Splendid Resolution System for Medical Image Handling

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ABSTRACT

Today's world, one of the major challenges facing by medical field is to resolve the disease, they failed to observe the problem due to poor resolution of image and currently using technologies like Computerized Tomography, Positron Emission Tomography and Magnetic Resonance Imaging which is high cost and still facing resolution problem. Hence, to get an image at a preferred resolution is difficult due to imaging surroundings, the limitations of physical imaging system as well as quality limiting factors such as noise and blur. We proposed a system to enhance the images and increase the resolution of the images. This paper details the concept of CLAHE and how it is used for Medical image processing.

Keywords: Adaptive Histogram Equalization, Patch Extraction, Cubic and Bilinear Interpolation.

INTRODUCTION

Major benefit of the use of digital images as opposed to film-based ones is that it allows easier capture and archival/remote retrieval of medical images. Medical imaging is an important diagnostic instrument to determine the presence of certain diseases, which are crucial for early discovery and correct diagnosis of disorders, even for patients in remote locations. Experienced physicians and technicians have been responsible for diagnosis based on available information provided by medical imaging systems, like wired/wireless endoscopies, MRI,CT,X-Rays etc. And as the number of images to be inspected increases, the role of such medical specialists becomes extremely time consuming and exhausting. For instance, assuming a wireless capsule endoscope takes two images per second during two hours of traveling through the small intestine, the total number of captured images exceeds 50,000. Hence computer-aided support schemes are essential for generating relevant images to be put to detailed examination by a physician. However, the captured images suffer from various degradations, due to undesired noises, such as the thermal ones in CCD/CMOS chips, and hence their image quality is too degraded to be put directly to such clinical examination. Thus some sophisticated medical image pre-processing schemes have to be devised.

Increasing the image resolution should drastically recover the diagnosis ability for corrective treatment. The arrival of digital health imaging technologies such as Computerized

Tomography (CT), Positron Emission Tomography (PET), and Magnetic Resonance Imaging etc. has revolutionize current medicine, still facing a resolution problem. This paper explains how to enhance image and to extract some useful information from a region of interest in it. Digital processing techniques help in the manipulation of the obtained digital images, raw data from imaging sensors in various platforms contains deficiencies. All types of image data have to undergo while using digital image enhancement techniques are Pre-Processing, Enhancement and Information extraction.

RELARED WORK

[1]Thirimachos Bourlai explained the problem of restoring severely tainted face images such as images scanned from passport photos or images subjected to fax compression, downscaling, and printing. The purpose of this paper is to demonstrate the complexity of face recognition in such realistic scenarios and to provide a viable solution to it. The contributions of this work are twofold. First a database of face images is assembled and used to illustrate the challenges associated with matching severely degraded face images. Second a preprocessing scheme with low computational complexity is developed in order to eliminate the noise present in corrupted images and return their quality. An extensive experimental study is performed to establish the restoration scheme improves the quality of the ensuing face images while simultaneously improving the performance of face matching.

[2]This paper presents a unified blind method for multi-image super-resolution (MISR or SR), single-image blur deconvolution (SIBD), and multi-image blur deconvolution (MIBD) of low-resolution (LR) images degraded by linear space-invariant (LSI) blur, aliasing, and additive white Gaussian noise (AWGN). The proposed approach is based on alternating minimization (AM) of a new cost function with respect to the unknown high-resolution (HR) image and blurs. The regularization term for the HR image is based upon the Huber-Markov random field (HMRF) model, which is a type of variation integral that exploits the piecewise smooth nature of the HR image. The blur estimation process is supported by an edge-emphasizing smoothing operation, which improves the quality of blur estimates by enhancing strong soft edges toward step edges while filtering out weak structures. The parameters are updated gradually so that the number of salient edges used for blur estimation increases at alliteration. For better performance the blur estimation is done in the filter domain, rather than the pixel domain i.e., using the gradients of the LR and HR images. The regularization term for the blur is Gaussian (L2 norm), which allows for fast iterative optimization in the frequency domain. We accelerate the processing time of SR reconstruction by separating the up sampling and registration processes from the optimization procedure. Simulation results on both synthetic and real-life images (from a novel computational imager) confirm the robustness and effectiveness of the proposed method.

