Abstract

Over the years, large amount of transferred information has been attacked by hackers; so it has been considerable to make all effort for securing data and encrypting the information. Color images represent a very vital and important type of multimedia; so many encryption techniques have been proposed to protect the color image against different types of attacks. In this paper two proposed techniques will be introduced which have had high robustness against complex composite form of attacks. Discrete Wavelet Transform (DWT) has been applied for image transformation in one method and Discrete Cosine Transform (DCT) has been applied in the other one. Six various chaotic maps have been used with different parameters to introduce the needed encryption keys for the proposed approaches. After many extensive comparisons with other traditional techniques it has been found that the proposed algorithms have given better performance against both friendly and hard forms of complex composite attacks.

References


19. Table 2. performance metrics in case DCT technique against Friendly Gaussian attack for image (1)

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100. Table 3. performance metrics in case DWT technique against Friendly Gaussian attack for image (1)
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DCT versus DWT Chaotic based Color Image Encryption

Table 4. performance metrics in case DCT technique against Friendly Salt & pepper attack for image (1)

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DCT versus DWT Chaotic based Color Image Encryption

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262. Table 5. performance metrics in case DWT technique against Friendly Salt & pepper attack for image (1)
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Table 6. performance metrics in case DCT technique against Friendly Speckle attack for image (1)

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Table 7 performance metrics in case DWT technique against Friendly Speckle attack for image (1)
DCT versus DWT Chaotic based Color Image Encryption

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431. ğ Quadratic
432. ğ Refrence no.(14) without using filter
433. ğ Refrence no.(14) with using median filter
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435. ğ Elapsed time
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437. ğ 0.2701
438. ğ 0.3522
439. ğ 0.3120
440. ğ 0.2930
441. ğ 0.3049
442. ğ 0.6259
443. ğ 0.6296
444. ğ
445. ğ MSE
446. ğ 5.747e+043
447. ğ 6.5952e+03
448. ğ 6.3071e+03
449. ğ 6.5553e+03
450. ğ 7.8616e+03
451. ğ 6.5878e+03
452. ğ 10495
453. ğ 10066
454. ğ
455. ğ PSNR
456. ğ 10.5411
457. ğ 9.9385
458. ğ 10.1325
459. ğ 9.9649
460. ğ 9.1757
461. ğ 9.9437
462. ğ 7.9209
463. ğ 8.1021
464. ğ
465. ğ R
466. ğ 0.0429
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472. ğ 0.4341
473. 0.4601
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475. NPCR
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482. 0.00074
483. 0.00074

484.

485. UACI
486. 18.2553
487. 22.3527
488. 23.5403
489. 24.6183
490. 16.2727
491. 24.0672
492. 5.6079
493. 5.3108
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495. Entropy of original image
496. 7.0237
497. 7.0237
498. 7.0237
499. 7.0237
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502. 5.9133
503. 5.6448
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505. Table 8. performance metrics in case DCT technique against Hard Gaussian attack
for image (1)

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571. 10.1701
572. 10.1589
573. 28.221
574. 29.1083
575. 
576. Entropy of original image
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582. 6.9219
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586. Table 9. performance metrics in case DWT technique against Hard Gaussian attack for image (1)

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DCT versus DWT Chaotic based Color Image Encryption

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617. PSNR
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621. $11.9538$
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Table 11. Performance metrics in case DWT technique against Hard salt & pepper attack for image (1)

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<tr>
<th>Metrics</th>
<th>Chirikov</th>
<th>Chirikovtan</th>
<th>Henon</th>
<th>Ikeda</th>
<th>Logistic</th>
<th>Quadratic</th>
<th>Reference no.(14) without using filter</th>
<th>Reference no.(14) with using median filter</th>
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<td>4.2072e+03</td>
<td>4.2069e+03</td>
<td>4.2048e+03</td>
<td>4.2063e+03</td>
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<td>15388</td>
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| 798 | NPCR |
| 799 | 5.0863e-04 |
| 800 | 5.0863e-04 |
| 801 | 5.0863e-04 |
| 802 | 5.0863e-04 |
| 803 | 5.0863e-04 |
| 804 | 5.0863e-04 |
| 805 | 5.0863e-04 |
| 806 | 0.00074 |
| 807 | 0.00074 |

