INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 5, Issue 1)
Available online at: www.ijariit.com

Study of X-ray image via pseudo coloring algorithm

Komal Sharma
ishsharma55629@gmail.com
Rayat Bahra University,
Mohali, Punjab

Karamvir Singh Rajpal
neonex.technology@gmail.com
Neonex Technology,
Mohali, Punjab

Ravi Kant
ravikant@gmail.com
Rayat Bahra University,
Mohali, Punjab

ABSTRACT

The objective of this paper is to comprehensively study the concept of pseudo colouring techniques with Repetitive Line Tracking Method

Keywords— *False coloring, MATLAB, Ferro magnetic, Medical images*

1. INTRODUCTION

Medical imagining refers to techniques and processing used to create images of unanimous parts of the body. It is not always easy to analyze and interpret X-Ray images. The human eye can distinguish only a limited number of gray scale values but can distinguish thousands of color. So it is clear that the human eye can extract more amount of information from the colored image than that of a gray image. So pseudo coloring is very useful in improving the visibility of an image. As we know that in X-Ray images can only perceive gray shades.

In detecting edges of dark hues like Violet, Indigo, Blue and Green [2]. Organs and tissues within the body contain magnetic properties. MRI involves radio waves and magnetic field (instead of X-rays) and on another side, a computer is used to manipulate the magnetic elements and generate highly detailed images of organs in the body. Images are viewed as cross sections or "slices" of the body part being scanned. There is no radiation involved as with X-rays. X-rays are a type of radiation, and when they pass through the body, dense objects such as bone block the radiation and appear white on the X-Ray film, while less dense tissues appear gray and are difficult to see. X-rays are typically used to diagnose and assess bone degeneration or disease, fractures and dislocations, infections, or tumors.

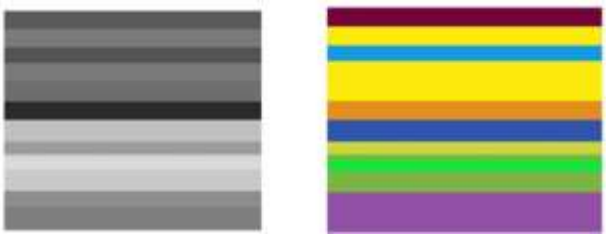

Fig. 1: Representing gray bands with corresponding false bands

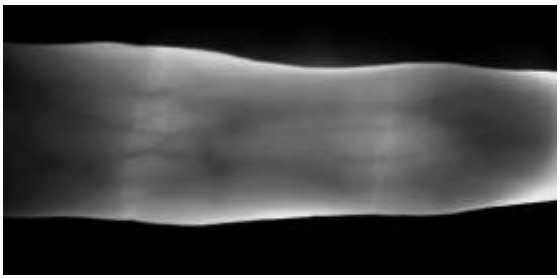

Fig. 2: X-Ray Image of hand before repetitive line tracking method is applied

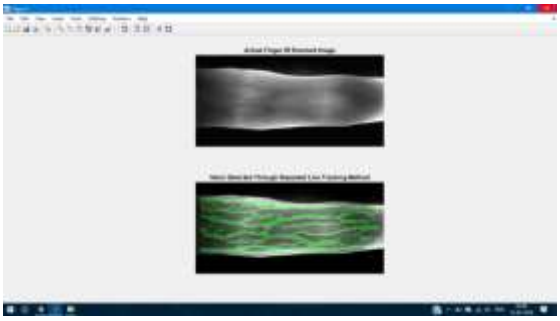

Fig. 3: X-Ray Image of hand after repetitive line tracking method is applied

2. OBJECTIVES

To achieve that objective various color scales are defined in the literature. The color scales are defined in different color spaces like RGB or HSI etc. [2] before performing the actual color assigning the gray scale image is enhanced by performing certain operations like filters and classifiers on it. The project discusses the various techniques of enhancing the image and performing false coloring on it to enhance visibility. But it can't distinguish the readability of bright colors like Yellow. In our case, the Repetitive Line Tracking Method is applied.

