iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: VI Month of publication: June 2022

DOI: https://doi.org/10.22214/ijraset.2022.44811

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

Kidney Stones Identification Based On Ultrasound Images Using Matlab and ML

Santosh K C[1], Narendra H S[2], Pavan T S[3], Sowmya N M[4], Rohan Patil L S[5]
[1, 2, 3, 4, 5]Department of Information Science and Engineering, BIET Davanagere

Abstract: The Kidney stones are one of the most common disorders of the urinary tract. Kidney stone problem occurs as a common problem to every human being, due to nature of living. A kidney stone termed as renal calculi is a solid piece of material that forms in a kidney when substances that are normally found in the urine become highly concentrated. The ultimate aim of medical image segmentation is to reduce the amount of time a radiologist needs to spend for looking at an image to identify the portions of renal calculi.
Keywords: Segmentation, Renal calculi and Radiologist.

I. INTRODUCTION

The detection of kidney stones are highly challenging task as they have low contrast and speckle noise. This challenge is overcome by using suitable imaging techniques and filters. Ultrasound images normally consist of speckle noise which cannot be removed by normal filters. So the median filtering algorithm is proposed, the median filter removes the speckle noise. The preprocessed image is achieved with a median filter to remove noise and to detect the stone region. Majority of people with kidney stone disease do not notice the disease as it damages organs slowly before showing symptoms. Different types of kidney stones namely renal calculi, struvite stones, staghorn stones were analyzed. In order to get rid of the painful disorder the kidney stone is diagnosed through ultrasound images and then removed through a surgical process like breaking up of stone into smaller pieces which then pass through the urinary tract. Kidney stone disease is one of the major life-threatening ailments persisting worldwide. The stone diseases remain unnoticed in the initial stage, which in turn damages the kidney as they develop.

A majority of people are affected by kidney failure due to diabetes mellitus, hypertension, glomerulonephritis, and so forth. Since kidney malfunctioning can be menacing, diagnosis of the problem in the initial stages is advisable. Ultrasound (US) image is one of the currently available methods with noninvasive low cost and widely used imaging techniques for analyzing kidney diseases. Shock wave lithotripsy (SWL), percutaneous nephrolithotomy (PCNL), and relative super saturation (RSS) are the available practices to test urine. The Robertson Risk Factor Algorithms (RRFA) are open and are used for laparoscopic surgery; these algorithms are assigned for exceptional special cases. Hyaluronan is a large (>106 Da) linear glycosaminoglycan composed of repeating units of glucuronic acid (GlcUA) and N-acetyl glucosamine (GlcNAc) disaccharides. It has a significant role in a number of processes that can eventually lead to renal stone disease, including urine concentration, uric acid, salt form crystal, crystallization inhibition, crystal retention, magnesium ammonium phosphate, and amino acid. Here we use image processing technique for kidney stone detection using matlab software.

A. Problem Statement

The kidney malfunctioning can be a life intimidating. Hence early detection of kidney stone is essential and this can be done by image processing techniques. One of the method to identify stones is by taking ultrasound images as an input. The identification of stone in kidney using ultrasound images comprise of speckle noise and are of low contrast. As a result, we use a filter to smoothen the image and SVM algorithm is applied for the precise results of kidney stone identification.

B. Objectives

The detection of Kidney Stone is a challenging task for radiologist and time consuming. we have proposed a system for Kidney Stone identification based on ultra sound image. To achieve this task, we have framed following objectives.

1) To collect the Ultrasound image of Kidney, since these images are publicly not available.
2) To Investigate and apply efficient segmentation technique like threshold method, edge detection method etc.., that can critically segregate the important regions of Kidney for detection of stone.
3) To develop a fully automated system to identify the kidney stones by analyzing input ultrasound image of kidney.

