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Encryption and enhance medical image using hybrid transform (Ã-module and partial fuzzy Ĥ-transform)

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Abstract

This research provides a novel application for fuzzy partial differential equations in the biomedical and engineering sectors. To create this program, we multiplied the Ã-module by the fuzzy partial F-transform, which yielded a new transform that was then used as a filter in image processing. Around 6 percent of all cancer cases in adults are caused by people under 20, and most cancers begin as acute interstitial pneumonia. In recent years, many oncologists have used mathematical models to draw conclusions and make forecasts. This is by experimental biological models. Based on the newly proposed rational valued cyclic group characters and partial fuzzy transformation, this study proposes a novel method for image processing of diseased cells, which involves solving such concepts as encoding and differentiating parameters, optimizing radiographic images, and converting the idea into a filter. Radiographic image optimization and parameter differentiation were also part of the study. It was shown that the suggested transformation provided much higher levels of intelligibility than the fuzzy partial Laplace transform analysis and categorization of how a patient's illness trajectory affects their responsiveness to treatment.

Subject Classification: *68P25, 68P01.*

Keywords: *Mathematical modeling, Rationally valued characters, Ã-module, PD E, FPFT, Lung cancer imaging processing.*

1. Introduction

Today's information society relies heavily on cryptography for many different reasons, including but not limited to confidentiality, trust, User access control, electronic payment, corporate security[1-3], and many more. Encryption in writing is no longer the exclusive domain of governments and specialized experts; everyone may use it today. Several lives have been lost due to a lack of confidentiality in official interactions. This led to wars and the collapse of states [4-7]s. Government entities were created specifically to maintain secrecy,. The desire to learn about the inner workings of other nations and a healthy dose of patriotism. Since it was legalized, the Bitcoin market has made a remarkable comeback[8-10]. Though the United States government has used this technology for years in the military and government, it was only recently that it was approved for export to countries outside the United States[11], particularly those whose encryption strength exceeds 56 bits, to support the side security in the field of electronic commerce. In this research, we propose an idea for a hybrid fuzzy conversion resulting from multiplying its Ã-module with a proposed fuzzy conversion and converting the idea into a filter for encoding important images and data, and it has proven its efficiency in the work.

Definition 1 [5]: That is an abelian group. (M, +) is called a left Ã-module ↔a mapping X: Ã×M→M such that (r,m) r.m, r→Ã, m ∈ M satisfying :- ∀ r, r1, r2 ∈ Ã, ∀ m, m1, m2 ∈ M

i. (r1+ r2, m) = (r1, m) + (r2, m)
ii. (r1.r2, m) = (r1, (r2..m))
iii. (r, m1 + m2) = (r, m1) + (r, m2)
iv. (1, m) = m

Remark 1:

1. The right Ã-modules are defined as a similarity.
2. All properties for left modules are also for right modules.

Example 1: Every abelian group (H,+) is a module over the ring ¥ (the ring of all integers). (every Abelian group is a ¥-module). Define Ĥ : ¥×H→H such that Ĥ(n, m) = $\frac{m+m+\ldots+m}{n\,time}$ = n.m ∈ H.

Proposition 1 [6]: Let be the set of all non-reducible characters in group G on set Ã, then Ã f(G) under Vector spaces over Ã with a basis for addition $\partial_1 \ldots \partial_n$.

Definition 2: Let $\Im = \Im(\sigma,\alpha)$ to be a fuzzy valued function that continues indefinitely, and to α t is starting with a hard-to-fuzz argument, the function is transformed into a fuzzy F-form $\Im$. Denote by $\hat{F}_\alpha(\sigma,\varepsilon)$ is defined as follows:

$$\hat{F}_\alpha(\sigma,\varepsilon) = F_\alpha[\Im(\sigma,\alpha)] = \int_0^\infty e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}\Im(\sigma,\alpha)d\alpha = \lim_{\tau\to\infty} e\int_0^\tau e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}\Im(\sigma,\alpha)d\alpha,$$

$$\hat{F}_\alpha(\sigma,\varepsilon) = \left[\lim_{\tau\to\infty} e\int_0^\tau e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}\underline{\Im}(\sigma,\alpha)d\alpha, \lim_{\tau\to\infty} e\int_0^\tau e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}\overline{\Im}(\sigma,\alpha)d\alpha\right].$$

