9</b>	<b>Result and Comparison</b>	<b>48</b>

<b>3.10</b>	<b>Summary</b>	<b>51</b>
<b>CHAPTER 4</b>		
<b>RESULT AND DISCUSSION</b>		
<b>4.0</b>	<b>Introduction</b>	<b>52</b>
<b>4.1</b>	<b>pre-processing, scanning, merging and post-processing</b>	<b>52</b>
<b>4.1.1</b>	<b>Pre-Processing, Scanning, Merging and Post-Processing (SOP)</b>	<b>53</b>
<b>4.1.1.1</b>	<b>Set up procedure (REXCAN CS+2)</b>	<b>53</b>
<b>4.1.1.2</b>	<b>Set up procedure (ZEISS T-SCAN)</b>	<b>56</b>
<b>4.1.1.3</b>	<b>Scanning procedure (REXCAN CS+)</b>	<b>57</b>
<b>4.1.1.4</b>	<b>Scanning procedure (ZEISS T-SCAN)</b>	<b>60</b>
<b>4.1.1.5</b>	<b>Standard of procedure for data manipulation (Rexcan Cs+ Using Ezscan)</b>	<b>61</b>
<b>4.1.1.6</b>	<b>Standard of procedure for data manipulation (ZEISS T-SCAN using Polywork: Iminspect)</b>	<b>65</b>
<b>4.1.1.7</b>	<b>Direct data conversion (for both REXCAN CS+ and ZEISS T-SCAN)</b>	<b>68</b>
<b>4.1.1.8</b>	<b>Indirect data conversion (for both REXCAN CS+ and ZEISS T-SCAN)</b>	<b>76</b>
<b>4.1.1.9</b>	<b>Standard of procedure in fabrication of the prototypes for both Rexcan and T-SCAN STL file.</b>	<b>84</b>
<b>4.1.2</b>	<b>Time analysis before STL file generation (REXCAN and T-SCAN)</b>	<b>90</b>
<b>4.2</b>	<b>Determined the Quality of STL File (Direct and Indirect Convert to STL File)</b>	<b>92</b>
<b>4.2.1</b>	<b>CAD-CAD analysis after STL File Generation (REXCAN AND T-SCAN)</b>	<b>92</b>
<b>4.2.2</b>	<b>Part-Part analysis after STL File Generation (REXCAN AND T-SCAN)</b>	<b>101</b>
<b>4.2.3</b>	<b>CAD-Part analysis after STL File Generation (REXCAN AND T-SCAN)</b>	<b>103</b>
<b>4.3</b>	<b>Challenges Encounter and Counter Measures Taken</b>	<b>108</b>
<b>4.4</b>	<b>Summary</b>	<b>110</b>

	CHAPTER 5	
	CONCLUSION AND RECOMMENDATION	
<b>5.0</b>	Conclusion	<b>112</b>
<b>5.1</b>	Recommendation	<b>113</b>
	REFERENCES	<b>114</b>
	APPENDICES	<b>119</b>

## LIST OF TABLE

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
3.1	The 'Weighted decision matrix (WDM)' used for selection of scanned object	45
3.2	Template of Time Taken for Comparison both Rexcan and T-Scan based on	49
3.3	Template for Gap comparison between both scanned data	50
3.4	Template of 'Weighted decision matrix (WDM)' for selection of Part to part analysis	50
3.5	Template of dimension taken between actual and scanned data	50
4.1	Time Taken for Comparison both Rexcan and T-Scan based on Scanned Object	90
4.2	Result Gap distance for REXCAN data analysis (mm)	96
4.3	Result of Gap distance for T-SCAN data analysis (mm)	98
4.4	Differences Gap at the Same Area for Rexcan and T-Scan	99
4.5	'Weighted decision matrix (WDM)' for selection of Part to part analysis	102
4.6	Dimension of actual artifact (mm)	104
4.7	Dimension of actual 'Hulu keris' (mm)	105
4.8	Dimension taken from scanned data of REXCAN and T-SCAN	106

## LIST OF FIGURE

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	structure of the report	5
2.1	Triggered probe mounted on an articulated arm (Boejang et al., 2013).	9
2.2	Analogue probe attached on CCM (Boejang et al., 2013).	10
2.3	Structure light RE system (Boejang et al., 2013)	11
2.4	A Photogrammetry method in action (Boejang et al., 2013).	12
2.5	A CGI Machine (Boejang et al., 2013).	13
2.6	CT scanner in action	14
2.7	ZSCANNER 700 CX	15
2.8	iSense 3D Scanner with iPad	16
2.9	Sense 3D Scanner	16
2.10	REXCAN CS2+	16
2.11	ZEISS T-SCAN	17

2.12	Comprehensive RE process chain (Boejang et al., 2013).	20
2.13	“Sundang Raja Mohamad”	27
2.24	Details of ‘Sundang Raja Mohamad’	27
2.15	Additive Manufacturing Processes Along with Classes of Materials and Method of Deposition (Abdul Kudus, 2019).	32
2.16	Overall AM Process Chain	34
2.17	Schematic diagram of triangle tessellation of STL file (Boejang et al., 2013).	35
2.18	AM Technologies (Abdul Kudus, 2019)	36
2.19	Schematic diagram of Laser Sintering (LS), (Sætre, 2013).	37
2.20	Laser Sintering (LS) machines in FTKMP	39
2.21	Laser Sintering (LS) internal chamber	39
3.1	Flowchart of the development of the studies	41
3.2	workflow of scanning process	44
4.1	SKD-S2 Developer spray	53
4.2	Unboxing the machine	54
4.3	Lens installation	54
4.4	Placing the calibration board in front of laser	55