C. Proposed System

A kidney ultrasound is a non-invasive diagnostic exam that produces images, which are used to assess the size, shape, and location of the kidneys. Ultrasound may also be used to assess blood flow to the kidneys. Ultrasound uses a transducer that sends out ultrasound waves at a frequency too high to be heard. The ultrasound transducer is placed on the skin, and the ultrasound waves move through the body to the organs and structures within. The sound waves bounce off the organs like an echo and return to the transducer. The transducer processes the reflected waves, which are then converted by a computer into an image of the organs or tissues being examined. The sound waves travel at different speeds depending on the type of tissue encountered - fastest through bone tissue and slowest through air. The speed at which the sound waves are returned to the transducer, as well as how much of the sound wave returns, is translated by the transducer as different types of tissue. An ultrasound gel is placed on the transducer and the skin to allow for smooth movement of the transducer over the skin and to eliminate air between the skin and the transducer for the best sound. Ultrasound may be safely used during pregnancy or in the presence of allergies to contrast dye, because no radiation or contrast dyes are used.

II. LITERATURE SURVEY

In the year 2021 Annameti Rohith [1] et.al, "Detection of Kidney Stones in Ultrasound Images Using Median Filter Compared with Rank Filter" by Annameti Rohith; S. Premkumar

To detect the kidney stones in ultrasound images using median filters to improve the detection rate in terms of accuracy and sensitivity. Materials and Methods: The accuracy and sensitivity of median filter (n=114) was compared with rank filter (n=114). The median filter is used to detect the kidney stone in ultrasound images. 114 is the sample size taken with the p-value 0.8 and has been used to improve detection rate of kidney stones in terms of accuracy and sensitivity using MATLAB simulation tool. Results: According to the results obtained Median filter has accuracy (86.4%) and rank filter has accuracy (82.2%) and also sensitivity of median filter (87.7%) and sensitivity of rank filter is (82.5%). Median filter has a significantly higher accuracy (p=0.018) and sensitivity (p=<0.01) compared with the rank filter. Conclusion: The detection rate is improved using the Median filter compared with rank filter in terms of accuracy and sensitivity.

In the year 2021 Monica Jenifer J [2] et.al, "Design and Implementation of Kidney Stones Detection using Image Processing Technique" By A Roopa, C R Sarvasri, G Sharmila, A Yamuna. In certain days, renal calculus has become a significant problem and if not detected at an early stage, then it's going to cause difficulties and sometimes surgery is additionally needed to get rid of the stone. Here, to detect the stone which too precisely paves the thanks to image processing because through image processing there's a bent to urge the precise results and it's an automatic method of detecting the stone. Doctor generally uses the manual method to detect the stone from the Xradiation image but our technique is fully automated so it's advantageous because the time is reduced and therewith the possibilities of error also reduce. This project presents a way for detection of kidney stones through different steps of image processing. the primary step is that the image pre-processing using filters during which image gets smoothed likewise because the noise is far away from the image. Image enhancement may be a part of preprocessing which is employed to reinforce the image which is achieved with Stevens' law transformation. Next, the image segmentation is performed on the preprocessed image using thresholding technique. this technique implements image processing technique to attain the aim. The imaging modality used is CT because its low noise compared to other modalities like x-ray and ultrasound.

In the year 2021 Mayandi Sivaguru [3] et.al, "Human kidney stones: a natural record of universal biomineralization"GeoBioMed — a new trans disciplinary approach that integrates the fields of geology, biology and medicine — reveals that kidney stones composed of calcium-rich minerals precipitate from a continuum of repeated events of crystallization, dissolution and recrystallization that result from the same fundamental natural processes that have governed billions of years of biomineralization on Earth. This contextual change in our understanding of renal stone formation opens fundamentally new avenues of human kidney stone investigation that include analyses of crystalline structure and stratigraphy, diagenetic phase transitions, and paragenetic sequences across broad length scales from hundreds of nanometers to centimeters (five Powers of 10). This paradigm shift has also enabled the development of a new kidney stone classification scheme according to thermodynamic energetics and crystalline architecture. Evidence suggests that ≥50% of the total volume of individual stones have undergone repeated in vivo dissolution and recrystallization. Amorphous calcium phosphate and hydroxyapatite spherules coalesce to form planar concentric zoning and sector zones that indicate disequilibrium precipitation. In addition, calcium oxalate dihydrate and calcium oxalate monohydrate crystal aggregates exhibit high frequency organic-matter-rich and mineral-rich nano layering that is orders of magnitude higher than layering observed in analogous coral reef, Roman aqueduct, cave, deep subsurface and hot-spring deposits.