3. IMAGE ENHANCEMENT

In digital image processing, image enhancement is a process of making images more useful and enhances the hidden information. The reason behind image enhancement is to highlight the interesting details in images removing noise from the images and finally making images more visually appealing to the viewer [4].

4. CONTRAST ENHANCEMENTS

Contrast enhancements improve the perceptibility of objects in the scene by enhancing the brightness difference between objects and their backgrounds. Contrast enhancements are typically performed as a contrast stretch followed by a tonal enhancement, although these could both be performed in one step [21].

5. EXISTING LITERATURE

Apurva B. Parandekar et al. [1]. The author has focused on the conversion to the color image from the colourless image based on chromaticity values and intensity values of the luminous parameter with a kind of adaptability and dynamism to the detected shades of gray in the segments of an original image. According to the author, the information content of some scientific images can be perceptually enhanced with color by exploiting variations in chromaticity as well as luminance. Since different colors may have the same luminance value but vary in hue or saturation, the problem of colorizing grayscale images has no inherently "correct" solution. Due to these ambiguities, a direct prediction of color usually plays a large role in the colorization process. Where the mapping of luminance values to color values is automatic, the choice of the color map is commonly determined by a reference image.

Jakia Afruz et al. [2] Authors have explored FALSE-color in the frequency domain and applied the process to ultrasound images. According to the author, a FALSE-color refers to coloring an image by mapping gray scale values to a three-dimensional color space [1]. After applying these methods authors have concluded that Fourier Transform may not result in the best images. The Discrete cosine Transform was chosen over FFT. Also, authors have discussed that Walsh-Hadamard transforms are least desirable for use of FALSE-coloring imaging [1].

B. Abidi et al. [3] has conceptualized the theory of Screener Evaluation of luggage via X-Ray stream. It has emphasized a series of linear and non-linear mapping can be advantageous by allowing the ranking of color maps and optimal selection of coloring scheme. The rate improvement in this paper has seen 97% of detecting weapons more precisely. Parameters of psychological and physiological processing are applied to get human perception better. Low density weapons can easily be detected because the penetration power of X-Ray is deeper.

J. H. Jang et al.[4] Authors have introduced a FALSE-color image processing scheme for multi sensor gray images which is further based upon intensity-hue-saturation (IHS) color space In the IHS color space, the luminance component and chrominance components can be dealt with independently [2]. Hence, authors can control the colors without the change of intensity values. This characteristic enables them to use an existing good gray fusion algorithm for the I component processing. In the algorithm, the common component of the two original images is first determined [2]. Finally, false-color fused image is produced by displaying the obtained images through the red and green channels of color display, respectively [2]. At this time, the blue channel is assigned either to zero or to the difference between the unique components of the original images. Authors have also adopted a good gray fusion algorithm [2].

6. OBJECTIVES

The main objective is to enhance Medical images using the enhanced false-coloring algorithm. Hence, the most recent published techniques that use false coloring have been studied from which the improved false-coloring technique came into existence. This new technique has been selected, implemented and compared with the existing techniques. These techniques were implemented on various Medical images such as hand, knee and foot of human being. The proposed algorithm is also applicable for any type of Medical image but it was implemented on these three Medical images.

- To evaluate the pros and cons of Pseudo coloring algorithms.
- To differentiate various medical images in our study using improved pseudo coloring algorithm as quoted in the literature review [2] [7] of **J. H. Jang et al** and **Sun Gang** respectively.
- To devise a new and improved false coloring algorithm for a better distinct of medical images' various tissues, ligaments, blood traces and etc.

7. PROBLEM STATEMENTS

We have known the advantages offered by the gray scale technique via various studies and our proposed technique is based on the same technological backdrop but with a new approach as discussed. The false coloring is the process which finds great utility in many applications especially in the medical genre. We have discovered the core essence of medical images' processing friendly reading via MATLAB. The details of false-coloring in Medical images along with the methodology of techniques applied have been discussed in this chapter. False color doesn't only mean they represent t of three colors but it is the clear representation of grey textured substance in distinct color bands. There are n-number of things in medical terminology which sometimes not visibly friendly like bones could be overlapped with tracers of blood or may be with tissues. So with the generic fact of false coloring could make tissues, bones, ligaments, spleen etc. So we could see there are more than three medical entities which can't be visualized with sufficiently RGB.

