

CONTENTS

APPROVAL PAGE	i
SELF DECLARATION AGAINTS PLAGIARISM.....	ii
ABSTRACT	iii
ABSTRAK	iv
DEDICATION	v
ACKNOWLEDGEMENTS	vi
CONTENTS.....	vii
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xv
LIST OF ABBREVIATIONS.....	xvi
LIST OF ALGORITHMS	xvii
CHAPTER 1: INTRODUCTION	1
1.1 Rationale	1
1.2 Theoretical Framework	2
1.3 Conceptual Framework	2
1.4 Statement of the Problem	3
1.5 Hypothesis.....	3
1.6 Assumption.....	4
1.7 Scope and Delimitation	4
1.8 Importance of the Study	4
CHAPTER 2: REVIEW OF LITERATURE AND STUDIES.....	5
2.1 Related Literature.....	5
2.1.1 Data Hiding	6
2.1.2 Reversible Data Hiding	6
2.1.3 Adaptive Pattern Subtitution Method.....	9

2.1.3.1 Pattern Substitution Method	15
2.1.3.1.1 Scenario Application in Binary	18
2.2 Concept of Adaptive PS Method and Two-Phase Adaptive PFR.....	25
2.2.1 Adaptive PS Method (Pattern Substitution Method).....	25
2.2.2 Two-Phase Adaptive PFR Method	26
2.2.2.1 Pattern Frequency Replacement (PFR) Method	27
2.2.2.2 Context Window.....	28
2.2.2.3 Adaptive Overlapping Pattern Substitution (PS) Method.....	29
2.2.2.4 Three Round Embedding	31
CHAPTER 3: RESEARCH METHODOLOGY	35
3.1 Two-Phase Adaptive Pattern Frequency Reduction (PFR)	35
3.1.1.1 Payload Capacity.....	42
3.1.1.1.1 Embedding Capacity for Adaptive Pattern Substitution Method (PS Method).....	42
3.1.1.1.2 Embedding Capacity for Two Phases Adaptive PFR Method.....	43
3.1.1.1.3 Calculate total number of patterns (N) and number of patterns that cannot be used for embedding (k)	44
3.1.1.1.4 Formulation for N (Total Number of Patterns).....	44
3.1.1.1.5 Formulation for k (Number of Unusable Patterns).....	45
3.1.2 Difference Matrix.....	46
3.1.2.1 Inverse Difference Matrix (Inverse XOR Process).....	49
3.1.3 Determining PM, PF, and PFR.....	50
3.1.3.1 Difference Matrix.....	51
3.1.4 Context Window.....	52
3.1.5 Two-Phase Adaptive PFR Embedding	52
3.1.5.1 First Phase Adaptive Embedding PFR.....	53
3.1.5.2 Second Phase Adaptive Embedding PFR.....	54
3.2 Design of Experiment	54

3.2.1 Similarity Comparison Between Original and The Reconstruction Secret	54
3.2.1.1 Peak Signal-to-Noise Ratio (PSNR)	56
3.2.1.2 Structural Similarity Index (SSIM).....	57
3.2.2 Robustness of Embedded Image	58
3.2.2.1 Salt and Pepper.....	59
3.2.2.2 Scratch.....	59
3.2.3 Trade off Analysis	59
CHAPTER 4: EXPERIMENT AND RESULT	62
4.1 Experiment Data.....	62
4.1.1 Peak Signal to Noise Radio (PSNR).....	67
4.1.2 Sturctural Similarity Index (SSIM).....	70
4.1.3 Payload (bits)	72
4.1.4 SALT and PEPPER	76
4.1.4.1 Embedded Image.....	81
4.1.4.2 Recovery Image	95
4.1.5 Scratch.....	108
4.2 Analyse the Experiment Results	112
4.2.1 Distortion	113
4.2.1.1 Peak Signal-to-Noise Ratio (PSNR)	113
4.2.1.1.1 Implementation PSNR in binary images.....	114
4.2.1.1.2 Peak Signal to Noise Radio (PSNR) Result Analysis	115
4.2.1.2 Structural Similarity Index Measure (SSIM)	117
4.2.1.3 SALT & PEPPER.....	118
4.2.1.4 SCRATCH.....	119
4.2.2 Capacity Embedding	120
4.2.2.1 Payload Capacity.....	120

4.2.2.1.1 Embedding Capacity for Adaptive Pattern Substitution Method (PS Method).....	120
4.2.2.1.2 Embedding Capacity for Two Phases Adaptive PFR Method...	121
4.2.2.1.3 Calculate total number of patterns (N) and number of patterns that cannot be used for embedding (k)	122
4.2.2.1.4 Formulation for N (Total Number of Patterns).....	122
4.2.2.1.5 Formulation for k (Number of Unusable Patterns).....	123
4.2.2.1.6 Payload (bits) Result Analysis	124
4.2.3 Similiarity Comparison Between Original and The Reconstruction Secret	129
4.2.3.1 PSNR and SSIM.....	129
4.2.3.1.1 Comparative Analysis	129
4.2.4 Robustness Test.....	130
4.2.4.1 Salt and Pepper.....	130
4.2.4.1.1 SALT and PEPPER Result Analysis	131
4.2.4.2 Scratch.....	158
4.2.4.2.1 Scratch.....	159
CHAPTER 5: CONCLUSION AND RECOMMENDATION	163
5.1 Conclusion	163
5.2 Recommendation.....	164
REFERENCES.....	167
APPENDIX.....	169