Kidney Stone Detection Using Digital Image Processing Using Python ML

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ABSTRACT - The Kidney stones are a hard collection of salt and minerals, often calcium and uric acid that form in the kidneys. The majority of persons with kidney stones do not recognize them at first, and their organs gradually deteriorate. For surgical procedures, it is critical to determine the exact and precise location of a kidney stone. Speckle noise is present in most ultrasound images, which cannot be removed by humans.
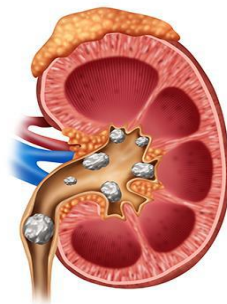
Keywords - Gaussian filter, Median filter, x-ray, CT Scan, Non-linear filter, Accuracy

I.   INTRODUCTION

Problem Statement

Kidney is a bean shaped organ and present on each side of the spine. The main function of kidney is to regulate the balance of electrolytes in the blood.

Kidney stones

II.   METHODOLOGIES

The basic fundamental are:

IMAGE ACQUISITION

The image that we get from the hospital is of DICOM so to perform the image processing it converted to jpg. Through MicroDicom converter.

IMAGE PREPROCESSING

Is performed using these two basic steps:

1.   Filtering

It is used to remove the noise. There are various filters such as average filter, weighted average filter, Gaussian filter but the median filter is the best to remove the impulse noise or the salt and pepper noise. It is a low pass non linear filter. After filtering the image gets smoothed hence, filtering is also done to smooth the image.

2.   Enhancement

Image enhancement is a technique to modify the intensities image. The image that we get is of lower quality therefore the image enhancing is done to improve the quality of the image. The best way to do is through histogram equalization. In this, each pixel intensity is modified so if the image is towards the darker side then it gets stretched towards more white side and hence, we can say that the image is enhanced

IMAGE SEGMENTATION

The image segmentation means to partition the image into different regions to extract the desired features. There are different ways of doing segmentation through different algorithms, here, thresholding technique is used to segment the image. In this technique, threshold value based on the intensity of the pixel is selected and intensities below this value will become zero. Thresholding is done on the preprocessed image. Here, the threshold value is taken as 120.

The proposed methodology of detecting the presence of stones formed in kidneys has been done by pre-processing the ultrasound image followed by its segmentation and finally performing morphological analysis on the resulting image. The resulting image helped in detecting the exact location of stone and further the to identify the shape and stones formed. The strategic combination of these three methods proved to be an accurate method that can be process of detection of kidney stone. The accuracy of proposed algorithm is 92.57% which is competent enough as compared to previous algorithms.

III.   ALGORITHM's

WATERSHED ALGORITHM:

The motive of watershed algorithm is visualizing a gray level photograph into its topographic representation categorizing it into three basic categories such as catchment basins, minima and watershed strains. Thus, inside the image, the dark areas are assumed to have low altitudes and the brilliant areas are to have high altitudes making it look like a topographic floor. Therefore, watershed algorithm suggests superb ability in image segmentation and properly segments the recognized strange areas.
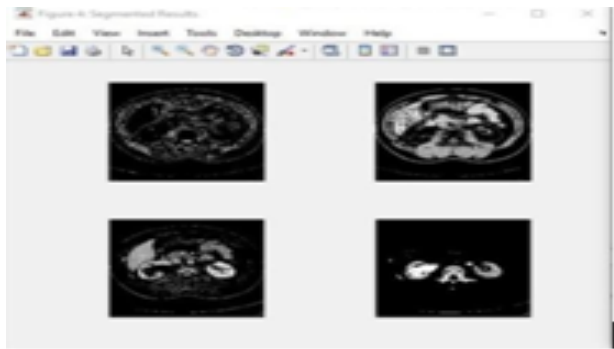