[4]Esben Plenge, Improving the resolution in magnetic resonance imaging comes at the cost of either lower signal-to-noise ratio, longer acquisition time or both. This study investigates whether so-called super-resolution reconstruction methods can increase the resolution in the slice selection direction, such are a viable alternative to direct high-resolution acquisition in terms of the signal-to-noise ratio and acquisition time trade-offs. The performance of six super-resolution reconstruction methods and direct high-resolution

acquisitions was compared with respect to these trade-offs. The methods are based on iterative back-projection, algebraic reconstruction, and regularized least squares. The algorithms were applied to low-resolution data sets within which the images were rotated relative to each other. Quantitative experiments involved a computational phantom and a physical phantom containing structure of known dimensions. To visually validate the quantitative evaluations, qualitative experiments were performed in which images of three different subjects (a phantom, an ex vivo rat knee, and a postmortem mouse) were acquired with different magnetic resonance imaging scanners. The results show that super-resolution reconstruction can indeed improve the resolution, signal-to-noise ratio and acquisition time trade-offs compared with direct high-resolution acquisition.

[7]Jay Patel says Segmentation is a vital role in medical image processing, where clustering technique widely used in medical application particularly for brain tumor detection in magnetic resonance imaging (MRI). We use MRI because of its provide accurate visualize of an anatomical structure of tissues. In this paper various clustering methods that have been used for segmentation in MRI are reviewed.

[8]Dinh-Hoan Trinh, Proposed a novel example-based method for denoising and super-resolution of medical images. The objective is to estimate a high-resolution image from a single noisy low-resolution image, with the help of a given database of high and low-resolution image patch pairs. Denoising and super-resolution in this paper is performed on each image patch. For each given input low-resolution patch, its high-resolution version is estimated based on finding a nonnegative sparse linear representation of the input patch over the low-resolution patches from the database, where the coefficients of the representation strongly depend on the similarity between the input patch and the sample patches in the database. The problem of finding the nonnegative sparse linear representation is modeled as a nonnegative quadratic programming problem. The proposed method is especially useful for the case of noise corrupted and low-resolution image. Experimental results show that the proposed method outperforms other state-of-the-art super-resolution methods while effectively removing noise.

According to [10]Pranita Balaji Kanade1 most cells in the body grow and then divide in an orderly way to form new cells as they are needed to keep the body healthy and working properly. When cells lose the ability to control their growth, they divide too often and without any order. The extra cells form a mass of tissue called a tumor. Brain tumors are abnormal and uncontrolled proliferations of cells. Segmentation methods used in biomedical image processing and explores the methods useful for better segmentation. A critical appraisal of the current status of semi automated and automated methods are made for the segmentation of anatomical medical images emphasizing the advantages and disadvantages. In this project we detect the brain tumor & classify the stages of the tumor by using testing & training the database. Segmentation for testing purpose is done by spatial FCM used.

SYSTEM ARCHITECTURE

In this paper, proposed system consists of two stages, In the first stage the poor qualities of image is processed by preprocessing and patch extraction and in the second stage the output of the first stage is further processed by contrast limited adaptive histogram equalization to improve contrast of images. Figure 1 shows the architecture of the proposed system.

