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Judul Artikel : FeistelX network-based image encryption leveraging hyperchaotic fusion and extended DNA coding

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Penulis Korespondensi : De Rosal Ignatius Moses Setiadi

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FeistelX Network-Based Image Encryption Leveraging Hyperchaotic Fusion and Extended DNA Coding

--Manuscript Draft--

Manuscript Number:	EGIJ-D-24-00766R1
Article Type:	Full Length Article
Keywords:	Chaotic Sequence; DNA Cryptography; Feistel Network; Hyperchaotic Encryption; Image Security
Corresponding Author:	De Rosal Ignatius Moses Setiadi Universitas Dian Nuswantoro Semarang, Central Java INDONESIA
First Author:	Kristiawan Nugroho, Dr
Order of Authors:	Kristiawan Nugroho, Dr
	De Rosal Ignatius Moses Setiadi, Dr
	Eri Zuliarso, Dr
	Aceng Sambas, Dr
	Omar Farooq, Prof.
Abstract:	The rising frequency of cyberattacks has heightened the need for more secure and efficient image encryption techniques. Traditional chaotic and DNA-based methods often struggle with limited key space, low diffusion efficiency, or vulnerability to statistical attacks, especially when handling large or high-dimensional image data. This study introduces an image encryption technique that integrates the FeistelX Network with extended DNA cryptography and two distinct two-dimensional hyperchaotic maps, namely the two-dimensional symbolic chaotic map (2D-SCM) and the two-dimensional hyperchaotic exponential adjusted Logistic and Sine map (2D-HELS), to bolster data security. The proposed method synergizes three key components: the FeistelX Network offers a robust encryption framework with bijectivity ensured by property H; the extended DNA cryptography expands the key space and minimizes pixel correlation through advanced DNA operations; and the two hyperchaotic maps generate highly intricate chaotic sequences, ensuring greater randomness and resilience. Compared to existing schemes, the proposed method demonstrates improved diffusion, randomness, and resistance to statistical attacks. Experimental results show that this method achieves high-security indicators, with Chi-square values consistently below the critical threshold, average entropy values of 7.9994, and UACI and NPCR metrics remaining within the optimal theoretical ranges. Moreover, the method passed all sixteen NIST randomness tests with an average p-value of 0.6278. It demonstrated resilience to noise and data loss with PSNR values above 18 dB under attack scenarios. This combination of FeistelX structure, extended DNA operations, and dual hyperchaotic maps offers a novel and effective solution for enhancing image encryption security beyond traditional approaches.
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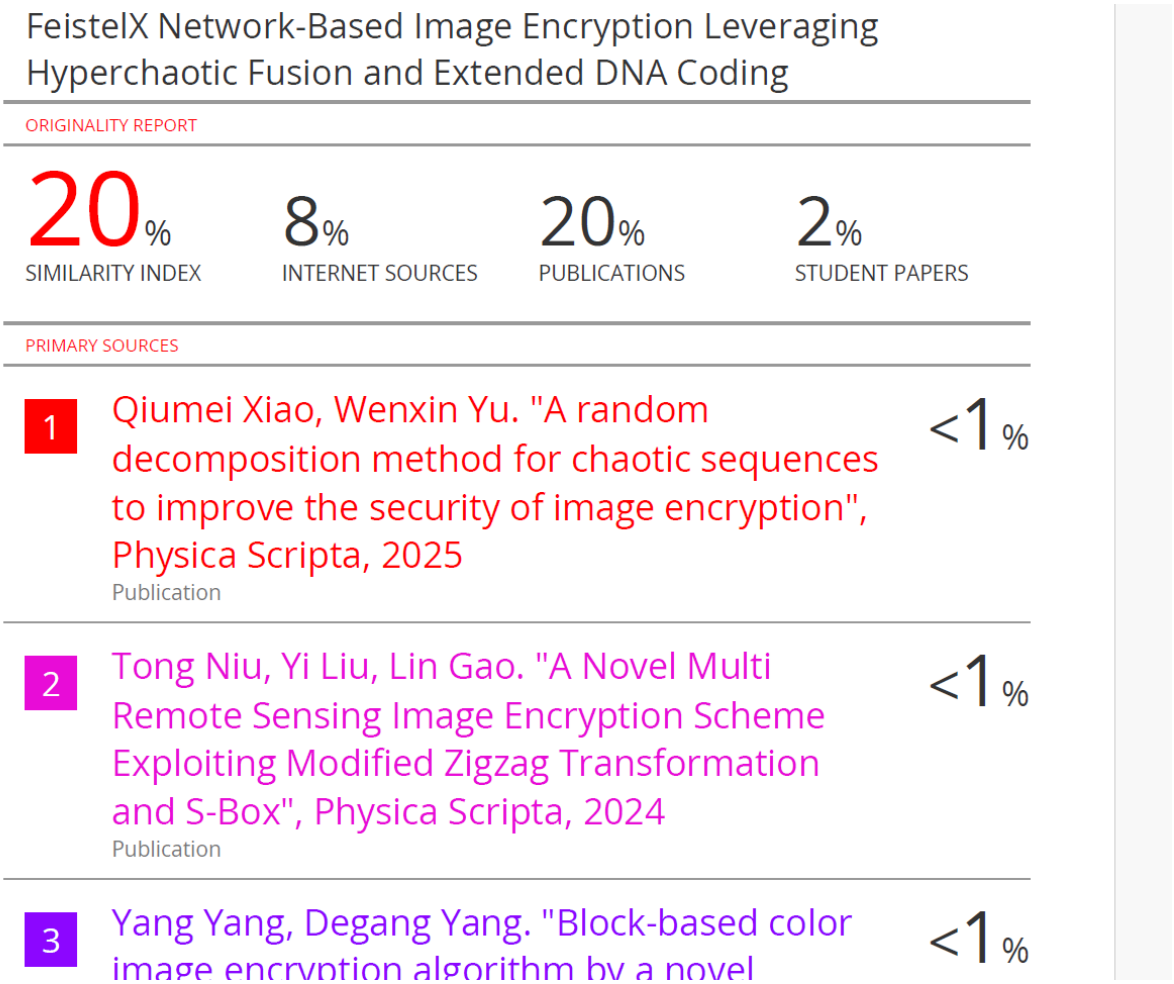

