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2 pesan

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02-Nov-2020

Dear Mr. wibisono:

Your manuscript entitled "Hybrid Reversible Data Hiding in Encrypted Satellite Images using Fluctuation Modification Extraction and Reed-Solomon Code Embedding" has been successfully submitted online and is presently being given full consideration for publication in IEEE Access.

As noted during the submission of your manuscript, IEEE Access is a fully open access journal. Open Access provides unrestricted access to peer-reviewed articles via IEEE Xplore. In lieu of paid subscriptions, authors are required to pay an article processing charge of $1,750 after the article has been accepted for publication.

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Sincerely,

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02-Nov-2020

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As a reminder, IEEE Access is a fully open access journal. Open Access provides unrestricted access to published articles via IEEE Xplore. In lieu of paid subscriptions, authors are required to pay an article processing charge of $1,750 (plus applicable local taxes) after the article has been accepted for publication.

[Kutipan teks disembunyikan]

Teguh Firmansyah <teguhfirmansyah@untirta.ac.id>

IEEE Access - Decision on Manuscript ID Access-2020-53481

1 pesan

IEEE Access <onbehalfof@manuscriptcentral.com> 1 Desember 2020 pukul 16.28
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01-Dec-2020

Dear Mr. wibisono:

Your manuscript entitled "Hybrid Reversible Data Hiding in Encrypted Satellite Images Using Fluctuation Modification Extraction and Reed-Solomon Code Embedding" has been accepted for publication in IEEE Access. The comments of the reviewers who reviewed your manuscript are included at the foot of this letter. We ask that you make changes to your manuscript based on those comments, before uploading final files.

However, NO CHANGES to the author list or the references will be permitted.

Finally, please improve the English grammar and check spelling, as it is only lightly edited before publication.

Once you have updated your article accordingly, please send all final versions of your files through the “Awaiting Final Files” queue in your Author Center on ScholarOne Manuscripts. Once you have completed the submission of your final files, you will not be able to make changes until you have received your page proofs from IEEE.

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Thank you for your fine contribution. On behalf of the Editors of IEEE Access, we look forward to your continued contributions to IEEE Access.

Sincerely,
Dr. Shiqi Wang
Associate Editor, IEEE Access
shiqwang@cityu.edu.hk

Reviewer(s)' Comments to Author:

Reviewer: 1

Recommendation: Accept (minor edits)

Comments:
The revision is sufficient for the article.

Additional Questions:
1) Does the paper contribute to the body of knowledge?: Yes.

2) Is the paper technically sound?: Yes.

3) Is the subject matter presented in a comprehensive manner?: Yes.

4) Are the references provided applicable and sufficient?: Yes.

5) Are there references that are not appropriate for the topic being discussed?: No

5a) If yes, then please indicate which references should be removed.:

Reviewer: 2

Recommendation: Accept (minor edits)

Comments:
The authors have incorporated my given suggestions. Therefore I recommend accepting.

Additional Questions:
1) Does the paper contribute to the body of knowledge?: Yes

2) Is the paper technically sound?: Yes

3) Is the subject matter presented in a comprehensive manner?: Yes

4) Are the references provided applicable and sufficient?: Yes

5) Are there references that are not appropriate for the topic being discussed?: No

5a) If yes, then please indicate which references should be removed.:

If you have any questions, please contact article administrator: Mr. Ankit Srivastava a.srivastava@ieee.org

Original Manuscript ID: ID Access-2020-40576

Original Article Title: Hybrid Reversible Data Hiding System Using Fluctuation Modification in Extraction and Reed-Solomon Code Hiding for Satellite Images

Revised Title: Hybrid Reversible Data Hiding in Encrypted Satellite Images using Fluctuation Modification Extraction and Reed-Solomon Code Embedding

To: IEEE Access Editor

Re: Response to reviewers

Dear Editor,

Thank you for allowing a resubmission of our manuscript, with an opportunity to address the reviewers' comments.

We are uploading (a) our point-by-point response to the comments (below) (response to reviewers), (b) an updated manuscript with yellow highlighting indicating changes, and (c) a clean updated manuscript without highlights (PDF main document).

For your additional information, we agreee to the reviewer suggest regarding revise the title. Now, the title is "*Hybrid Reversible Data Hiding in Encrypted Satellite Images using Fluctuation Modification Extraction and Reed-Solomon Code Embedding*".

We hope that this paper can be assigned to the same reviewers.

