

Quantum Encryption of Healthcare Images: Enhancing Security and Confidentiality in E-Health Systems

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Abstract

This paper shows how the Generalized Novel Enhancement Quantum Representation (GNEQR) and the Novel Enhancement Quantum Representation (NEQR) can encrypt color and grayscale healthcare images with quantum algorithms. The proposed method ensures the security of medical media, which is crucial for safeguarding patient confidentiality and safety, and is supported by e-health systems. Healthcare facility staff members send cipher color images to the cloud, which they then receive at a different facility. By decrypting the content of the images, healthcare staff can securely assist users. C# and Asp.net core MVC on Visual Studio 2022 were utilized to implement the proposed encryption approach, and Azure cloud was used. The e-health system gives the proposed method a safe and effective way to be used in real life. The proposed algorithm uses bit-plane scrambling to scramble the original image. Then, a 9D chaotic map is utilized to generate an image key, which is used to produce the key image and the scrambled position. A quantum XOR operation is performed between the scrambled image and the scrambled position of the key image. The final encrypted image is made by mixing up the color channels of the image. A similar approach is followed for grayscale images, but instead of using GNEQR, a Novel Enhancement Quantum Representation (NEQR) is employed. Additionally, the color channels are not scrambled in this case. Analyses of numbers and simulations show that the proposed method is more effective, reliable, and useful than its classical counterpart. The proposed method can be used with different types of medical images, such as those from radiology and pathology, and can be used in telemedicine. It provides a secure way to transmit medical images without compromising patient privacy. Overall, the proposed framework for quantum encryption of healthcare images using GNEQR and NEQR could change how medical images are sent and protected. It is expected to impact the healthcare industry significantly and can be applied in various e-health systems.

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