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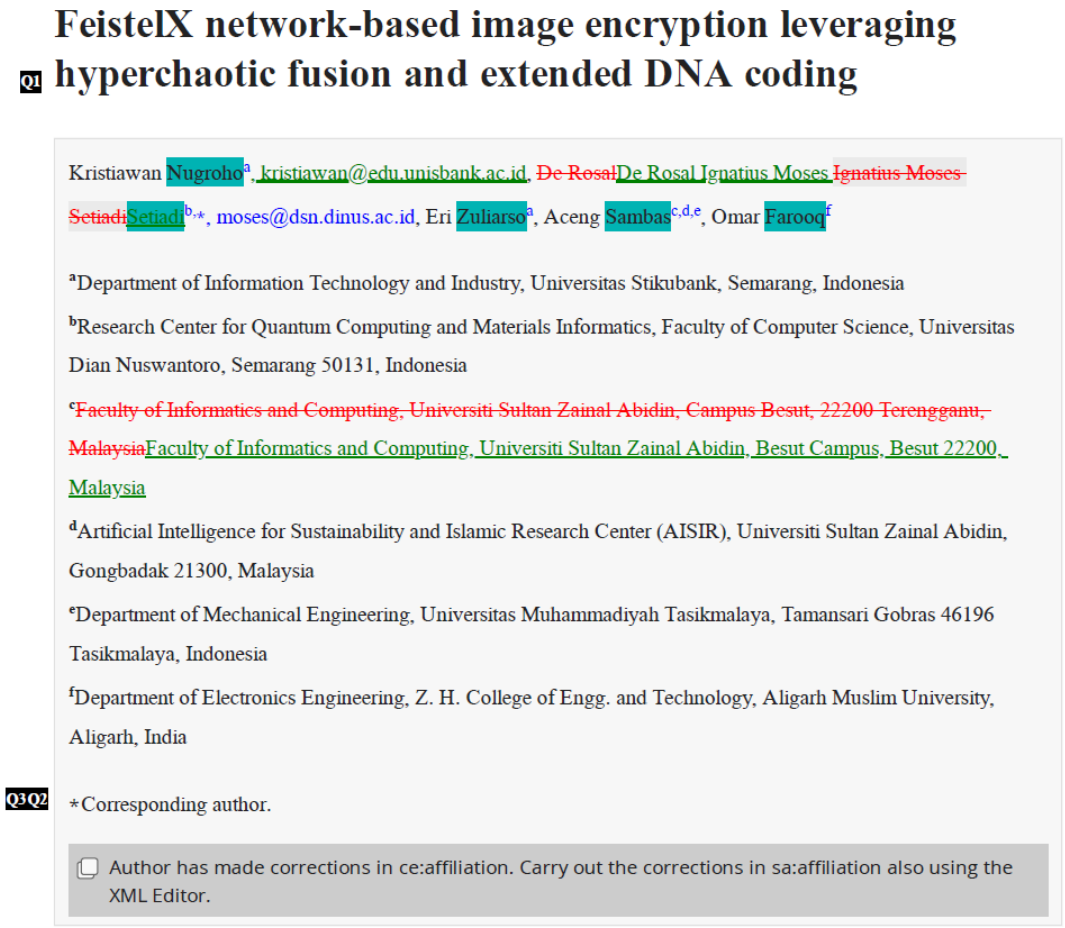

FeistelX network-based image encryption leveraging hyperchaotic fusion and extended DNA coding

Q1

Kristiawan Nugroho[a], kristiawan@edu.unisbank.ac.id, ~~De Rosal~~De Rosal Ignatius Moses ~~Ignatius Moses Setiadi~~Setiadi[b,*], moses@dsn.dinus.ac.id, Eri Zuliarso[a], Aceng Sambas[c,d,e], Omar Farooq[f]

[a]Department of Information Technology and Industry, Universitas Stikubank, Semarang, Indonesia

[b]Research Center for Quantum Computing and Materials Informatics, Faculty of Computer Science, Universitas Dian Nuswantoro, Semarang 50131, Indonesia

[c]~~Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, Campus Besut, 22200 Terengganu, Malaysia~~Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, Besut Campus, Besut 22200, Malaysia

[d]Artificial Intelligence for Sustainability and Islamic Research Center (AISIR), Universiti Sultan Zainal Abidin, Gongbadak 21300, Malaysia

[e]Department of Mechanical Engineering, Universitas Muhammadiyah Tasikmalaya, Tamansari Gobras 46196 Tasikmalaya, Indonesia

[f]Department of Electronics Engineering, Z. H. College of Engg. and Technology, Aligarh Muslim University, Aligarh, India

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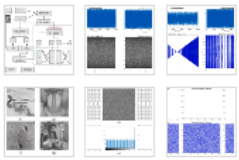

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Abstract

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Keywords

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