4.5	Calibration in progress using EZscan	55
4.6	Installed T-scan	56
4.7	Switch 'ON' T-Scan	56
4.8	Calibrate T-scan	57
4.9	Switch 'ON' all three devices from (a) till (c)	57
4.10	EZScan software icon	58
4.11	EZscan homepage	58
4.12	'Connect' icon	58
4.13	Calibrate the devices	58
4.14	Adjust the brightness, laser mode 'ON'	59
4.15	click 'auto scan' to scan the object	59
4.16	scanning using 100 pixel lens	60
4.17	Activate 'Iminspect'	60
4.18	Activate polywork virtual probe	60
4.19	Activate polywork line scan player	61
4.20	Aligning the hand held devices with tracking camera	61
4.21	Scanned data for 400 pixel lens	62

4.22	Scanned data for 100 pixel lens	62
4.23	'Editing' the scanned data	62
4.24	import both data from lens 100pxl and 400pxl	63
4.25	Use '3-point align' to the scanned according to each group	63
4.26	Global align	64
4.27	Merging process	64
4.28	Complete REXCAN data	65
4.29	Workflow of POLYWORK software	66
4.30	Activate the 'IMInspect_project'	67
4.31	Positioning scanned data	67
4.32	Use '3-point align' as reference	67
4.33	Merging scanned object to become a complete data	68
4.34	Start polywork modeller	68
4.35	Import polygonal model	69
4.36	Select scanned files	69
4.37	Default parameter	70
4.38	Automatic holes filled	70

4.39	Fill holes interactively	71
4.40	Smooth the surface	71
4.41	Export the polygonal model to STL	72
4.42	Open ‘MagicsRP’ software	72
4.43	Import STL scanned data	73
4.44	select desired STL file to be import	73
4.45	Select ‘Fix wizard’ icon	74
4.46	click ‘Update’ to identify the error and follow ‘Advice’	74
4.47	Select ‘surface to solid’	75
4.48	Set the thickness to 2mm	75
4.49	Export to STL files	76
4.50	Polywork solidified body to CAD format	77
4.51	Use anchor line	77
4.52	Completed area	78
4.53	Fitting NURBS surfaces	78
4.54	Export STL file	79
4.55	Open ‘Digitized shape editor’	79

4.56	Choose ‘Generative shape design’	80
4.57	Apply spline to make a close loop	80
4.58	Fill in the surface	81
4.59	Surface complete repair	81
4.60	Joining the surface	82
4.61	Adjust merging distance to ‘0.1mm’	82
4.62	Adjust merging distance to ‘0.005mm’	83
4.63	Complete CAD solid model retrieve	83
4.64	Export model Into CATpart. File format	84
4.65	BuildStar Icon	84
4.66	Layout of the parts	85
4.67	Check collision	85
4.68	Build powder estimate	86
4.69	Platform of the SLS machine	86
4.70	Pouring powder into the build chamber	86
4.71	Flatten the powder with blade	87
4.72	Flatten with ‘Motion’ operation	87

4.73	SLS machine	88
4.74	Lift the powder upwards	88
4.75	Powder Purify Station	89
4.76	Process remove the powder from built part	89
4.77	Blasting Machine	89
4.78	Comparison of duration taken between Rexcan and T-Scan	91
4.79	REXCAN' Color deviation Map.	93
4.80	'T-SCAN' color deviation map	93
4.81	Graph standard deviation of Rexcan	95
4,82	Graph standard deviation of T-Scan	95
4.83	Comparison of selected area between Rexcan and T-Scan for the gap distance	100
4.84	Rexcan detailed part of the crown area	101
4.85	T-SCAN detailed part of the crown area	101
4.86	The actual reading measurement indicator	103
4.87	The actual reading measurement indicator for 'Hulu keris'	104
4.88	Dimension taken from CAD scanned data REXCAN	105

4.89	Dimension taken from CAD scanned data T-Scan	106
4.90	Part to Cad analysis of REXCAN and T-Scan (mm)	108
4.91	Defects occur at 'A' area	109

## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
<b>A</b>	TYPES OF ARTIFACT IN MELAKA	119
<b>B</b>	DETAILING OF ‘SUNDANG RAJA MOHAMAD’	121
<b>C</b>	GANTT CHART PSM 1	122
<b>D</b>	GANTT CHART PSM 2	123
<b>E</b>	SURAT PERMOHONAN MENJALANKAN KAJIAN PSM	124
<b>F</b>	SURAT PERMOHONAN MENJALANKAN AKTIVITI	125
<b>G</b>	SURAT KELULUSAN PERZIM	126
<b>H</b>	CAD TO CAD RESULT (GEOMAGIC)	127
<b>I</b>	OFFICIAL MEETING WITH PERZIM	133
<b>J</b>	SCANNING SESSION AT ‘THE STADTHUYS’	134
<b>K</b>	PROTOTYPE USING SLS MACHINE	136

## **LIST OF ABBREVIATION**

<b>BDP</b>	Bachelor Degree Project
<b>AM</b>	Additive Manufacturing
<b>CAD</b>	Computer Aided Design
<b>RE</b>	Reverse Engineering
<b>RP</b>	Rapid Prototyping
<b>SLS</b>	Selective Laser Sintering
<b>2D</b>	Two Dimensional
<b>3D</b>	Three Dimensional
<b>SLA</b>	Stereolithography
<b>FDM</b>	Fusion Deposition Modelling (FDM)