7.1 Environmental Setup

To achieve the simulation of false coloring with new techniques framework, an environment has been created. MATLAB requires powerful x86 class CPU, 2 GB RAM with any modern Windows Operating System. On the *software* front, MATLAB software can be used to map the components. In IDE we will be using C++ or C. On the *hardware* front, the system should have the following configuration of Machine architecture: 32 Bit (Intel x86) and a moderate amount of RAM.

Demonstrating the false coloring algorithm and plotting histograms, equalized alike parameters and generating false coloring figures with applying median filters. After performing the above steps by de-allocating any paged information with clear command. After that image has been read and converted to gray scale. Size is calculated by assigning values in three variables. Now the matrix is assigned to these variables and the traversing is done by inner looping. Correspondingly, the pixel's range is examined and accordingly the assigning of gray shade is performed. After that plotting of figures with the equalized histogram is performed. Also, entropy and PSNR is calculated for three medical images. In gray images which contain abundant information, if the differences between adjacent pixels' intensity are small, the required information cannot be extracted by humans, since humans are more sensitive to color images than gray images [19]. If gray images are transformed into FALSE-color images, the details of the

images will be more explicit, and the target will be recognized more easily [5].

There are two methods (in frequency field and in the spatial field) to realize FALSE-color enhancement of gray images.

- The first method is mainly filtering in the frequency field
- The second is the equal density FALSE-colour coding methods which mainly include density segmentation coding, function transformation and complementary FALSE-colour coding.

Moreover, there are many other methods to realize FALSE-colour enhancement, such as pixel's self-transformation based on RGB tri-primary, FALSE-colour coding from the phase-modulated image based on RGB colour model, FALSE-colour coding of the high grey-resolution image [19]. However, the above methods are tailored to a particular situation and transformations are based on RGB colour space. In order to improve the visual effect, the method based on RGB colour space and pixels' self-transformation is improved, which is based on HIS colour space [5]. Compared with other methods, some grey images with ordinary formats can be processed, and many grey images can be transformed into FALSE-colour images with 24 bits. The concept of FALSE-colour suggests itself due to two limitations with grey-scale images, both of which are related to specific characteristics of the human visual system. First, a human's ability to discern grey-shade differences in an image decreases as the size of the feature composed of the alternate grey-shade is reduced [5]. As the size of the feature decreases, it takes larger differences in gray-scale intensity for a person to be able to see the alternate shade of grey. Second, humans are only capable of discerning between 60 and 90 separate shades of grey, suggesting much of the information in atypical 256 grey-shade images is lost on the viewer. By contrast, humans are able to discern more shades of color than grey-scale [19]

We have used the false color algorithm in many gray scale images processing. Human Body contains a number of tissues, parts. Only nerds can detect and scrutinize the broken, and linkage of these ligaments. But for better clarity of bones and tissues and ease of reading one needs to apply the false color technique to have better distinguish and also detect the extent of the damage. We have used the range logic to determine gray shades from the input image (i.e. original image) and thereby corresponding shades of false colors are produced in the output image.

7.2 Algorithm used to detect the veins

Miura et al. Vein Detection using Repetitive Line Tracking Method: Under this method, a locus starts at random points in the image and makes effort to track a line. In case a pixel has been visited several times by the algorithm then that line will likely be a vein. Today's authentication systems have been completely redefined with the use of biometric scanning. Earlier, we used to do a login into highly protected resources using a password and the related which could be lost or stolen for misuse. Even now, the latest biometric scanning methods like the finger prints, iris, and palm prints, etc. might get forged as they all are external to the human body. Seeing this potential risk, researchers have had found a cost effective and a way more secured biometric scan which can be used for personal identification – the finger vein pattern.