This higher frequency nano layering represents the unique microenvironment of the kidney in which potent crystallization promoters and inhibitors are working in opposition. These GeoBioMed insights identify previously unexplored strategies for development and testing of new clinical therapies for the prevention and treatment of kidney stones.

In the year 2020 Malathy Chidambaranathan [4] et.at, “Kidney Stone Detection with CT images using neural network.” Back Propagation Network (BPN) with image and data processing techniques are employed to implement an automated kidney stone classification. By human inspection and operators, it is impossible to produce result for large amount of dataset. CT scan and MRI produces a lot of noise and hence leads to inaccuracies. Artificial intelligent techniques through neural networks techniques have shown great importance in this field. Hence, in this project we are applying the Back-Propagation Network (BPN) for the purposes. Features are extracted using GLCM and are then classified using BPN. This project presents a segmentation method, Fuzzy C-Mean (FCM) clustering algorithm, for segmenting computed tomography images to detect the kidney stones in its early stages.

In the year 2020 Adriana Mart´ınez1 [5] et.at, “Towards an automated classification method for ureteroscopic kidney stone images using ensemble learning”. Urolithiasis is a common disease around the world and its incidence has been growing every year. There are various diagnosis techniques based on kidney stone identification aiming to find the formation cause. However, most of them are time consuming, tedious and expensive. The accuracy of the diagnosis is crucial for the prescription of an appropriate treatment that can eliminate the stones and diminish future relapses. This paper presents two effective supervised learning methods to automate and improve the accuracy of the classification of kidney stones; as well as a dataset consisting of kidney stone images captured with ureteroscopes. In the proposed methods, the image features that are visually exploited by urologists to distinguish the type of kidney stones are analyzed and encoded as vectors. Then, the classification is performed on these feature vectors through Random Forest and ensemble K Nearest Neighbor classifiers. The overall classification accuracy obtained was 89%, outperforming previous methods by more than 10%. The details of the classifier implementation, as well as their performance and accuracy, are presented and discussed. Finally, future work and improvements are proposed.

In the year 2020 T.Vineela [6] et.al, “Kidney Stone Analysis Using Digital Image Processing” by T. Vineela1, R.V.G.L. Akhila, T. Anusha, Y. Nandini, S. Bindu. Kidney stones are hard collection of salt and minerals often made up of calcium and uric acid. Majority of people with stones in kidney at initial stage do not notice and it damages the organs slowly. It is very important to detect the exact and accurate position of kidney stone for surgical operations. Ultrasound images normally consists of Speckle noise which cannot be removed by mankind. Hence we preferred automated techniques in detection of kidney stones in ultrasound images using median filter instead of gabor filter.

In the year 2020 Mua’ad M Abu-Faraj [7] et.al, “Analysis and implementation of kidney stones detection by applying segmentation techniques on computerized tomography” by Mua’ad M Abu-Faraj. Kidney stone disease is one of the risks for life throughout the world and majority of people with stone formation in kidney at the initial stage do not notice it as disease and it damages the organ slowly. Current estimation is that there are 30 million people suffering by this disease. There are different imaging techniques for diagnosing kidney diseases, such as CT images, X-rays, and Ultrasound imaging. In this study we explored the deployment of three segmentation techniques using MATLAB to examine the kidney area, and to enhance kidney stone detection. The segmentation techniques under investigation are: threshold based segmentation, watershed based segmentation and edge based segmentation.