When certain limits are in place. The abridged version of $\hat{F}_\alpha(\sigma,\varepsilon)$ is given as:

$$\hat{F}_\alpha(\sigma,\alpha;\vartheta) = F_\alpha[\Im(\sigma,\alpha;\vartheta)] = [\gamma(\underline{\Im}(\sigma,\alpha)), \gamma(\overline{\Im}(\sigma,\alpha))].$$

Theorem 1: *Let* $\Im(\sigma,\alpha)$ *in that it produces a function that can be differentiated, which is an actual* $-\left(\sqrt[3]{3\,\mathrm{ncot}\,\varepsilon}\right)\alpha$ *If a difficult positive function to evaluate, then:*

$$F_\alpha\left[\frac{\partial}{\partial\sigma}\Im(\sigma,\alpha)\right]=-\left(\sqrt[3]{3n\cot\varepsilon}\right)F_\alpha[\Im(\sigma,\alpha)]-\Im(\sigma,0),$$

1. $F_\alpha\left[\frac{\partial^2}{\partial\sigma^2}\Im(\sigma,\alpha)\right]=-(\sqrt[3]{3n\cot\varepsilon})^2F_\alpha[\Im(\sigma,\alpha)]-(\sqrt[3]{3n\cot\varepsilon})\Im(\sigma,0)$ $-\Im_\alpha(\sigma,0).$

Proof:

1. Since $F_\alpha\left[\frac{\partial}{\partial\sigma}\Im(\sigma,\alpha)\right]=\int_0^\infty\frac{\partial}{\partial\alpha}\Im(\sigma,\alpha)e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}d\alpha,$ integrating by parts:

   $\int_0^\infty\frac{\partial}{\partial\sigma}\Im(\sigma,\alpha)\ \ e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}\ \ d\alpha\ =\ -(\sqrt[3]{3n\cot\varepsilon})\ \ F_\alpha[\Im(\sigma,\alpha)]\ -\ \Im(\sigma,0),$

   thus $F_\alpha\left[\frac{\partial}{\partial\sigma}\Im(\sigma,\alpha)\right]=-(\sqrt[3]{3n\cot\varepsilon})\ F_\alpha[\Im(\sigma,\alpha)]-\Im(\sigma,0).$

2. Since $F_\alpha\left[\frac{\partial^2}{\partial\sigma^2}\Im(\sigma,\alpha)\right]=\int_0^\infty\frac{\partial^2}{\partial\alpha^2}\ \Im(\sigma,\alpha)\ e^{-(\sqrt[3]{3n\cot\varepsilon})\alpha}d\alpha,$ integrating by parts twice:

$$F_\alpha\left[\frac{\partial^2}{\partial\sigma^2}\Im(\sigma,\alpha)\right]=-(\sqrt[3]{3n\cot\varepsilon})^2F_\alpha[\Im(\sigma,\alpha)]-(\sqrt[3]{3n\cot\varepsilon})\Im(\sigma,0)-\Im_\alpha(\sigma,0).$$

3. Applied the proposed method:

Encryption is the process of changing data you don't want others to view (Plaintext) into an encrypted version. Indecipherable coded message (when sent through an unsecured cypher channel) Deciphering is the inverse operation of encrypting In the world of encryption. Crossbreeding Model employs a cryptographic mechanism (or methods).

The process of multiplying the Ã-module by **the fuzzy partial F-transform**, which led to a new **transform** that was converted into a filter for image processing, was decided to compare the results of the proposed method with other image processing methods. The image showed that he had a large lesion 2, a man in his fifties. (a, b) Both T1 and T2 weighting MRI chest scan; No defect was detected in 2005 (E) and confirmed as two cases of Bronchial squamous cell carcinoma

4. Key encryption algorithm

Below are the detailed procedures of the encryption algorithm:

1- Input the original image I(M, N).
2- The input of multiplying the Ã-module by **the fuzzy partial F-transform** led to a new **transform** converted into a filter for image processing.
3- **Encryption** image using the suggested method (Multiplying points 1&2)
4- **return image** using inverse hyper transform