| 808 | UACI |
| 809 | 10.5114 |
| 810 | 10.5116 |
| 811 | 10.5072 |
| 812 | 10.5121 |
| 813 | 10.5079 |
| 814 | 10.5099 |
| 815 | 5.6079 |
| 816 | 29.1083 |

| 817 | Entropy of original image |
| 818 | 6.9219 |
| 819 | 6.9219 |
| 820 | 6.9219 |
| 821 | 6.9219 |
| 822 | 6.9219 |
| 823 | 6.9219 |
| 824 | 6.9219 |
| 825 | 6.9219 |
| 826 | 5.9133 |
| 827 | 7.2331 |
| 828 | |

| 829 | Table 12. performance metrics in case DCT technique against Hard Speckle attack |
| 830 | for image (1) |
| 831 | Metrics |
| 832 | Chirikov |
| 833 | Chirikovtan |
| 834 | Henon |
| 835 | Ikeda |
| 836 | Logistic |
836. Quadratic
837. Reference no.(14) without using filter
838. Reference no.(14) with using median filter
839. 
840. Elapsed time
841. 0.2662
842. 0.2762
843. 0.2803
844. 0.2823
845. 0.2960
846. 0.2812
847. 0.7704
848. 0.7911
849. 
850. MSE
851. 4.2233e+03
852. 4.2152e+03
853. 4.2121e+03
854. 4.2141e+03
855. 4.2171e+03
856. 4.2070e+03
857. 15819
858. 15388
859. 
860. PSNR
861. 11.8743
862. 11.8826
863. 11.8858
864. 11.8837
865. 11.8807
866. 11.8911
867. 6.1391
868. 6.2590
869. 
870. R
871. 0.3326
872. 0.338
873. 0.3334
874. 0.3349
875. 0.3337
876. 0.3351
877. 0.1545
878. 0.1846
879. 
880. NPCR
881. 5.0863e-04
882. $5.0863e-04$
883. $5.0863e-04$
884. $5.0863e-04$
885. $5.0863e-04$
886. $5.0863e-04$
887. $0.00074$
888. $0.00074$
889. 
890. $UACI$
891. $10.6046$
892. $10.6249$
893. $10.6235$
894. $10.6057$
895. $10.6348$
896. $10.6167$
897. $28.221$
898. $29.1083$
899. 
900. Entropy of original image
901. $6.9219$
902. $6.9219$
903. $6.9219$
904. $6.9219$
905. $6.9219$
906. $6.9219$
907. $7.2638$
908. $7.2331$
909. 
910. Table 13. performance metrics in case DWT technique against Hard Speckle attack for image (1)
911. Metrics
912. Chirikov
913. Chirikovtan
914. Henon
915. Ikeda
916. Logistic
917. Quadratic
918. Reference no.(14) without using filter
919. Reference no.(14) with using median filter
920. 
921. Elapsed time
922. $0.2662$
923. $0.2762$
924. $0.2803$
925. $0.2823$
926. $0.2960$
927. 0.2812
928. 0.6259
929. 0.7911
930. 
931. MSE
932. 4.2233e+03
933. 4.2152e+03
934. 4.2121e+03
935. 4.2141e+03
936. 4.2171e+03
937. 4.2070e+03
938. 10495
939. 15388
940. 
941. PSNR
942. 11.8743
943. 11.8826
944. 11.8858
945. 11.8837
946. 11.8807
947. 11.8911
948. 7.9209
949. 6.2590
950. 
951. R
952. 0.3326
953. 0.338
954. 0.3334
955. 0.3349
956. 0.3337
957. 0.3351
958. 0.4341
959. 0.1846
960. 
961. NPCR
962. 5.0863e-04
963. 5.0863e-04
964. 5.0863e-04
965. 5.0863e-04
966. 5.0863e-04
967. 5.0863e-04
968. 0.00074
969. 0.00074
970. 
971. UACI
972. 10.6046
Entropy of original image

Keywords

Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT), Inverse Discrete Cosine Transform (IDCT), Inverse Discrete Wavelet Transform (IDWT), Data Encryption Standard (DES), Data Encryption Standard (TRIPLE DES), Advanced Encryption Standard (AES).