

DAFTAR GAMBAR

| | | |
|--------------------|--|----|
| Gambar 2.1 | Desktop Operating System Market Share Worldwide..... | 14 |
| Gambar 2.2 | Klasifikasi teknik watermarking..... | 15 |
| Gambar 2.3 | Skema Pengujian Sistem Watermarking..... | 19 |
| Gambar 3.1 | Flowchart Embedding RRW PHT LQIM..... | 34 |
| Gambar 3.2 | Proses Penyisipan PHT LQIM | 35 |
| Gambar 3.3 | Proses Ekstraksi PHT LQIM | 37 |
| Gambar 3.4 | Proses penyisipan dengan PHT Multibit Spread Spectrum..... | 40 |
| Gambar 3.5 | Proses Ekstraksi dengan PHT Multibit Spread Spectrum | 42 |
| Gambar 3.6 | Skema pemisahan kanal RGB | 44 |
| Gambar 3.7 | <i>Flowchart embedding</i> pada pengaplikasian citra RGB | 45 |
| Gambar 3.8 | Flowchart ekstraksi pada pengaplikasian citra RGB | 48 |
| Gambar 3.9 | Proses Embedding Reversible | 50 |
| Gambar 3.10 | Proses Ekstraksi Reversible..... | 52 |
| Gambar 3.11 | Desain Global Aplikasi | 54 |
| Gambar 3.12 | Use Case Diagram Embedding dan Extraction Aplikasi | 56 |
| Gambar 3.13 | Flowchart Antarmuka | 58 |
| Gambar 3.14 | Desain Antarmuka Aplikasi..... | 59 |
| Gambar 4.1 | Proses pemisahan kanal RGB pada ukuran 8×8 | 71 |
| Gambar 4.2 | Proses pergantian kanal asli menjadi kanal berwatermark..... | 73 |
| Gambar 4.3 | Tampilan App Designer Aplikasi Wmarks | 77 |
| Gambar 4.4 | Tampilan Halaman Pembuka..... | 77 |
| Gambar 4.5 | Tampilan Antarmuka Utama..... | 78 |
| Gambar 4.6 | Dialog Pesan Peringatan..... | 79 |
| Gambar 4.7 | Tampilan Panel Penampilan Citra Host pada Antarmuka Utama..... | 79 |
| Gambar 4.8 | Dialog Pesan Error | 79 |
| Gambar 4.9 | Dialog Progress Embedding | 80 |
| Gambar 4.10 | Antarmuka Proses Embedding Berhasil | 81 |
| Gambar 4.11 | Dialog Guide..... | 81 |
| Gambar 4.12 | Halaman Save Image | 82 |
| Gambar 4.13 | Figure Hasil Serangan | 84 |
| Gambar 4.14 | Dialog About Us | 85 |
| Gambar 4.15 | Pengaruh Delta terhadap nilai BER..... | 86 |

| | |
|---|-----|
| Gambar 4.16 Pengaruh Delta Terhadap nilai PSNR1 | 87 |
| Gambar 4.17 Pengaruh Delta Terhadap nilai PSNR2 | 88 |
| Gambar 4.18 Nilai Rata – Rata (mean) | 89 |
| Gambar 4.19 Sigma = 0.9 k[8 8] | 89 |
| Gambar 4.20 Sigma = 1.1 k[8 8] | 90 |
| Gambar 4.21 Sigma = 0.9 k[12 12] | 90 |
| Gambar 4.22 Sigma = 1.3 k[9 9] | 90 |
| Gambar 4.23 Sigma = 1.5 k[9 9] | 91 |
| Gambar 4.24 Sigma = 1.4 k[9 9] | 91 |
| Gambar 4.26 Pengaruh Ukuran Blok PHT Terhadap BER | 94 |
| Gambar 4.27 Pengaruh Ukuran Blok terhadap PSNR | 95 |
| Gambar 4.28 Pengaruh Ukuran Blok terhadap BER | 95 |
| Gambar 4.29 Pengaruh jumlah Bit terhadap nilai BER | 96 |
| Gambar 4.30 Pengaruh Terhadap BER | 97 |
| Gambar 4.31 Pengaruh Terhadap PSNR | 97 |
| Gambar 4.32 Perbandingan PSNR robust embedding | 98 |
| Gambar 4.33 Perbandingan PSNR reversible embedding | 99 |
| Gambar 4.34 Perbandingan PSNR recovery image | 99 |
| Gambar 4.35 Hasil embedding yang dilakukan pada kanal green | 100 |
| Gambar 4.36 Citra Host PHT LQIM | 104 |
| Gambar 4.37 Citra berwatermark PHT LQIM | 104 |
| Gambar 4.38 Citra Host PHT MSS | 106 |
| Gambar 4.39 Citra Ber-watermark PHT MSS | 107 |
| Gambar 4.40 Perbedaan antara Citra Host dan Citra berwatermark PHT MSS | 107 |
| Gambar 4.41 Citra Host RGB | 109 |
| Gambar 4.42 Citra berwatermark PHT RGB | 110 |
| Gambar 4.43 Citra Host SS Adaptif | 110 |
| Gambar 4.44 Citra berwatermark skema DWT | 111 |
| Gambar 5.1 Hasil Pengujian JPEG Quality factor PHT LQIM | 113 |
| Gambar 5.2 Hasil Pengujian JPEG2000 Compression ratio PHT LQIM | 113 |
| Gambar 5.3 Hasil Pengujian AWGN PHT LQIM | 114 |
| Gambar 5.4 Hasil Pengujian Salt and Pepper Noise PHT LQIM | 117 |
| Gambar 5.5 Hasil Pengujian Speckle Noise PHT LQIM | 118 |
| Gambar 5.6 Hasil pengujian Rotasi PHT LQIM | 119 |

| | |
|--|-----|
| Gambar 5. 7 Hasil pengujian Scaling PHT LQIM | 120 |
| Gambar 5.8 Hasil pengujian JPEG Quality factor PHT MSS | 122 |
| Gambar 5.9 Hasil pengujian JPEG2000 Compression ratio PHT MSS..... | 123 |
| Gambar 5. 10 Hasil pengujian AWGN PHT MSS..... | 123 |
| Gambar 5.11 Hasil Pengujian Salt and Pepper Noise PHT MSS | 127 |
| Gambar 5.12 Hasil Pengujian <i>Speckle Noise</i> PHT MSS | 128 |
| Gambar 5.13 Hasil pengujian Rotasi PHT MSS | 129 |
| Gambar 5.14 Hasil pengujian Scaling PHT MSS | 130 |
| Gambar 5.15 Hasil pengujian JPEG Quality factor PHT citra RGB..... | 132 |
| Gambar 5.16 Hasil Pengujian JPEG2000 PHT citra RGB..... | 132 |
| Gambar 5.17 Hasil Pengujian AWGN PHT citra RGB | 133 |
| Gambar 5.18 Hasil Pengujian Gaussian Filter PHT citra RGB..... | 134 |
| Gambar 5.19 Hasil Pengujian Average Filter PHT citra RGB..... | 134 |
| Gambar 5.20 Hasil Pengujian Salt & Pepper Noise PHT citra RGB | 135 |
| Gambar 5.21 Hasil Pengujian Speckel Noise PHT citra RGB..... | 136 |
| Gambar 5.22 Hasil Pengujian Rotation PHT citra RGB | 137 |
| Gambar 5.23 Hasil Pengujian Scaling PHT citra RGB..... | 137 |