In the year 2020 Nagireddi Amrutha Lakshmi [8] et.al, “Kidney Stone Detection From Ultrasound Images By Using Canny Edge Detection And CNN Classification” by Nagireddi Amrutha Lakshmi, 2Bodasakurti Jyothirmayi, 3Manjeti Sushma, 4Attaluri SriManoj, 5G. Santoshi. Kidney stones as not a new subject to being one of the major health concerns of today’s day and age, if not detected at early stages might also become life threatening. Detecting a kidney stone might require a technique that ensures precision and also is in wide use. Hence the technique none other than image processing has a tendency to encompass an automatic method to detect stones precisely leading itself to being one of the more popular methods for performing detecting, sensing, or forecasting processes through images. The speckle noise and low contrast of images produced using ultrasound could pose a considerable challenge to detect merely any stones. Therefore, is deployed the befitting image processing technique to overcome the challenge. The image restoration which uses Gaussian filter process helps get rid of the speckle noise by pre-processing the produced ultrasound image. Which is also used to smoothen the ultrasound image thus we obtain restored image. Image segmentation is done to the already preprocessed image for the detection of any possible stones using a canny edge detection technique thereby retaining much prominent edges. Further wavelet transformation and CNN classification is done to the segmented image to identify the presence of stones in a kidney.

In the year 2020 Fouqiya Badar [9] et.al, “Kidney Stone Detection Using CNN” by Farheen Sultana, Amatul Sami Sajida, Mr. Mohd. Abdul Nayeem. Automatic defects detection in MR images is very important in many diagnostic and therapeutic applications.

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Volume 10 Issue VI June 2022- Available at www.ijraset.com

Because of high quantity data in MR images and blurred boundaries, stonesegmentation and classification is very hard. This work has introduced one automatic Kidney Stone detection method to increase the accuracy and yield and decrease the diagnosis time. The goal is classifying the tissues to three classes of normal, begin and malignant. . In MR images, the amount of data is too much for manual interpretation and analysis. During past few years, Kidney Stone segmentation in magnetic resonance imaging (MRI) has become an emergent research area in the field of medical imaging system. Accurate detection of size and location of Kidney Stone plays a vital role in the diagnosis of Kidney Stone. The diagnosis method consists of four stages, pre-processing of MR images, feature extraction, and classification. After Histogram equalization of image, the features is extracted based on discrete wavelet transformation (DWT). In the last stage, Convolution Neural Network (CNN) are employed to classify the Normal and abnormal Kidney Stonedetection based on the K-Means Clustering.

In the year 2019 Vinayagam.P [10] et.al, "Kidney stone detection using Neural Network" by Vinayagam.P, Sreemathi.M, Jeevitha K, Sandhya S. Due to the presence of noise, there are inaccuracies in the classification of kidney stone.Kidney stone has become common nowadays due to various factors. In the proposed methodology nephrolithiasis in the MRI (Magnetic Resonance Image) image is preprocessed using DWT (Discrete Wavelet Transform).Key features are extracted using Gray level co-occurrence matrix (GLCM).A data set of 20 test data containing normal and abnormal kidney MRI images are classified using Back Propagation Method of Neural Network (BPNN).

The output of BPN classification is displayed in LCD board which is interfaced with an Arduinouno board. AFuzzy Clustering Mean Algorithm (FCM) is used for successful segmentation of kidney stone.

In the year 2019 Raju.P [11] et.al, "An Efficient Optimized Probabilistic Neural Network Based Kidney Stone Detection and Segmentation over Ultrasound Images" by Raju.P, Malleswara Rao.V, Prabhakara Rao.B. Locating renal calculus in the ultrasound image is a demanding requirement in the field of medical imaging. For accurate detection of kidney stone, in this paper, optimal recurrent neural network (OPNN) is adopted. The proposed work undergoes pre-processing, feature extraction, classification, and segmentation. Initially, the noise present in input images is removed with the median filter because noises impact the accuracy of the classification.