Figure 1: Fuzzy C-Means Algorithm

Fuzzy clustering is an unmanaged clustering technique which does no longer demand a human interaction to decide the clustering standards. It performs on the premise of distance metrics among the information factor and cluster middle through assigning a membership function to each fact point corresponding to every cluster mid-value. It corporates huge units of statistics into smaller sets of comparable information. Comparing to k-means clustering fuzzy-c approach works properly for overlapped records set consequently permitting us to discover the correct region of the kidney stone.
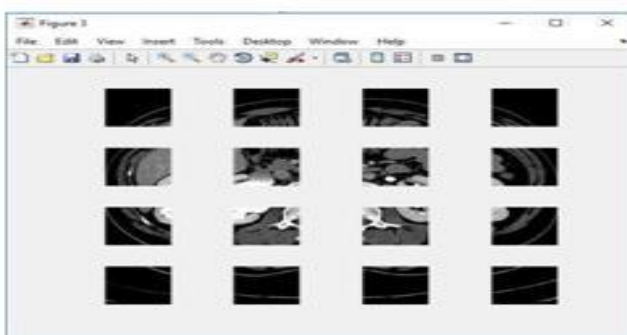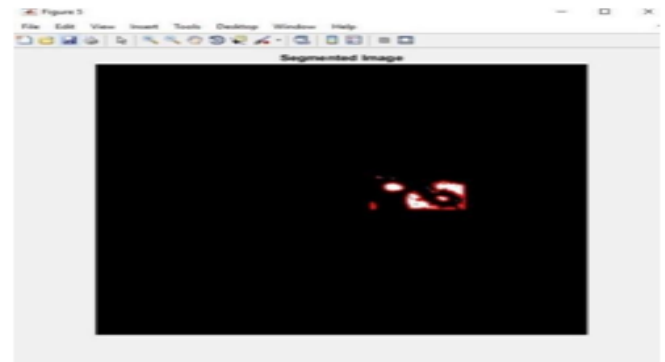

Figure 2: Segmentation

Figure 3: Detected Kidney Stone

Implementation the first step in our implementation is will be to upload the ct scan image guising matlab. We can browse through the various images and select the one which we require. The next complete the preprocessing and the DWT feature extraction step which helps to the the image ready so that the classifier can be implemented on the image. After applying the nn classifier on processed and scanned for the stones. No stone present in the ct scan image then an appropriate result will be shown to the user.
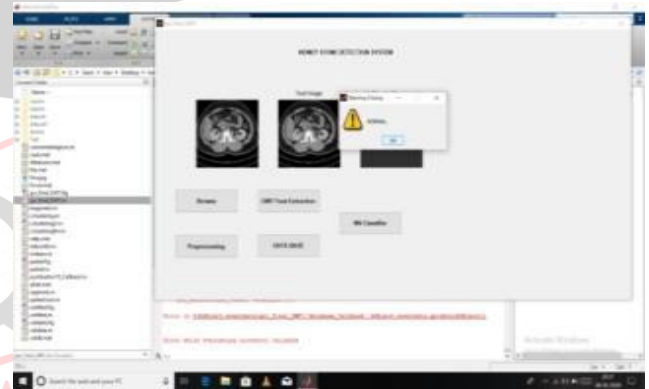

Figure 4: CT scan is normal as depicted .

The stone localization helps to determine whether there is a stone present in the uploaded image or not

IV.   EXISTING SYSTEM

Kidney stones are on the rise worldwide, but are unaware of the disease because it slowly damages the organ before symptoms appear.

Kidney is a bean shaped organ and present on each side of the spine. The main function of kidney is to regulate the balance of electrolytes in the blood. Formation of stones in kidneys is due to blockage of urine congenital anomalies, cysts. Renal dysfunction can be life-threatening. Therefore, early detection of kidney stones is necessary essential. Precise identification of Renal stone is vital in order to ensure surgical operations success. The ultrasound images of kidney comprise speckle noise and are low contrast which makes the identification of kidney abnormalities a difficult task.

Earlier systems will detect the Stone but the drawback in the existing system is that the stages in the Stone

identification is somewhat tedious process, without the level and stage of the Stone further proceeding to the treatment will not be desired.

Disadvantages:

High Computational complexity

- Poor discriminatory power

V. PROPOSED SYSTEM

The main involvement is that the detailed process of detecting a kidney stone using ultrasound images is given. We discuss various kidney stone detection techniques available in the existing literature with their advantages and disadvantages. Further, comparative study of various existing kidney stone detection techniques on the basis of different evaluation parameters used in the arena of kidney stone detection is provided in this paper

Advantages:

High Accuracy Low complexity

- It can segment the Brain regions from the image accurately.

- It is useful to classify the Kidney Stone images for accurate detection.

- Kidney Stone will be detected in an early stages

VI. APPLICATIONS

Kidney Stone diagnosis system for medical application

VII. IMPLEMENTATION

Screen Shot

Normal Kidney (Kidney Stone not present)

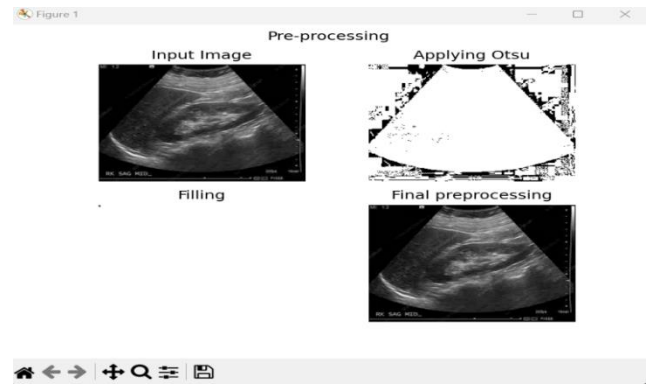**Figure 5: -Taking input images.Applying otsu.**