Best regards,

Gunawan Wibisono et al.
Universitas Indonesia
Depok Campus, 16424 Depok, Jawa Barat, Indonesia
Email : gunawan@eng.ui.ac.id

Response Letter

Manuscript ID Access-2020-40576

Title :
Hybrid Reversible Data Hiding in Encrypted Satellite Images System using Fluctuation Modification in Extraction and Reed-Solomon Code Hiding Hybrid Reversible Data Hiding

Revised title:
Hybrid Reversible Data Hiding in Encrypted Satellite Images using Fluctuation Modification Extraction and Reed-Solomon Code Embedding

Authors :
Gunawan Wibisono, (Member, IEEE), Ali Syahputra Nasution, Teguh Firmansyah (Member, IEEE), and Anton Satria Prabuwono, (Fellow, IEEE)

First of all, we would like to thank the reviewers for their in-depth and constructive reviews of our manuscript and the editor for his careful reading and suggestion to resubmit our manuscript. In this revised version of the manuscript, we did our best to address all comments raised by the reviewers. A detailed item-by-item response to each of the reviewers' points is presented below.

Reviewer 1

Concern # 1:
Recommendation: Accept (minor edits)

Author response:
Many thanks to the reviewer for this positive feedback.

Concern # 2:
The article organization should be given in the last paragraph of the introduction section.

Author response:
We have added the organization in the last paragraph of the introduction section.

The remaining part of this paper is organized as follows. The proposed system model based on a hybrid RDH scheme with modified fluctuation function, including image encryption, data embedding, hybrid data extraction, and image recovery, was described in the first part of Section II. Moreover, the proposed hybrid RDHEI scheme in remote sensing satellite images with modified fluctuation functions and RS code embedding, including codeword embedding, hybrid codeword extraction, and image recovery, was explained in the second part of Section II. Moreover, the experimental results and analysis are explained in Section III. Section IV provides concluding remarks.

Author action: We updated the manuscript by yellow highlight as shown on page 3 line 22.

Concern # 3:
In some sections, references are given as [20-26] [27,28], while in some section as [34] - [35].

Author response: We apologize for this error, and we have corrected the text as suggested by the reviewer.

We have revised all the references as IEEE Access format.
For instance:
[7-28] → IEEE format : [7-28]
[27,28] → IEEE format : [27], [28]
[34] - [35] → IEEE format : [34], [35]

Author action: We updated the manuscript by yellow highlight as shown on page 2 line 17, 30,34, and 42.

Concern # 4:
Author's paper is very similar to the articles presented below. Some paragraphs were written directly from these articles. Therefore, authors should rewrite similar parts of their articles.

Author response: We have corrected and revised the text as suggested by the reviewer.

Author action: We updated the manuscript by yellow highlight, as shown on page 1 line 50, page 2 line 24, 36,50, page 3 line 21,31, page 5 line 30.

Concern # 5:
According to their proposed method, it can reduce the number of bit errors extracted and increase the reversibility and visual quality of the restored satellite images. The authors have performed sufficient technically research. The authors have explained their articles comprehensively, taking into literature studies. According to their paper, the references are provided applicable and sufficient.

Author response: Many thanks to the reviewer for this positive feedback.

Reviewer 2

Concern # 1:
Recommendation: Updates required before resubmission

Author response:
Many thanks to the reviewer for this positive feedback.

Concern # 2:
The title is not appropriate. Only reversible data hiding is metioned in the tiltle of this paper. However, RDH emphasizes on reversibility and imperceptibility, and RDHEI emphasizes on reversibility and embedding capacity. Moreover, in the title, it emphasizes that the method is applied to satellite images, but I don't see why this point should be emphasized.

Author response: Thank you for pointing this out. The complete proposed schematic flow was contained of RDH, RDHEI, satellite images, fluctuation modification extraction, and reed-Solomon code embedding, as shown in Figure 2.

The proposed schematic flow chart is shown in Figure 2 and consists of the following **three stages: image encryption, data embedding, and hybrid data extraction and image recovery**. In the satellite image encryption phase, by using encryption key, the image owner encrypts the original satellite image to produce the encrypted satellite image. Then, in the data hiding phase, the data hider embeds additional information bits into the encrypted satellite image using the data hiding key without knowing its original content. In the hybrid phase of

data extraction and image recovery, with encrypted images containing additional information bits, the recipient first decrypts the image using the encryption key, and the decrypted version is similar to the original satellite image. In accordance with the data hiding key, the receiver may further extract embedded information bits and recover the original satellite image from the decrypted version with the help of the fluctuation function.

