

TABLE OF CONTENTS

	Page No.
DECLARATION	III
CERTIFICATE	IV
DEDICATION	V
ACKNOWLEDGEMENTS	VI
ABSTRACT	VII
LIST OF FIGURES	IX
LIST OF TABLES	XI
NOMENCLATURE	XIII
TABLE OF CONTENTS	XV
CHAPTER 1 INTRODUCTION	1 - 12
1.1 Introduction	1
1.2 Data Security Techniques	1
1.2.1 Cryptography	3
1.2.2 Watermarking	3
1.2.3 Steganography	4
1.3 Quality assessment Parameters in Image Steganography	5
1.4 The Research Issues and Objectives	9
1.5 Thesis Organization	10
CHAPTER 2 LITERATURE REVIEW	11 - 28
2.1 Introduction	11
2.2 A Study on Image Steganography Techniques	11
2.2.1 LSB Substitution Techniques	11
2.2.2 Improved LSB Based Techniques	14
2.2.3 PVD Techniques	15
2.2.4 LSB+PVD Techniques	18
2.2.5 Modulus Function Based Techniques	22

2.2.6	Edge Based Techniques	24
2.3	Security Evaluation	25
2.3.1	PDH Attack	25
2.3.2	RS Attack	25
2.4	Identified Research Problems	26
2.4.1	FOBP in PVD Steganography	26
2.4.2	Unused Blocks Problem in APVD	27
2.4.3	PDH Analysis cannot Detect Multi-directional PVD	28
2.5	Research Contributions	28
 CHAPTER 3 STEGANOGRAPHY BASED ON QVD AND PVC		29-51
3.1	Introduction	29
3.2	The Proposed QVD+PVC Scheme	29
3.2.1	The Data Hiding Procedure	29
3.2.2	The Data Extraction Procedure	35
3.3	A Step-by-Step Example	37
3.4	Experimental Results	43
3.5	Security Evaluation	49
3.6	Conclusion	51
 CHAPTER 4 A HYBRID STEGANOGRAPHY TECHNIQUE BASED ON RR, AQVD, AND QVC		52-71
4.1	Introduction	52
4.2	The Proposed RR, AQVD, and QVC Technique	52
4.2.1	The Data Embedding Procedure	53
4.2.2	The Data Extraction Procedure	55
4.3	Example of Embedding and Extraction	58
4.3.1	Example of Embedding Procedure	58
4.3.2	Example of Extraction Procedure	60
4.4	Results and Discussion	61
4.5	Security Analysis	69
4.6	Conclusion	71

CHAPTER 5	MULTI-DIRECTIONAL PIXEL DIFFERENCE HISTOGRAM ANALYSIS BASED ON PIXEL BLOCKS OF DIFFERENT SIZES	73-103
5.1	Introduction	73
5.2	Proposed MDPDH Analysis	74
5.2.1	Algorithm 1: 1D Test	74
5.2.2	Algorithm 2: 2D Test	75
5.2.3	Algorithm 3: 3D Test	76
5.2.4	Algorithm 4: 5D Test	77
5.2.5	Algorithm 5: 8D Test	78
5.3	Results and Discussion	78
5.4	Conclusion	103
CHAPTER 6	OVERALL CONCLUSION AND SCOPE FOR FUTURE WORK	104-105
6.1	Overall Conclusion	104
6.2	Scope for Future Work	105
REFERENCES		106 - 115
LIST OF PUBLICATIONS		116