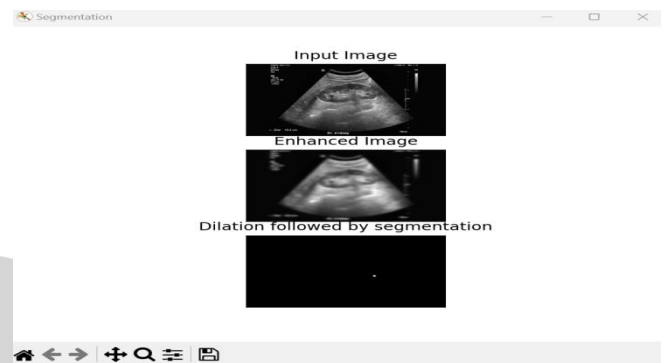**Figure 6:-Pre-processing stage where Gaussian filter and Median filter are used for more clear image.**

Figure 7:-After enhanced image it shows stone is not present.
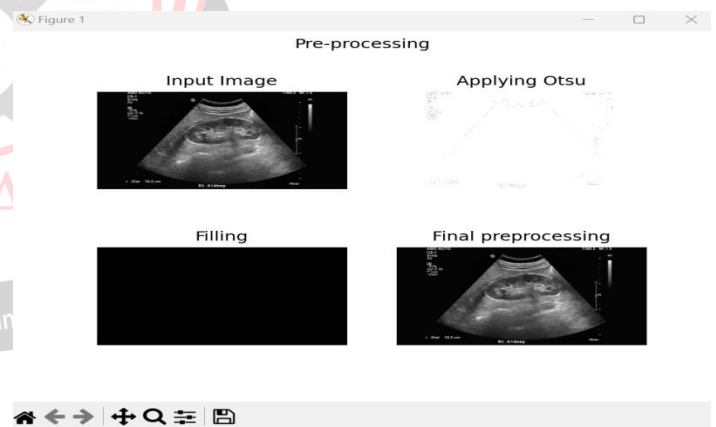
Kidney Stone Present

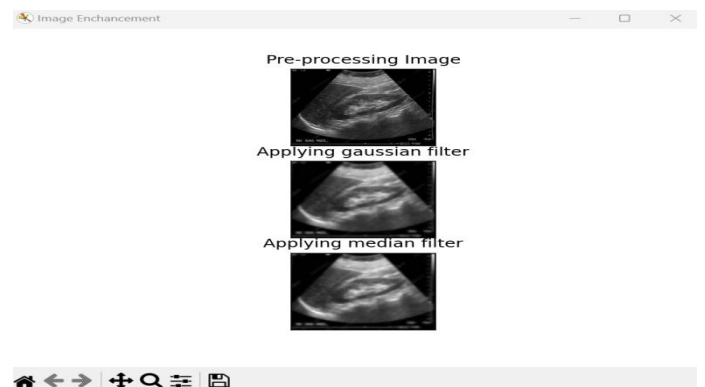**Figure 8: -Taking input images.Applying otsu.**

Figure 9:-Pre-processing stage where Gaussian filter and Median filter are used for more clear image.
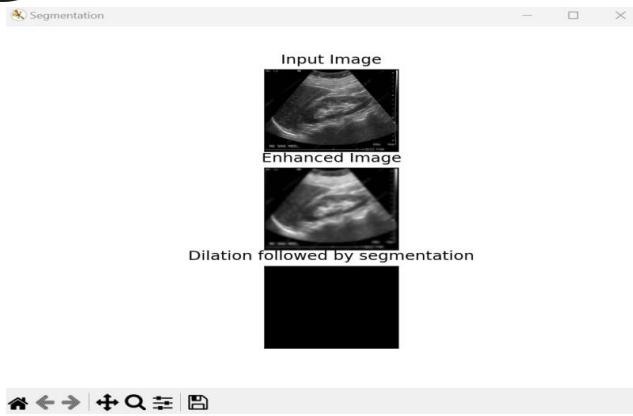
Figure 10:-After enhanced image it shows stone is present.

VIII.   CONCLUSION

The proposed methodology of detecting the presence of stones

formed in kidneys has been done by pre-processing the ultrasound image followed by its segmentation and finally performing morphological analysis on the resulting image. The resulting image helped in detecting the exact location of stone and further to identify the shape and building of the stones formed. The strategic combination of these three methods proved to be an accurate method that can be the process of detection of kidney stone. The exactness of proposed algorithm is 92.57% which is competent enough as compared to previous algorithms.

IX.   FUTURE ENHANCEMENTS

In Future We Add some Of the more Feature Related To Kidney Problem. Study Of the Kidney Stones can done in more Depth.

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