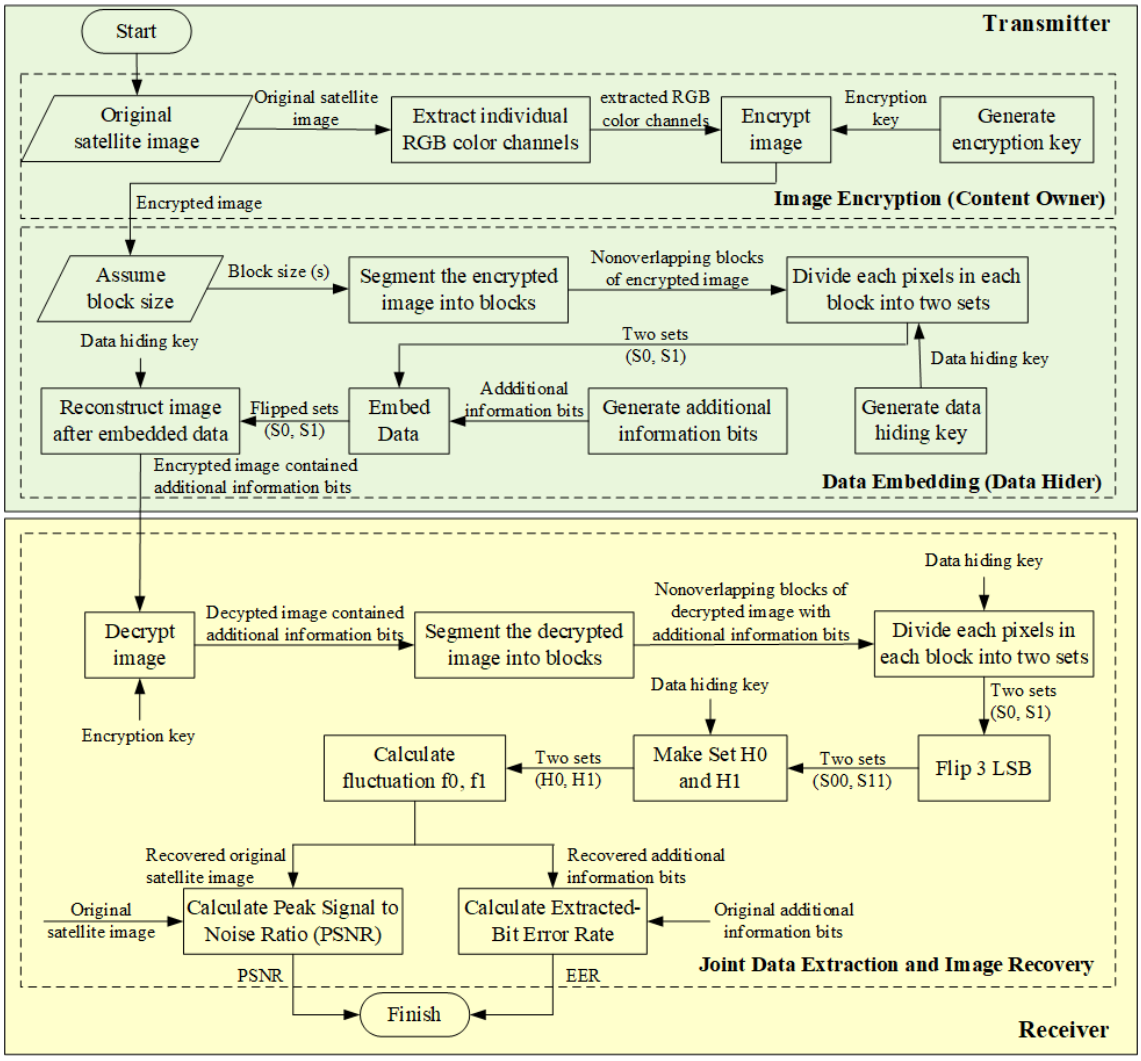

FIGURE 2. **Proposed hybrid RDH scheme in remote sensing satellite images with fluctuation function modification.**

Moreover, in this paper, high-resolution remote sensing satellite images of SPOT-6, SPOT-7, and Pleiades-1A are used as test images. The SPOT-6 and SPOT-7 images have four multispectral channels. Each channel has a spatial resolution of 6 meters and one panchromatic channel with a spatial resolution of 1.5 meters. Similarly, Pleiades-1A imagery has four multispectral channels. Each channel has a spatial resolution of 2 meters and one panchromatic channel with a spatial resolution of 0.5 meters. Figure 1 shows one scene sample from each SPOT-6, SPOT-7, and Pleiades-1A test images with a composite band 3,2,1 (RGB).

