Abstract

In this research work a fully automated and given to automatic algorithm to detect Quantification of Kidney Stones by using symmetric analysis, which is proposed in this paper. Here we detect the renal-stones, segment the renal regions and calculate the area of the renal which is occupied by kidney stones. The quantitative analysis of kidney stones allows obtaining useful key indicators of disease progression. The stone detection is often an essential preliminary phase to solve the segmentation problem successfully. Thus, the user eventually notices that it is hard to detect the boundary of the kidney in the US image; even it's done by the trained sonographers. In addition, human error might occur during the interpretation of
ultrasound image by untrained sonographer, especially when taking measurement. Therefore, in order to reduce the dependability to the sonographers’ expertise, some image processing can be done which can automatically detect the centroid of human kidney and stones. Ultra Sound (US) is one of the modality of first choice in kidney image processing. US can be used to measure the size and appearance of the kidneys and to detect stones, congenital anomalies, swelling and blockage of urine flow. As this imaging technique is non-invasive, portable, and affordable and does not require radiation, most of the medical practitioner chosen US for primary screening of kidneys’ condition. Three kinds of Ultrasound kidney images namely, Normal (NR), Medical Renal Diseases (MRD) and Cortical Cysts (CC) images are classified based on texture properties. This algorithm involves only convolution and simple arithmetic in various stages which leads faster implementation. The efficient feature space is created for textures as well as US kidney stone classification. Firstly, some techniques of speckle noise reduction were implemented consist of median filter, Wiener filter and Gaussian low-pass filter. Then texture analysis was performed by calculating the local entropy of the image, continued with the threshold selection, morphological operations, object windowing, determination of seed point and ROI generation. This method was performed to several kidney ultrasound images with different speckle noise reduction techniques and different threshold value selection. Based on the result, it shows that for median filter, threshold value of 0.6 gave the highest TRUE ROIs which were 70%. For Wiener filter, threshold value of 0.8 gave highest TRUE ROIs which were 80% and for Gaussian low-pass filter, threshold value of 0.7 gave highest TRUE ROIs which were 100%. By using the previous methods result, this method has been tested also to more than 200 kidney stone ultrasound images. Therefore, we conducted a texture analysis to the kidney stone images. As the result, the renal sinus, the central area of the kidney stone appeared brighter compared to the other part of the renal, and in the texture analysis, it also appear as the most common region detected in kidney stones.

References


- Local binary pattern histogram based texton learning for texture classification, Yonggang He, Nong Sang and Rui Huan, 18th IEEE Int. Conf. on image processing, (2011).


Index Terms

Computer Science

Image Processing

Keywords

Algorithm Kidney Stones Segmentation Sonography Medical Renal Diseases Ultrasound Texture Threshold