**AN X-RAY IMAGE ENHANCEMENT ALGORITHM FOR DANGEROUS GOODS IN AIRPORT SECURITY INSPECTION**

**Abstract:**

An X-ray image enhancement technique integrating USM+CLAHE is presented to address the problem of colour distortion in CLAHE enhanced airport security X-ray images. Calculating the grayscale images on the R, G, and B channels of the X-ray image and applying CLAHE enhancement to each, then merging the enhanced R, G, and B grayscale images will take place. After that, USM sharpening operation is applied to the CLAHE-enhanced X-ray image, and then it is merged with the original and USM-sharpened images according to the weight. The results of the experiments reveal that the USM+CLAHE algorithm can successfully improve the security X-ray image while also suppressing colour distortion in the enhanced image.

**Keywords:** Airport security, X-ray image, USM, CLAHE, Image enhancement

**Existing Method:**

In order to improve contrast and restore color for underwater image captured by camera sensors without suffering from insufficient details and color cast, a fusion algorithm for image enhancement in different color spaces based on contrast limited adaptive histogram equalization (CLAHE) and Retinex are used.

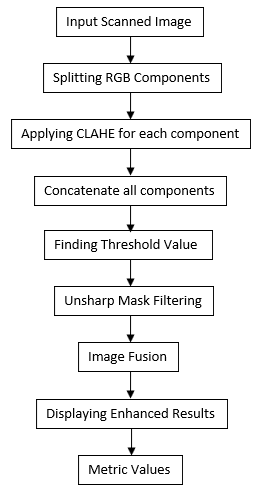
CLAHE is a well-known block-based processing, and it can overcome the over amplification of noise problem in the homogeneous region of image with standard histogram equalization. CLAHE algorithm differs from standard HE in the respect that CLAHE operates on small regions in the image, called tiles, and computes several histograms, each corresponding to a distinct section of the image and use them to redistribute the lightness values of the image.

Retinex, Homomorphic and Wavelet Multi-Scale techniques have been popular for enhancing images. These methods perform much better than those traditional ones. The Retinex theory is firstly introduced to image enhancement by Edwin et al. There are some different algorithms based on Retinex theory such as single-scale Retinex (SSR), multi-scale Retinex (MSR), multi-scale Retinex with color restoration (MSRCR), and fast multi-scale Retinex (FMSR) etc. Among them, the MSRCR method proposes to estimate the illumination of the input image using gaussian surround filtering of different scales and conducts enhancement by applying color restoration followed by linear stretching to the logarithm of reflectance.

**Disadvantages:**

* It may increase the contrast of background noise, while decreasing the usable signal/image data
* Suffer from color distortion
* This method is the tendency to over-amplify noise in relatively homogeneous regions of an image

**Proposed System**

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**Fig: Block Diagram**

This section will elaborate on the security inspection Xray image enhancement algorithm process: (1) CLAHE enhancement. First, calculate the grayscale images on the R, enhancement respectively, and then merge the enhanced R, G, and B grayscale images. (2) USM sharpening. This algorithm uses an improved USM (Unsharp Mask) algorithm to sharpen the CLAHE-enhanced image to highlight details such as image edges and shapes. The USM algorithm combines the sharpened image with the original image according to the superposition coefficient for the second level image fusion. (3) Image fusion. The original image and the USM sharpened image are weighted and summed to reduce image color distortion.

**Advantages:**

* Airports
* Railway stations etc,
* High secured areas

**Applications:**

Image denoising plays an important role in a wide range of applications such as

* Image restoration
* Visual tracking
* Image registration
* Image segmentation
* Image classification

**Software & Hardware Requirements:**

**Software:** Matlab 20218a or above

**Hardware:**

**Operating Systems:**

* Windows 10
* Windows 7 Service Pack 1
* Windows Server 2019
* Windows Server 2016

**Processors:**

Minimum: Any Intel or AMD x86-64 processor

Recommended: Any Intel or AMD x86-64 processor with four logical cores and AVX2 instruction set support

**Disk:**

Minimum: 2.9 GB of HDD space for MATLAB only, 5-8 GB for a typical installation

Recommended: An SSD is recommended A full installation of all MathWorks products may take up to 29 GB of disk space

**RAM:**

Minimum: 4 GB

Recommended: 8 GB

**Learning outcomes:**

* Introduction to Matlab
* What is EISPACK & LINPACK
* How to start with MATLAB
* About Matlab language
* Matlab coding skills
* About tools & libraries
* Application Program Interface in Matlab
* About Matlab desktop
* How to use Matlab editor to create M-Files
* Features of Matlab
* Basics on Matlab
* What is an Image/pixel?
* About image formats
* Introduction to Image Processing
* How digital image is formed
* Importing the image via image acquisition tools
* Analyzing and manipulation of image.
* Phases of image processing:
* Acquisition
* Image enhancement
* Image restoration
* Color image processing
* Image compression
* Morphological processing
* Segmentation etc.,
* How to extend our work to another real time applications
* Project development Skills
  + Problem analyzing skills
  + Problem solving skills
  + Creativity and imaginary skills
  + Programming skills
  + Deployment
  + Testing skills
  + Debugging skills
  + Project presentation skills
  + Thesis writing skills