The phrase "satellite images" is also essential to emphasize in the title due to applying the proposed method. The proposed method was applied to high-resolution remote sensing satellite images of SPOT-6, SPOT-7, and Pleiades-1A. Moreover, the fluctuation modification extraction and reed-Solomon code embedding will generate different values for different satellite images. Therefore, we think that the phrase "satellite images" should be emphasized.

However, as suggested by the reviewer and to make it more clear, we have revised the title;

Title :
Hybrid Reversible Data Hiding in Encrypted Satellite Images System using Fluctuation Modification in Extraction and Reed-Solomon Code Hiding Hybrid Reversible Data Hiding

Revised title:
Hybrid Reversible Data Hiding in Encrypted Satellite Images using Fluctuation Modification Extraction and Reed-Solomon Code Embedding

Author action: We updated the manuscript by yellow highlight.

Concern # 3:
Lack of comparision with RS based RDHEI methods. Only three methods using different fluctuation function. It should be compared with RS based RDHEI methods such as [29], [30].

Author response: Thank you for pointing this out. We think this is an excellent suggestion. We have compared with RS based RDHEI methods such as [29], [30].

Comparison results are shown in Table II, Table III, Fig 10, Fig 11, and Fig 12. Please see the main manuscript for more detailed values.

TABLE II
MINIMUM BLOCK SIZE TO OBTAIN ERROR-FREE EXTRACTED-BITS WITH SEVERAL METHODS FOR TESTING SPOT-6 IMAGE.

Methods	Rate	Minimum block size	Number of messages (bits)	Gain (%) to									
				Zhang [7]	Hong et al. [8]	Fatema et al. [16]	Taesoo et al. with RS(15,7) [29]	Taesoo et al. with RS(31,21) [29]	Sunghwan with RS (15,11) [30]	Sunghwan with RS (15,7) [30]	Sunghwan with RS (31,23) [30]	Sunghwan with RS (31,15) [30]	Proposed without RS code
SPOT-6 Remote Sensing Test Image													
Zhang [7]	1	20x20	625	100.00	100.00	100.00	148.81	142.05	183.82	89.29	126.26	87.41	79.72
Hong et al. [8]	1	20x20	625	100.00	100.00	100.00	148.81	142.05	183.82	89.29	126.26	87.41	79.72
Fatema et al. [16]	1	20x20	625	100.00	100.00	100.00	148.81	142.05	183.82	89.29	126.26	87.41	79.72
Taesoo et al. with RS(15,7) [29]	0.47	14x14	420	67.20	67.20	67.20	100.00	95.45	123.53	60.00	84.85	58.74	53.57
Taesoo et al. with RS(31,21) [29]	0.68	14x14	440	70.40	70.40	70.40	104.76	100.00	129.41	62.86	88.89	61.54	56.12
Sunghwan with RS(15,11) [30]	0.73	16x16	340	54.40	54.40	54.40	80.95	77.27	100.00	48.57	68.69	47.55	43.37
Sunghwan with RS(15,7) [30]	0.47	11x11	700	112.00	112.00	112.00	166.67	159.09	205.88	100.00	141.41	97.90	89.29
Sunghwan with RS(31,23) [30]	0.74	13x13	495	79.20	79.20	79.20	117.86	112.50	145.59	70.71	100.00	69.23	63.14
Sunghwan with RS(31,15) [30]	0.48	11x11	715	114.40	114.40	114.40	170.24	162.50	210.29	102.14	144.44	100.00	91.20
Proposed without RS code	1	18x18	784	125.44	125.44	125.44	186.67	178.18	230.59	158.38	109.65	109.65	100.00
Proposed + RS (7, 1)	0.14	11x11	300	48.00	48.00	48.00	71.42	68.18	88.23	42.86	60.61	41.96	38.27
Proposed + RS(15,5)	0.33	10x10	860	137.60	137.60	137.60	204.76	195.45	252.94	122.86	173.74	120.28	109.69
						0	140.80	209.52	200.00	252.94	125.71	177.78	123.08	112.24
						0	80.00	119.05	113.64	147.06	71.43	101.01	69.93	63.78
						6	178.56	265.71	253.64	328.24	159.43	225.45	156.08	142.35
						4	99.84	148.57	141.82	183.53	89.14	126.06	87.27	79.59
						8	150.08	223.33	213.18	275.88	134.00	189.49	131.19	119.64
Proposed + RS(127,27)	0.21	9x9	567	90.72	90.72	90.72	135.00	128.86	166.76	81.00	114.55	79.30	72.32
Proposed + RS(255,111)	0.44	10x10	888	142.08	142.08	142.08	211.43	201.82	261.18	126.86	179.39	124.20	113.27
Proposed + RS(255,45)	0.18	9x9	360	57.60	57.60	57.60	85.71	81.82	105.88	51.43	72.73	50.35	45.92