Then, compute features of this image. In the classification stage, features are used to classify defects through optimal probabilistic Neural Network (OPNN). OPNN is a combination of PNN and spider monkey optimization (SMO). The parameter of PNN is optimized with the help of SMO. Then, the stone region from the abnormal image is segmented using probabilistic fuzzy c-means clustering (PFCM). The proposed methodology performance can be analyzed by using Sensitivity, Accuracy, and Specificity.

In the year 2019 Priyankaa [12] et.al, "Feature Extraction and Selection of kidney Ultrasound Images Using GLCM and PCA" by Priyankaa , Dr. Dharmender Kumar. Ultrasound (US) is considered as safest medical imaging technique and is therefore used extensively in medical and healthcare using computer aided system. However presence of some artifacts due to patient mobility and equipment limitations makes diagnosis of these US images difficult.

There is need for some pre-processing methods to improve quality of images for the purpose of classification and segmentation while preserving pixels of interest. These pixels contain information about images known as image features which forms the data model for classification.

So, feature extraction and selection is important phase in classification step of diagnostic system. Keeping this in mind, this study focuses on preprocessing and feature extraction and selection phase of ultrasound images of kidney for making a classification model. Four operations cropping, interpolation, rotation and background removal are applied as preprocessing methods to enhance the quality of images and for making diagnosis easy and effective. Afterwards, a number of second order statistical texture features including energy, entropy, homogeneity, correlation, contrast, dissimilarity are generated using GLCM. Finally obtained features are reduced to optimal subset using principal component analysis (PCA).

In the year 2019 Dominik Vilimek [13] et.al, "Modeling of Kidney Stones from Ultrasound Images based on Hybrid Regional Segmentation with Active Contours" by Dominik Vilimek , Jan Kubicek, Adela Kloudova, Alice Krestanova, Marek Penhaker, Martin Cerny, Martin Augustynek, David Oczka and Daniel Barvik. Kidney stones (nephrolithiasis) are among the most common kidney diseases.

They are solid stones that arise from minerals dissolved in urine. The treatment of kidney stones depends primarily on the position, size and composition of the stones, as well as on the general health condition of the patient. However, early diagnosis is quite complicated. In this paper, we propose a fully automatic hybrid method for identification and features extraction of the kidney stones. Specifically, model is based on the multiregional segmentation and approximation of the kidney stone area. Methods consequently use concept of the active contours which are focused on extraction of the geometrical features. The method remarkably allowing for an objective monitoring and classification of the kidney stones.