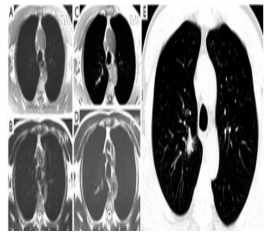
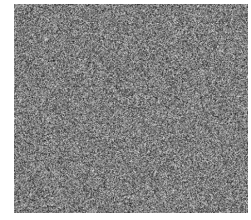
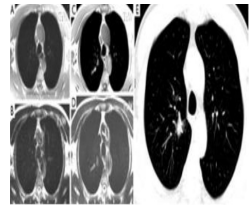
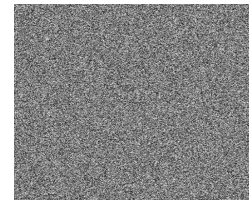
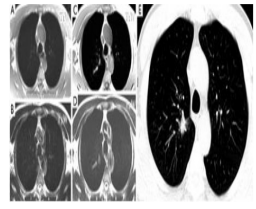
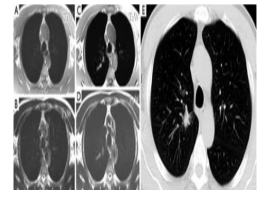
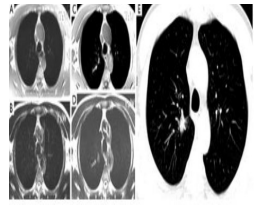
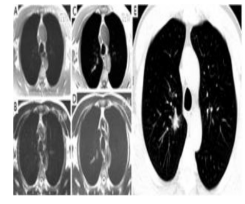
	Original image	**Encryption image**
Filter hybrid		
Filter Laplace's		
	Return Image	**Enhance Image**
Filter hybrid		
Filter Laplace's		

Figure 1

Two cases of Bronchial squamous cell carcinoma

5- **Enhance image** using f fuzzy partial transform This image resulted in considerably better results than previous approaches, as shown in Figure 2-2; the findings were analyzed further by means of a density function and other statistical factors, which shows that the suggested method is quite successful.

In Figure 1, two ideas were applied to the proposed method, where medical images were encoded and calculated, as shown in Figure 1. The proposed method is a type of conversion based on the cyclic array of boolean characters. It has been shown that the shunt is effective in enhancing the contrast of MRI images, and the partial occult shunt is a type of shunt that depends on the shunt occult. Gaussian conversion is effective in suppressing noise in MRI images. Hybrid conversion combines modulo with partial fuzzy conversion. Hybrid conversion is effective in enhancing contrast and suppressing noise in MRI images.

In Figure 2, two cases of Bronchial squamous cell carcinoma, stage III, were discussed when the value of the histogram in the recommended method was closer to the histogram taken for the original image, indicating the conversion's effectiveness. Also, the development of disease cases

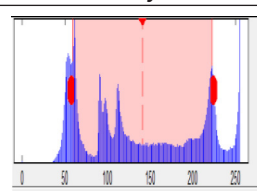
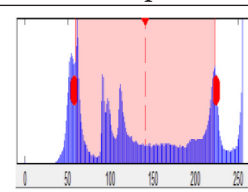
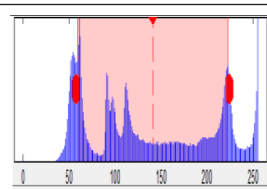
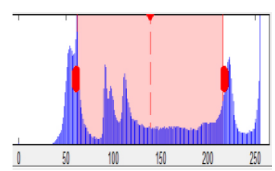
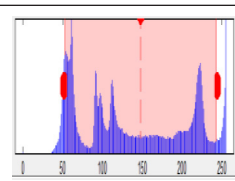
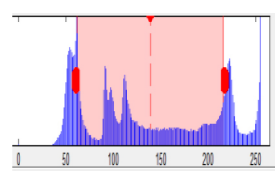
	Filter hybrid	**Filter Laplace's**
Original image		
Return image		
Enhance image		

Figure 2

Histogram of two cases of Bronchial squamous cell carcinoma

increases the value of the min, and this indicates that the patient is in the second stage, as the mean increases, and a criterion was also discussed. Another strength of the proposed conversion from the s.t solver, wherein the proposed method was closer to the original image, indicates that the conversion preserves the pixel information and does not lose any color value of the image and preserves the existing information.

5. Conclusion

In this paper, we compare the fuzzy Laplace transform to the proposed method, showing that the transform used in the latter is more effective at producing usable results in the image content of medicine and this adaptation result of edge (national, horizontal, and vertical as shown in the following where ease Use in the application of the proposed transformation is shown in the figures above) than those used by competing methods. MRI scan of the chest, T1 and T2 weighted (a, b); T1 and T2 weightings showed a nodule (arrow) in 2008, but not 2005. The diagnosis was confirmed by CT imaging (E) and surgery (stage I bronchial carcinoma). Figures (2) and (2) show this image's improved simulation, demonstrating the proposed strategy's efficacy. Statistical parameters and the density function were used for further analysis.

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