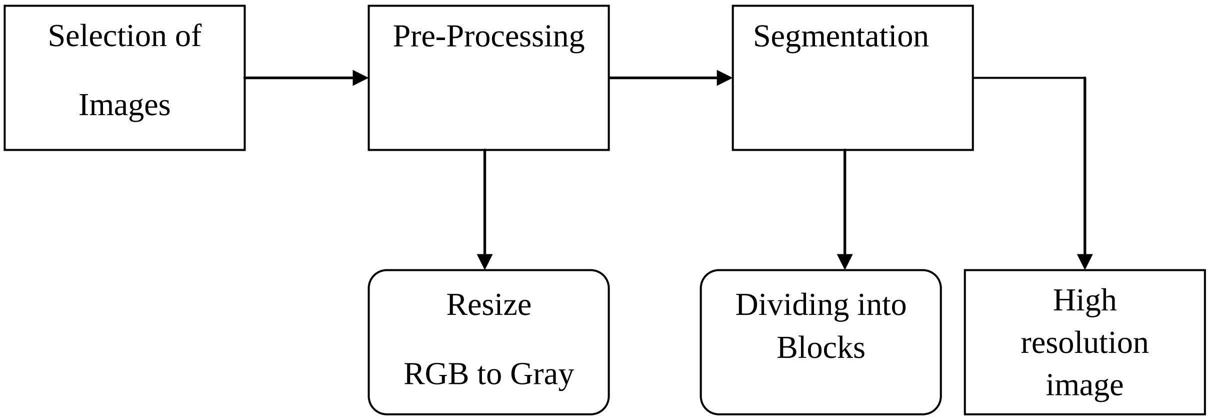

Figure1: Proposed System Architecture

During selection of Images, two low level images are selected and provide them as input to the pre-processing step. In Pre-processing step the two input images with different resolution are converting into the resized size and then RGB to gray conversion by channel extraction and separation. If the given input is in gray format, then directly it is given to next steps. During selection of Images, two low level images are selected and provide them as input to the pre-processing step. In Pre-processing step the two input images with different resolution are read and they are resized accordingly to the required size and then RGB to gray conversion by channel extraction and separation. If the given input is in gray format, then directly it is given to next steps.

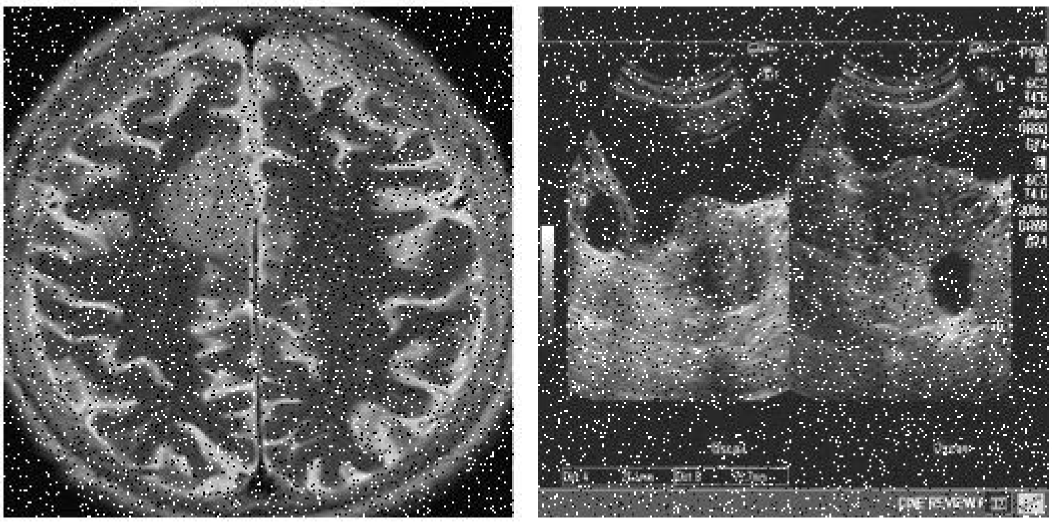

Figure 2: (a) Noisy MRI Image (b) Noisy Ultra Sound Image

There exist several different image denoising algorithms whose performances depend mainly on the structure of the image and the noise model. Due to the reasons that white noise can be assumed and system function components are well-compressible with the DFT and DCT, frequency domain filters are chosen. Such filters exploit the fact that white noise, in contrast to the true signal, is not compressible Image Enhancement is a process of humanizing the quality of image by improving its features. Here we have given three methods of image enhancement, Contrast stretching, the equalization and Contrast limited adaptive histogram equalization. A number of contrast measures were proposed for complex images. Figure 2 is a Noisy MRI image and Noisy Ultra Sound image input image, which include Noise, blur and figure 3 shows the output of figure 2 without noise.

Figure 3: (a) MRI Image (b) Ultra Sound Image

A local contrast measure is proposed in this paper for enhancement. Contrast is stretched between the limit of lower threshold and upper threshold. In the next stage histogram equalization is performed. The histogram is defined as the statistic likelihood supply of each gray level in a digital image. Histogram equalization (HE) is one of the familiar methods for improving the contrast of given images, making the result image have a uniform distribution of the gray levels.

In Image Enhancement, two techniques are used they are adaptive histogram equalization and Patch extraction, In Adaptive histogram equalization (AHE) is a computer image processing technique used to improve contrast in images. It differs from ordinary histogram equalization in the respect that the adaptive method computes several histograms, each parallel to a different part of the image, and uses them to redistribute the lightness values of the image. It is appropriate for improving the local contrast and enhancing the definitions of edges in each region of an image.