TABLE II. Minimum block size to obtain error-free extracted-bits with several methods for **testing SPOT-6 image.**

TABLE III

MINIMUM BLOCK SIZE TO OBTAIN ERROR-FREE EXTRACTED-BITS WITH SEVERAL METHODS FOR TESTING SPOT-7 IMAGE.

Methods	Rate	Minimum block size	Number of messages (bits)	Gain (%) to									
				Zhang [7]	Hong et al. [8]	Fatema et al. [16]	Taesoo et al. with RS (15,7) [29]	Taesoo et al. with RS (31,21) [29]	Sunghwan with RS (15,11) [30]	Sunghwan with RS (15,7) [30]	Sunghwan with RS (31,23) [30]	Sunghwan with RS (31,15) [30]	Proposed without RS code
SPOT-7 Remote Sensing Test Image													
Zhang [7]	1	23x23	484	100.00	84.03	84.03	96.80	110.00	96.80	83.45	80.00	67.69	61.73
Hong et al. [8]	1	21x21	576	119.01	100.00	100.00	115.20	130.91	115.20	99.31	95.21	80.56	73.47
Fatema et al. [16]	1	21x21	576	119.01	100.00	100.00	115.20	130.91	115.20	99.31	95.21	80.56	73.47
Taesoo et al. with RS(15,7) [29]	0.47	13x13	500	103.31	86.81	86.81	100.00	113.64	100.00	86.21	82.64	69.93	63.78
Taesoo et al. with RS(31,21) [29]	0.68	14x14	440	90.90	76.39	76.39	88.00	100.00	88.00	75.86	72.73	61.54	56.12
Sunghwan with RS(15,11) [30]	0.73	13x13	500	103.31	86.81	86.81	100.00	113.64	100.00	86.21	82.64	69.93	63.78
Sunghwan with RS(15,7) [30]	0.47	12x12	580	119.84	100.69	100.69	116.00	131.82	116.00	100.00	95.87	81.12	73.98
Sunghwan with RS(31,23) [30]	0.74	12x12	605	125.00	105.03	105.03	121.00	137.50	121.00	104.31	100.00	84.62	77.17
Sunghwan with RS(31,15) [30]	0.48	11x11	715	147.73	124.13	124.13	143.00	162.50	143.00	123.76	118.18	100.00	91.20
Proposed without RS code	1	18x18	784	161.98	136.11	136.11	156.80	178.18	156.80	135.17	129.59	109.65	100.00
Proposed + RS(7,5)	0.71	14x14	915	189.05	158.85	158.85	183.00	207.95	183.00	157.76	151.24	127.97	116.71
Proposed + RS(7,1)	0.14	11x11	300	61.98	52.08	52.08	60.00	68.18	60.00	51.72	49.59	41.96	38.27
						81.25	208.80	237.27	208.80	180.00	172.56	146.01	133.16
						6.11	41.60	47.27	41.60	35.86	34.38	29.09	26.53
						59.27	195.00	221.59	195.00	168.10	161.16	136.36	124.36
						6.81	100.00	113.64	100.00	86.21	82.64	69.93	63.78
						51.46	186.00	211.36	186.00	160.34	153.72	130.07	118.62
						5.00	86.40	98.18	86.40	74.48	71.40	60.42	55.10
						62.85	187.60	213.18	187.60	161.72	155.04	131.19	119.64
Proposed + RS(127,27)	0.21	9x9	567	117.15	98.44	98.44	113.40	128.86	113.40	97.76	93.72	79.30	72.32
Proposed + RS(255,145)	0.57	11x11	1160	239.67	201.39	201.39	232.00	263.64	232.00	200.00	191.74	162.24	147.96
Proposed + RS(255,41)	0.16	9x9	328	67.77	56.94	56.94	65.60	74.55	65.60	56.55	54.21	45.87	41.84

