# CONTENTS

1. **INTRODUCTION**
   
   1.1 GENERAL 1
   1.2 REVIEW OF PAST CONTRIBUTIONS 2
   1.3 MOTIVATION FOR THE PRESENT WORK AND OBJECTIVES 6
   1.4 PERFORMANCE MEASURES USED 8
   1.5 ORGANIZATION OF THE THESIS 10
   1.6 CHAPTERWISE CONTRIBUTIONS 11
   1.7 SUMMARY 14

2. **A SECOND ORDER DIFFERENTIAL BASED IMPULSE DETECTION AND FILTERING OF CORRUPTED IMAGE**
   
   2.1 GENERAL 15
   2.2 IMPULSE NOISE MODEL AND FILTER STRUCTURE
       2.2.1 Model 1 (Salt and Pepper noise) 16
       2.2.2 Model 2 (Random Valued positive impulse noise) 16
       2.2.3 Filter Structure 17
   2.3 PROPOSED SCHEME
       2.3.1 Noise Detection Algorithm 18
       2.3.2 Filtering Algorithms
           2.3.2.1 Average Filtering Algorithm 21
           2.3.2.2 Median Filtering Algorithm 22
   2.4 SIMULATION RESULTS AND DISCUSSIONS 23
   2.5 CONCLUSION 24
3. IMPULSE NOISE REMOVAL SCHEME USING FUZZY DETECTOR AND MEDIAN FILTERING

3.1 GENERAL 33
3.2 BASICS OF FUZZY LOGIC 33
3.3 PROPOSED SCHEME
   3.3.1 Impulse Detection for FLDM-I Filter 35
   3.3.2 Impulse Detection for FLDM-II Filter 38
3.4 SIMULATION RESULTS AND COMPARATIVE ANALYSIS 40
3.5 CONCLUSION 49
APPENDIX 50

4. EFFICIENT IMAGE DENOISING USING NEURAL NETWORK

4.1 GENERAL 51
4.2 ARTIFICIAL NEURAL NETWORK 52
4.3 PROPOSED SCHEME 54
4.4 SIMULATION RESULTS AND DISCUSSION 55
4.5 CONCLUSION 66

5. DEVELOPMENT OF HYBRID SCHEME FOR REMOVAL OF HIGH DENSITY IMPULSE NOISE

5.1 GENERAL 67
5.2 DENOISING USING DWT 68
5.3 THE HYBRID SCHEME 70
5.4 SIMULATION RESULTS AND DISCUSSIONS 72
5.5 CONCLUSION 74

6. COMPARATIVE PERFORMANCE STUDY OF DIFFERENT IMPULSE NOISE REMOVAL SCHEMES

6.1 GENERAL 83
6.2 PERFORMANCE EVALUATION OF THE IMPULSE DETECTION SCHEMES 84
6.3 COMPUTATIONAL COMPLEXITY OF DIFFERENT DETECTION SCHEMES 85
6.4 COMPARISON OF FILTERING PERFORMANCE 86
6.5 CONCLUSION 87
7. REMOVAL OF GAUSSIAN NOISE FROM IMAGES USING AN EFFICIENTLY TRAINED RADIAL BASIS FUNCTION NEURAL NETWORK

7.1 GENERAL 88
7.2 SIGNAL AND NOISE MODEL 89
7.3 RADIAL BASIS FUNCTION NEURAL NETWORK 91
  7.3.1 LMS based Back Propagation Algorithm 93
  7.3.2 EKF training Algorithm 94
7.4 SIMULATION RESULTS 95
7.5 CONCLUSION 98

8. CONCLUSIONS 103

REFERENCES 106