Patch Extraction from an Image, In Image patch extraction, mainly used for Content Based Image Retrieval (CBIR) and Patter recognition systems. Here we give the code for patch extraction from an Image. In patch extraction also get the features from each patch in CBIR system. It also used segmentation computation. The patches also used to recognize the Face Synthesis process and detect Nose, eyes, mouth. Patches also support improves the image quality and removes the noise from images. Feature Extraction – In this step feature extraction is done by using interpolation by 2-D Bilinear process and by using adaptive histogram features are extracted from the images. In adaptive histogram equalization, two low resolution images are converted to high resolution image and thus performance is enhanced. “Cubic and Bilinear Interpolation” Technique is used during the process. In the next stage the histogram equalization is performed. The histogram is defined as the statistic probability distribution of each gray level in a digital image. The histogram equalization (HE) is one of the well-known methods for enhancing the contrast of given images, making the result image have a uniform distribution of the gray levels.

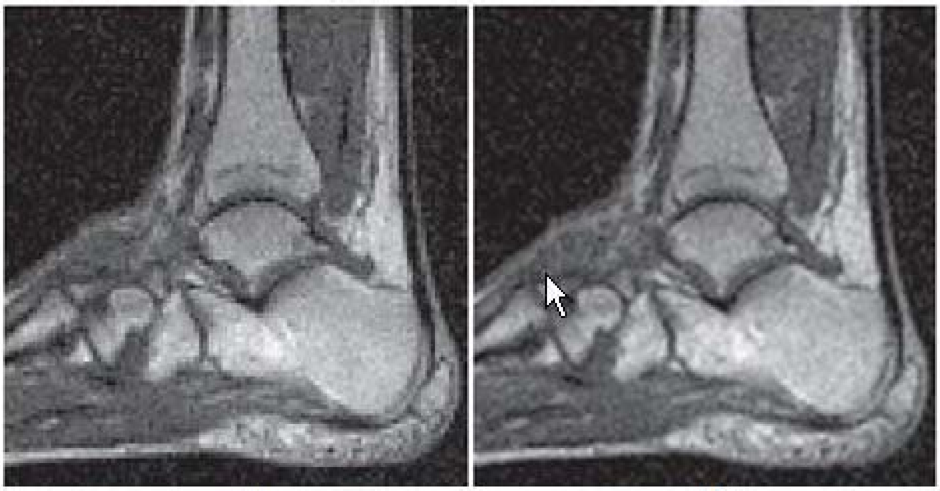

Figure 4: Low Resolution Input Images

Figure 4 is low resolution input image and figure 5 shows the enhanced image with high resolution. It flattens and stretches the dynamic range of the image's histogram and results in overall contrast improvement. HE has been widely applied when the image needs enhancement however, it may significantly change the brightness of an input images and cause a problem in some applications where brightness preservation is necessary

Figure 5: High Resolution Output Images

Finally, in this paper, a novel CLAHE enhancement method is proposed which can yield the optimal equalization and also limit the contrast of the images. The suggested method is very useful for the medical images. Efficient image sharpening and denoising using adaptive guided image filtering, Image sharpening and denoising play crucial roles in image process. The goal of image sharpening is to enhance edge slopes without producing haloartifacts', while the goal of an image denoising algorithm is to reduce noise while preserving image edges.

CONCULSIONS

Through the course of this report, we have come across the different types of medical images used in Medical image process. It has been understood that resolution plays an important part in extraction of important information from the images. Better image resolution will help for accurate diagnosis of the ailment and will help in faster rates of treatment to the patients. But medical images typically consist of a lot of noise and irregularities due to the anatomical structure of the human body and also due to the limitations of the image acquisition device sensors.

The Adaptive Histogram equalization technique has been detailed to be used to overcome this problem of resolution. By using effective Adaptive Histogram equalization algorithms, the resolution of low resolution medical images can be satisfactorily increased to required levels. Different methods have been detailed for enhancing the resolution via Adaptive Histogram equalization Dealing with the preprocessing part by dynamically enhancing the resolution, de noising the medical images and later on to apply the Adaptive Histogram equalization techniques of Example based, patch based and orthogonal acquisition algorithms have been explained in the report. There is tremendous future scope of this method of applying the Adaptive Histogram equalization techniques for medical image processing. Enhancing the present algorithms gives better results as compared to the ideas discussed in this paper.

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