TABLE III. Minimum block size to obtain error-free extracted-bits with several methods for **testing SPOT-7 image.**

TABLE IV

MINIMUM BLOCK SIZE TO OBTAIN ERROR-FREE EXTRACTED-BITS WITH SEVERAL METHODS FOR TESTING PLEIADES-1A IMAGE

Methods	Rate	Minimum block size	Number of messages (bits)	Gain (%) to									
				Zhang [7]	Hong et al. [8]	Fatema et al. [16]	Taesoo et al. with RS (15,7) [29]	Taesoo et al. with RS (31,21) [29]	Sunghwan with RS (15,11) [30]	Sunghwan with RS (15,7) [30]	Sunghwan with RS (31,23) [30]	Sunghwan with RS (31,15) [30]	Proposed without RS code
Pleiades-1A Remote Sensing Test Image													
Zhang [7]	1	21x21	576	100.00	100.00	108.88	169.41	174.55	151.58	99.31	149.61	116.36	92.16
Hong et al. [8]	1	21x21	576	100.00	100.00	108.88	169.41	174.55	151.58	99.31	149.61	116.36	92.16
Fatema et al. [16]	1	22x22	529	91.84	91.84	100.00	155.59	160.30	139.21	91.21	137.40	106.87	84.64
Taesoo et al. with RS(15,7) [29]	0.47	16x16	340	59.03	59.03	64.27	100.00	103.03	89.47	58.62	88.31	68.69	43.37
Taesoo et al. with RS(31,21) [29]	0.68	16x16	330	57.29	57.29	62.38	97.05	100.00	86.84	56.90	85.71	66.67	42.09
Sunghwan with RS(15,11) [30]	0.73	15x15	380	65.97	65.97	71.83	111.76	115.15	100.00	65.52	98.70	76.77	48.47
Sunghwan with RS(15,7) [30]	0.47	12x12	580	100.69	100.69	109.64	170.59	175.76	152.63	100.00	150.65	117.17	73.98
Sunghwan with RS(31,23) [30]	0.74	15x15	385	66.84	66.84	72.78	113.24	116.67	101.16	66.38	100.00	77.78	49.11
Sunghwan with RS(31,15) [30]	0.48	13x13	495	85.94	85.94	93.57	145.59	150.00	85.34	128.57	128.57	100.00	63.14
Proposed without RS code	1	18x18	784	125.44	125.44	125.44	230.59	237.58	206.32	135.17	203.64	158.38	100.00
Proposed + RS(7,3)	0.43	13x13	648	112.50	112.50	122.50	190.59	196.36	170.53	111.72	168.31	130.91	103.68
Proposed + RS(7,1)	0.14	12x12	252	43.75	43.75	47.64	74.18	76.36	66.32	43.45	65.45	50.91	40.32
Proposed +	0.46	12x12	812	140.97	140.97	153.49	238.82	246.06	213.68	140.00	210.91	164.04	129.92
						10	172	29.86	29.86	32.51	238.82	52.12	45.26	29.66	44.68	34.75	27.52
						12	715	124.13	124.13	135.16	210.29	216.67	188.16	123.27	185.71	144.44	114.40
						11	195	33.85	33.85	36.86	57.35	59.09	51.32	33.62	50.65	39.39	31.20
						12	648	112.50	112.50	122.50	190.59	196.36	170.53	111.72	168.31	130.91	103.68
						10	108	18.75	18.75	20.42	31.76	32.73	28.42	18.62	28.05	21.81	17.28
						11	630	109.38	109.38	119.09	185.29	190.91	165.79	108.62	163.64	127.27	100.80
Proposed + RS(127, 15)	0.12	10x10	210	36.46	36.46	39.70	61.76	63.64	55.26	36.21	54.55	42.42	33.60
Proposed + RS(255, 87)	0.34	11x11	696	120.83	120.83	131.57	204.71	210.91	183.16	120.00	180.78	140.61	111.36
Proposed + RS(255, 27)	0.11	10x10	216	37.50	37.50	40.83	63.53	65.45	56.84	37.24	56.10	43.64	34.56

Please see the main manuscript for more detailed values.