8. FUTURE SCOPE

The forces of ordinary magnetism, transmitted at a distance, are apt to stir wonder in all. Separate curiosity arises concerning the motion and forms of flowing liquid, whether observed in ocean surf or a teacup. Consider then magnetic fluids, in which the features of magnetism and fluid behavior are combined in one medium. These fluids display novel and useful behavior. It is hoped that some of the fascinations of such a fluid are expressed in this work.

Our initial studies are motivated by engineering endeavors and the hope that adds a magnetic term to the equation of fluid motion would lead to interesting and useful consequences. This hope was quickly substantiated with the realization of a succession of novel equilibrium flows arising in family groups both in the theoretical and the practical aspects. Subsequently, more subtle manifestations of magnetics in fluids made an appearance in the form of striking stability phenomena, some leading to the spontaneous organizations of fluid into geometric patterns not seen before. In this context, the magnetic surface force density unexpectedly emerges to play a key role. Another broad class of flow phenomena arises as the result of the anti-symmetric stress produced by the magnetic body torque present in dynamic flows along with magnetic body force. Interactions in magnetic multiphase flow illustrate the most recent extension of the general principles.

Ferro-hydrodynamics is an interdisciplinary topic having the inherent interest of a physical and mathematical nature with applications in tribology, separations science, instrumentation, information display, printing, medicine, and other areas. Because experts in these areas have widely different backgrounds, an effort has been made to produce a work that is sufficiently self-contained to be accessible to engineers, scientists, and students from various fields. Concepts of magnetism are scarcely included in any contemporary curriculum, and then often as an afterthought based on an appeal to electrostatics, and the treatment of polarization force receives less emphasis. Accordingly, careful preparation in the most important aspects of magnetism and introductory material of fluid dynamics are included. However, the interaction of electromagnetic fields and fluids has been attracting increasing attention with the promise of applications in areas as diverse as controlled nuclear fusion, chemical reactor engineering, medicine, and high speed silent printing. The study of the various field and fluid interactions may be divided into three main categories:

- EHD: Electrohydrodynamics, the branch of fluid mechanics concerned with electric force effects.
- MHD: Magnetohydrodynamics, the study of the interaction between magnetic fields and fluid conductors of electricity.
- FHD: Ferrohydrodynamics, the subject of this work, which has become of interest owing to the emergence in recent years of magnetic fluids

The field of image processing has been growing at a very pace. The day to day emerging technology requires more and more revolution and evolution in the image processing field.

The well-known saying "A picture says a thousand words" can be taken as the main motive behind the need for image processing. The work proposed in this thesis also portrays a small contribution in this regard. This work can be further enhanced to denoise the other type as well, like RGB, indexed, binary images. It provides a good on to the already existing denoising technique can provide a good platform for further research work this respect.

- The medical image sector needs more exposure with MATLAB's full capability of utilizing false colour algorithm.

- With the use of R, Python, SPSS, C++ graphics libraries can be properly exploited and also will be helpful in building up a multiprocessing system. This algorithm can be further ported to Mobile App platform (iOS, Android, etc.) to make more usable and quick.
- Also, horizontal scaling of the hardware plays an important role in driving image processing of high quality (H.Q.) images with smoothness. The scalability of adding co-processor or new hardware in distributed system configuration can hence be predicted with a number of executions required involved in the image processing.

We will be utilizing the fundamentals of false coloring in medical images' application where a clear diagnosis of tissues, ligaments, traces of blood and bone marrow are clearly drawn. Our system will take an approach forward by evolving an existing system and introducing notable new features. The capability of hardware could be calculated to process the image by differentiating calculus and then extraction of colors could be performed. With this, it could be compared to the performance throughput of hardware. If it is unable to fulfill the minimum criteria then coprocessor or distributed computing will act as a helping end. Moreover, let's say an original image has a resolution of 4K, and hardware is capable to process it to maximum 1366 x 768 then with an image convertor suitable application it can be scaled down for "Atleast View" then on the addition of secondary hardware an original image could be constructed. So here three languages will be used for specific purposes. C and C++ – It will analyze the hardware benchmark and its details will be maintained in a log file. MATLAB – According to the final conclusion, explicit values could be set for image processing. Also, another key feature of the proposed system is a fusion of parameters spatial and time. As we know that spatial is space which is **(x,y,z)** and time is **t**. So when combining these parameters it can be mathematically obtained as **(x,y,z,t)**. Means a kind of 4D image processing is obtainable. Each frame will be processed in each and every instance of time. This will ensure greater accuracy and notable difference when the image is being processed. When no change occurs in the difference of co-ordinates then only one copy can be retained for image processing. The complexity of our algorithm is very judgmental in the pre-processing phase. Hence it saves expensive cycles when image processing fails.

