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Detection of Nephrolithiasis using Deep Learning

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ABSTRACT: Kidney stone disease is a common problem amongst the western population. Most kidney stones are small and pass spontaneously. These patients often need no further treatment. However, some nephrolithiasis patients develop large stones, which can cause significant morbidity in the form of acute symptoms and chronic complications if they are not treated. Yet effective treatment and prevention may eradicate the disease completely to overcome this we proposed wavelet approach avoids both log and exponential transform, considering the fully developed speckle as additive signal-dependent noise with zero mean.The proposed method throughout the wavelet transform has the capacity to combine the information at different frequency bands and accurately measure the local regularity of image features and watershed algorithm enhance the image in the quality way and it classifies with the Neural network.

KEYWORDS: Neural Network, Deep Learning

I. INTRODUCTION

Optical coherence tomography (OCT) is an established modality for non-invasive assessment of diseases. As a result, OCT image analysis is becoming increasingly important. Texture analysis has been actively investigated for tissue characterization. The potential of texture analysis has been demonstrated in numerous biomedical applications, including OCT imaging of skin, bladder, eye, atherosclerotic plaque, esophagus, and breast. In general, texture analysis techniques can be classified into three groups: statistical technologies, spectral technologies, and structural technologies. The choice of optimal method for texture analysis may vary depending on the specific biomedical applications.

OCT and its functional extension (Doppler OCT and optical microangiography, OMAG) have been used for imaging kidney microanatomy and microcirculation. OCT can resolve renal corpuscles and uriniferous tubules. The morphological changes in these structures are associated with ischemia-reperfusion injury. Automatic algorithm for image analysis algorithm has been developed previously for quantifying spatially- resolved tubular diameter as a potential biomarker for indicating viability of the transplant kidney. In these previous studies, the tubular lumens were segmented out from cross-sectional OCT images of kidney microstructure based on an empirically-determined intensity threshold. However, as OCT intensity is attenuated with depth, segmentation of deeper tubular lumens based on one fixed threshold becomes challenging.

II. LITERATURE SURVEY

1. **Title:** Characterizing volumes of kidney segments in Streptozotocin induced diabetic rat model utilizing 4D contrast-enhanced ultrasound.
   Author: Kennita A
   Journal:IEEE International Ultrasonics Symposium (IUS)
   Year Of Publication: 2016
   Description:
   Diabetic Kidney Disease is a disease that if left uncontrolled may eventually lead to end stage kidney disease. Clinicians utilize biomarkers, such as albuminuria and serum creatinine, to identify diabetic populations at risk for kidney disease, but these markers often lag behind histologic disease. Contrast-enhanced ultrasound (CEUS) presents a potential tool to identify at risk patients, begin early intervention and prevent development and progression of kidney disease. Utilizing 4D CEUS, we observed the progressive

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effect of diabetes in a rodent streptozotocin (STZ) model, over a 12-week period. The following describes the experimental protocol and image process for characterization of the kidneys. Image datasets estimated total volume changes accurately in comparison to water-displacement volume measurements. Treated animals displayed an increase in total volume, as expected. Individual cortical and medullary volumes were estimated using the same datasets and showed a greater increase in medullary than cortical volumes. Further investigation is required to validate CEUS as a tool for early DKD diagnosis.

2. **Title:** Kidney Stone Detection in computed Tomography images
Author: T.Akkasaligar
Journal: International Conference on Smart Techmologies for Smart Nation (SmartTechCon)
Year Of Publication: 2017
Description:

The proposed work is used to detect the kidney stones by using Level set segmentation method. Initially input images are preprocessed and region of interest is segmented. The level set segmentation is a good method to solve the problem of segmentation successfully. Computed tomography scans are diagnostic tools that are used for many purposes. Basically, CT's send X-rays through the body in tiny slices, which are saved as images on the computer. The preprocessing of the CT images is carried out for cropping the input image. After preprocessing step, the input image is segmented using level set segmentation technique. Finally, the segmented images are analyzed to detect the size and location of the stone.

III. EXISTING SYSTEM

X-rays can find some stones, but little ones might not show up. A more in-depth type of scan is called computed tomography, or CT scan. A CT scan is a special kind of x-ray. The equipment takes pictures from several angles. A computer then puts all the x-rays, called “slices,” together into more detailed images than standard x-rays can give you. A CT scan is often used in emergencies, ultrasound test uses sound waves to create pictures of your insides. Normally we cannot get test result efficiently and it takes time to get the exact test result.