TABLE IV. Minimum block size to obtain error-free extracted-bits with several methods for **testing Plaides-1A image.**

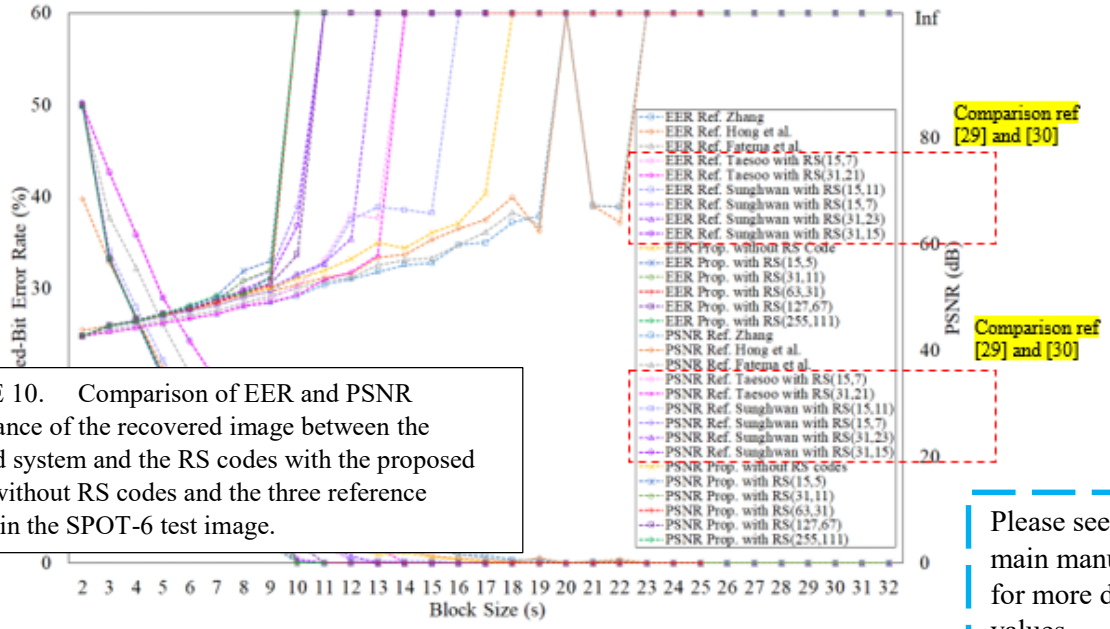

FIGURE 10. Comparison of EER and PSNR performance of the recovered image between the proposed system and the RS codes with the proposed system without RS codes and the three reference systems in the SPOT-6 test image.

Please see the main manuscript for more detailed values.

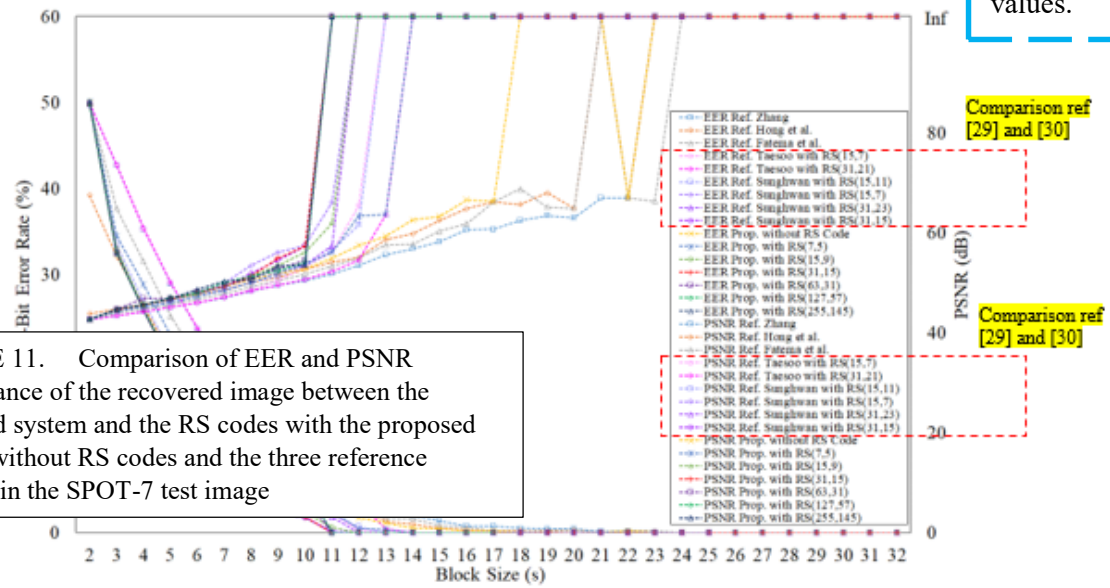

FIGURE 11. Comparison of EER and PSNR performance of the recovered image between the proposed system and the RS codes with the proposed system without RS codes and the three reference systems in the SPOT-7 test image