III.SYSTEM DESIGN

A. *System Architecture*

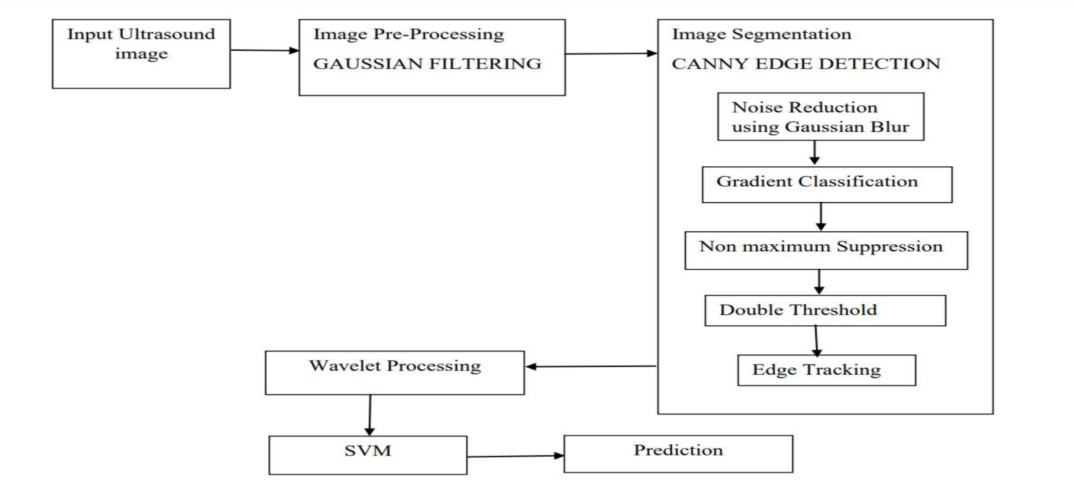

Fig. 1 Architectural diagram for Architecture of proposed System

The above fig 1 shows the architecture of proposed system. In this architecture at first input is given, here we give ultrasound image of a kidney it may be normal or abnormal kidney present with stones. As ultrasound images contain lot of speckle noise it is difficult to deal with them, to overcome this image preprocessing is done i.e., Gaussian filter is applied to remove noise. The next step is image segmentation, canny edge detection is used and this contains five steps such as Noise reduction, Gradient classification, non-maximum suppression, Double threshold and Edge tracking at last we get an output with edges detected. This segmented image is given for wavelet processing. Later SVM is applied, the SVM finds the hyper plane using support vectors and margins. Although the training time of even the fastest SVMs can be exceedingly slow, they are extremely accurate, outstanding to their ability to model complex nonlinear decision boundaries. They are much less prone to over fitting than other methods. The Support vectors initiate also provide a compact description of the learned model. SVMs can be used for prediction along with classification.

B. *Dataflow Diagram*

The fig 2 shows the dataflow of the proposed kidney stone detection system. First step is to take the input image and pre-process it. Next is to segment the pre-processed image using canny edge detection segmentation technique. After segmentation final step is to classify the image using svm classifier.

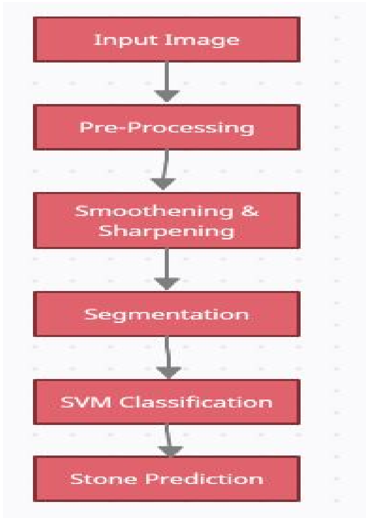

Fig. 2 Dataflow Diagram of proposed system

IV. IMPLEMENTATION

The proposed kidney stone detection is based on ultrasound images using MATLAB is the concept of image processing and computer vision. These concepts are bundled together to get desired result. Here the below fig 4.2 describes the methodology of the proposed system.

Our project is divided into 4 modules namely,
1) Image pre-processing
2) Image segmentation
3) Wavelet processing
4) SVM classification