IV. SYSTEM DESIGN

PROPOSED SYSTEM

Using neural network, we will get low complexity and better features discrimination and better classification accuracy. A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature. Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing acomputer system that is able to perform processing on an image.

Advantages

- More Accuracy
- Time requirement is low
- We can train more images in CNN
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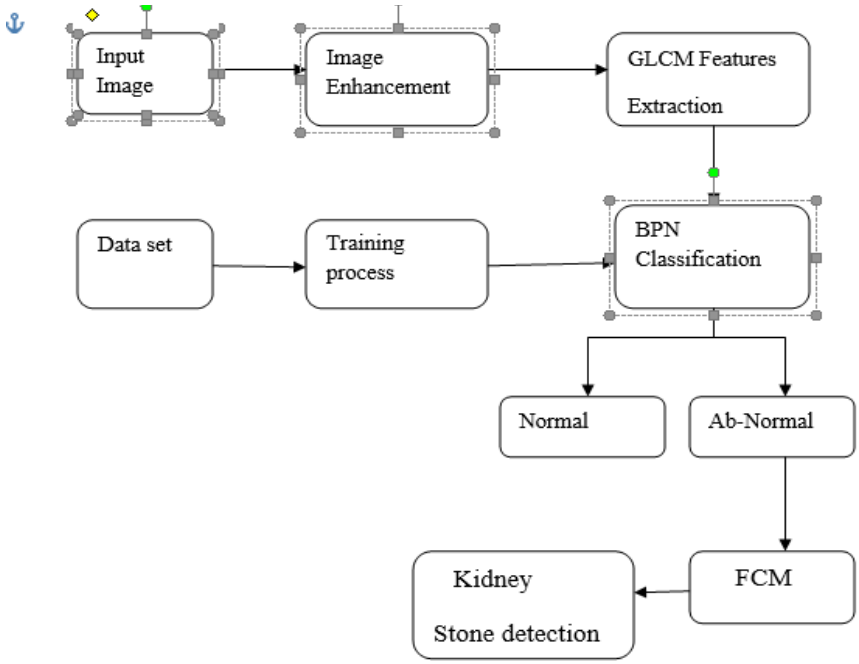
V. ARCHITECTURE DIAGRAM



VI. MODULES

PREPROCESSING

Image pre-processing is the term for operations on images at the lowest level ofabstraction.These operations do not increase image information content but they decrease it if entropy is an information measure.The aim of pre-processing is an improvement of the image data that suppresses undesired distortions or enhances some image features relevant for further processing and analysis task.

DWT

A discrete wavelet transform (DWT) is a transform that decomposes a given signal into a number of sets, where each set is a time series of coefficients describing the time evolution of the signal in the corresponding frequency band.

GLCM

The GLCM looks at two pixels and the relation between them, which is the second-order texture. The co-occurrence matrix contains the gray value relationship given by a kernel mask. The neighboring pixels in the transformation are defined by certain directions. The direction can also be in a negative direction (reverse). The position depends on the similarity in gray level values

BPNN(Back propagation neural network)

Back-propagation is the essence of neural net training. It is the method of fine-tuning the weights of a neural net based on the error rate obtained in the previous epoch (i.e., iteration). Proper tuning of the weights allows you to reduce error rates and to make the model reliable by increasing its generalization. Backpropagation is a short form for "backward propagation of errors." It is a standard method of training artificial neural networks. This method helps to calculate the gradient of a loss function with respects to all the weights in the network.

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FUZZY CLUSTERING METHODS

Automated fuzzy clustering is a method of clustering that provides one element of data or image belonging to two or more clusters. The method works by allocating membership values to each image point correlated to each cluster center based on the distance between the cluster center and the image point.

VII. CONCLUSION

The aim of the project is to detect kidney stone from the person who is affected in it. In this we used back propagation neural network technique to identify the stone. we are using image processing to extract the GLCM and DWT. BPNN is used to train the image. In this we are divide into two segmentation part normal /abnormal if person kidney is abnormal, it will pop out where it is affected in kidney.

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