9. REFERENCES

[1] Apurva B. Parandekar, S.S.Dhande "A Review on Changing Image from Grayscale to Color" International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3, Issue 1, January 2014.

[2] B. Abidi, Y. Zheng, A. Gribok, and M. Abidi, "Screener Evaluation of Pseudo-Colored Single Ener gy X-Ray Luggage Images," Proc. of IEEE Conference on Computer Vision and Pattern Recognition, Workshop CDROM, San Diego, CA, USA, June 2005.

[3] Besma R. Abidi, Yue Zheng, Andrei V. Gribok, and Mongi A. Abidi, "Improving Weapon Detection in Single Energy X-Ray Images Through Pseudo coloring," IEEE Transactions On Systems, Man, And Cybernetics—Part C: Applications And Reviews, Vol. 36, No. 6, Pp. 784-796, November 2006.

[4] Chung-Yen Su, Chi-Ming Lin"Effective False Color Suppression of Demosaicing Using Direction Inversion and Bidirectional Signal Correlation" National Taiwan Normal University, IEEE 2007.

[5] Cheng-Hsiung Hsieh, Chih-Ming Lin, Fung-Jung Chang "Pseudo-coloring with Histogram Interpolation" 2009.

[6] David R. Martin, Charless C. Fowlkes "Learning to Detect Natural Image Boundaries Using Local Brightness, Color, and Texture Cues" IEEE Transactions On Pattern Analysis And Machine Intelligence, VOL. 26, NO. 1, January 2004.

[7] GuoShijian, Sun Gang "A New Pseudo-coloring Coding Method for DPX Image" Fourth International Conference on Digital Manufacturing and Automation2013.

[8] Hiroaki Sugiura, Katsumi Asakawa "False Color Signal Reduction Method for Single-Chip Color Video Cameras" IEEE Transactions on Consumer Electronics, Vol. 40, No. 2, May 1994.

[9] JakiaAfruz, Va'Juanna Wilson "Frequency Domain FALSE-color to Enhance Ultrasound Images" Computer and Information Science Vol. 3, No. 4, November 2010.

[10] J. H. Jang and J. B. Ra "FALSE-Color Image Fusion Based on Intensity-Hue-Saturation Color Space" IEEE School of Electrical Engineering & Computer Science, August 2008.

[11] JingyiQu, Ying Du "Pseudo-Color Coding Based on Visual Model and Perceptual Space"The Institute for Cognitive Neurodynamics, InformationScience and Engineering Department, East China University of Science and Technology, Shanghai.

[12] Johan Himberg "A SOM based cluster visualization and its application for false coloring" Helsinki University Of Technology Laboratory Of Computer And Information Science, Finland, IEEE, 2000.

[13] Li Jinxiu, Li Junli Wei Ping "FALSE color Coding of Medical Images Based on Gradient" IEEE Institute of DSP and Software Techniques Ningbo University Vol. 3, No. 4, 2007.

[14] Mathias John, Christian Tominski "Interactive Poster: Two-Tone Pseudo Coloring for Multiple Variables" Institute for Computer Science Institute for Computer Science Institute for the Computer Science University of Rostock.

[15] Mohammad Zare, Mahdi Jampour "A Heuristic Method for Gray Images Pseudo Coloring with Histogram and RGB Layers" Computer Engineering Department at Bahmanyar Institute of Higher Education Kerman, Iran, IEEE 2011.