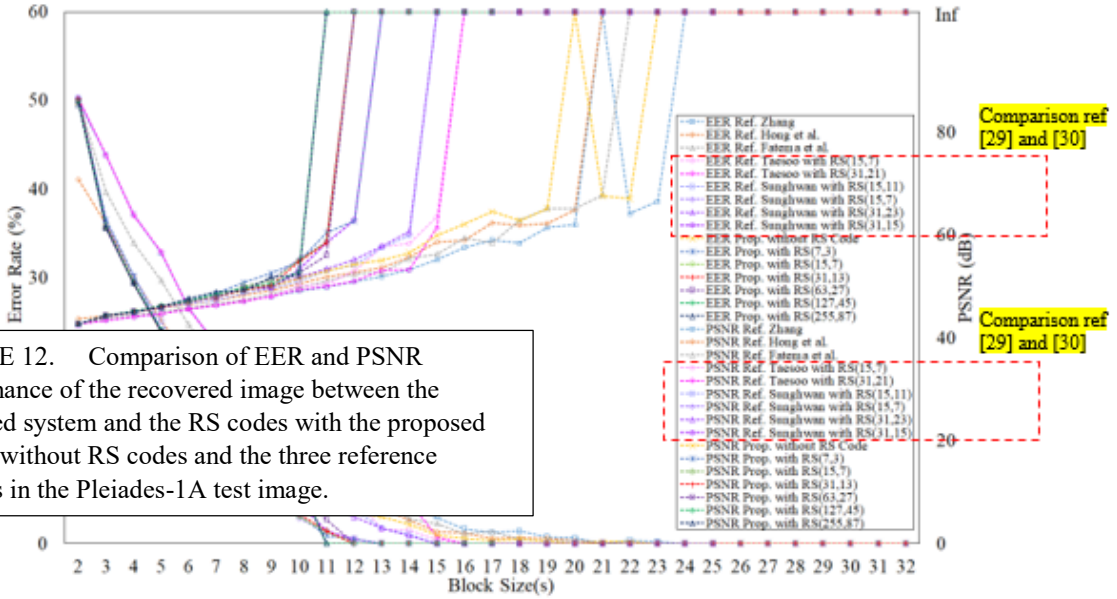

FIGURE 12. Comparison of EER and PSNR performance of the recovered image between the proposed system and the RS codes with the proposed system without RS codes and the three reference systems in the Pleiades-1A test image.

Author action: We updated the manuscript by yellow highlight shown on page 12 line 1, page 13 line 1, page 14 line 1, page 15 line 1, and page 16 line 1.

Concern # 4:
Only red channel of the cover image is used to carry additional data, how to prevent the attackers that have decryption key from getting some information about embedded data from green and blue channels.

Author response: We appreciate the reviewer's comments.

To prevent attackers who have the decryption key from getting some information about the embedded data from the green and blue channels, both the red, green and blue channels are encrypted with an encryption key. It could be achieved by applying bitwise exclusive-or (XOR) so that only the authorized recipient has an encryption key that can decrypt all three channels. In other words, the application of the description key can also be made on the green and blue channels, simultaneously.

However, this method has a heavy algorithm and is inconvenient to implement. We believe that the use of red channels only is excellent and convenient for making transmitted information secure.

Author action:
We have added your insightful comments for future works. We updated the manuscript by yellow highlight, as shown on line 37 at the conclusion part.

Concern # 5:
RS code is used to correct the error of extracted data. How to correct the error of the covered image.

Author response: We appreciate the reviewer's comments.

The proposed method was focused on using the RS code to correct the error of the extracted data. In contrast, the fixed error of the covered image method is beyond this paper's focus.

However, we have added your insightful comments for future works.

Author action: We updated the manuscript by yellow highlight, as shown on line 37 at the conclusion part.

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This paper appears in: IEEE Access
On page(s): 1-18
Print ISSN: 2169-3536
Online ISSN: 2169-3536
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- **On Page(s)**: 221367-221384
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