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Notice for the PhD Viva-Voce Examination

Mr Shiju Thomas M Y (Registration Number: 2072418), PhD scholar at the School of Engineering and Technology, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Friday, 27 September 2024 at 10.15 am in the CDI Conference Room, III Floor, Block V, Bangalore Kengeri Campus, Bengaluru 560074.

Title of the Thesis	:	**Designing a New Encryption-Then-Compression System for Grayscale Images Utilizing Entropy Encryption**
Discipline	:	**Computer Science and Engineering**
External Examiner (Outside Karnataka)	:	**Dr M V Judy** Professor Department of Computer Applications Cochin University of Science and Technology South Kalamassery, Kochi Kerala - 682022
External Examiner (Within Karnataka)	:	**Dr Jagadeesh Pujari** Professor and Head Department of Information Science & Engineering SDM College of Engineering and Technology Dharwad, Karnataka - 580002
Supervisor	:	**Dr Addapalli V N Krishna** Professor Department of Computer Science and Engineering School of Engineering and Technology CHRIST (Deemed to be University) Bengaluru – 560074 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 18 September 2024

ABSTRACT

In the digital era, images and video sequences have dramatically increased because of the rapid growth of the Internet and the widespread utilization of multimedia systems. The advancement in technology facilitates a faster way of transmitting data; however, the channel used for communication is an untrusted medium. The proposed research focus on the secure transmission of grayscale images over a social networking site (SNS) provider called the untrusted channel. Rigorous research has been conducted on the secure transmission of images and proposed different models, namely Compression-then-Encryption (CtE) Systems and Encryption-then-Compression (EtC) Systems. In EtC, the encrypted information is transmitted over the channel. However, the channel is compressing the information to reduce the overall traffic. Due to the compression performed by the channel, the decryption process may fail on the receiver side. Constructing an efficient EtC model, as good as the standard compression algorithms, will address the gap in research. Four objectives were formulated, and schemes were proposed for each objective to address the problem. Two schemes were developed to address the first objective, eliminating noise incurred during transmission through the channel.

The first scheme eliminates the noise using a two-pass hybrid mean and median filter. In the second scheme, a supervised curve fitting a linear regression model with a mean filter is applied. To secure the transmission of images over the untrusted channel, the objectives two and three address the scrambling and encryption of images. A hybrid of improved Arnold transforms and ElGamal encryption is experimented with in the first scheme to address scrambling and encryption. In this initially, a Block-wise scrambling is applied to the image, followed by pixels-wise scrambling within the block followed by Arnolds transform. The outcome is given to ElGamal encryption. In the second scheme proposed, a two-pass Block-XOR operation is applied on the pixel column-wise to change the pixel value of the image to reduce the autocorrelation of pixels in the image, followed by shuffling the pixels in the block in an anticlockwise crisscross pattern. The resultant image is encrypted using a chaotic sequence generated from the logistic map by applying binarization. Finally, to address the fourth objective, a mere lossless compression scheme is developed for compressing the image using a mathematical reduction operator applied to the DWT coefficients followed by Huffman Coding compression. The efficacy of the proposed schemes is evaluated using the standard evaluation metrics.

Keywords: Image Restoration, Scrambling, Pixel Autocorrelation, ElGamal, DWT Reduction, Huffman Coding

Publications:

1. **Thomas, M. Y.**, & Krishna, A. V. (2021). Encryption then steganography framework on high capacity data hiding in grayscale images. J. Math. Comput. Sci., 11(4), 4960-4980.
2. **Thomas, S.**, & Krishna, A. (2022). Impulse noise recuperation from grayscale and medical images using supervised curve fitting linear regression and mean filter. Indonesian Journal of Electrical Engineering and Computer Science, 28(2), 777-786.
3. **Thomas, S.**, & Krishna, A. (2022). Securing grayscale image using improved Arnold transform and ElGamal encryption. Journal of Electronic Imaging, 31(6), 063012-063012.
4. **Thomas, M. Y. S.**, Krishna, V. N. A., & Varghese, M. B. (2023). Image Encryption Algorithm with Block Scrambling Based on Logistic Map. INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY RESEARCH, (1), 1045-1055.
5. **Thomas, S.**, Krishna, A., Govind, S., & Sahu, A. K. (2023). A novel image compression method using wavelet coefficients and Huffman coding. Journal of Engineering Research.
6. **Shiju, T. M.**, & Krishna, A. V. (2021, September). A Two-pass hybrid mean and median framework for eliminating impulse noise from a grayscale image. In 2021 2nd International Conference on Advances in Computing, Communication, Embedded and Secure Systems (ACCESS) (pp. 206-210). IEEE.
7. **Shiju, T. M.**, Krishna, A. V., & Varghese, B. M. (2022, October). A CNN model to predict and segment cancerous regions from brain images using UNet and morphological operations. In 2022 International Conference on Trends in Quantum Computing and Emerging Business Technologies (TQCEBT) (pp. 1-5). IEEE.