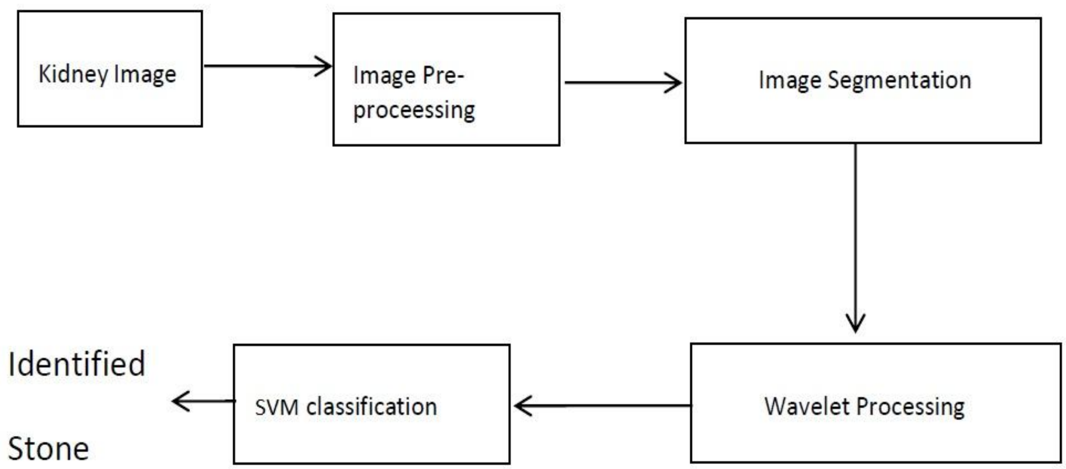

Fig 3 Methodology of proposed kidney stone detection system

A. Image Pre-processing

As the ultrasound consists of speckle noise and is of low contrast pre-processing needs to be done. Pre-processing involves Image restoration, Smoothing & sharpening, Contrast enhancement. Pre-processing is a common name for operations with images at the lowest level of abstraction both input and output are intensity images. These iconic images are of the same kind as the original data captured by the sensor, with an intensity image usually represented by a matrix of image function values (brightness). The aim of pre-processing is an improvement of the image data that suppresses unwilling distortions or enhances some image features important for further processing, although geometric transformations of images (e.g., rotation, scaling, translation) are classified among pre-processing methods here since similar techniques are used. For this Gaussian Filtering is used Filtering is a technique for modifying or enhancing an image. For example, you can filter an image to emphasize certain features or remove other features. Image processing operations implemented with filtering include smoothing, sharpening, and edge enhancement. Filtering is a neighborhood operation, in which the value of any given pixel in the output image is determined by applying some algorithm to the values of the pixels in the neighborhood of the corresponding input pixel. A pixel's neighborhood is some set of pixels, defined by their locations relative to that pixel. In image processing, a Gaussian blur (also known as Gaussian smoothing) is the result of blurring an image by a Gaussian function (named after mathematician and scientist Carl Friedrich Gauss). It is a widely used effect in graphics software, typically to reduce image noise and reduce detail. The visual effect of this blurring technique is a smooth blur resembling that of viewing the image through a translucent screen. Gaussian smoothing is also used as a pre-processing stage in computer vision algorithms in order to enhance image structures at different scales—see scale space representation and scale space implementation. Mathematically, applying a Gaussian blur to an image is the same as convolving the image with a Gaussian function. This is also known as a two-dimensional Weir strass transform. Since the Fourier transform of a Gaussian is another Gaussian, applying a Gaussian blur has the effect of reducing the image's high-frequency components; a Gaussian blur is thus a lowpass filter.

B. Image Segmentation

Segmentation is a vital aspect of medical imaging. It aids in the visualization of medical data and diagnostics of various diseases. Canny edge detection, one of the level set segmentation techniques which is used for identifying and sharpening the edge of the kidney and the stone in the kidney. Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as image objects).

The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image (see edge detection). Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity or texture.

Canny edge detection is a technique to extract useful structural information from different vision objects and dramatically reduce the amount of data to be processed. It has been widely applied in various computer vision systems. Canny has found that the requirements for the application of edge detection on diverse vision systems are relatively similar. Thus, an edge detection solution to address these requirements can be implemented in a wide range of situations.

The general criteria for edge detection include:

1) Detection of edge with low error rate, which means that the detection should accurately catch as many edges shown in the image as possible
2) The edge point detected from the operator should accurately localize on the center of the edge.
3) A given edge in the image should only be marked once, and where possible, image noise should not create false edges.

Steps Involved

- It is a multi-stage algorithm and we will go through each stage.
- Noise Reduction Since edge detection is susceptible to noise in the image, first step is to remove the noise in the image with a 5x5 Gaussian filter. The below fig 4 describes the steps involved in canny edge detection.
- Non-maximum Suppression: After getting gradient magnitude and direction, a full scan of image is done to remove any unwanted pixels which may not constitute the edge. For this, at every pixel, pixel is checked if it is a local maximum in its neighbourhood in the direction of gradient.
- Hysteresis Thresholding This stage decides which are all edges are really edges and which are not. For this, we need two threshold values, minVal and maxVal. Any edges with intensity gradient more than maxVal are sure to be edges and those below minVal are sure to be non-edges, so discarded. Those who lie between these two thresholds are classified edges or non-edges based on their connectivity. If they are connected to "sure-edge" pixels, they are considered to be part of edges. Otherwise, they are also discarded.

C. Wavelet Processing

Wavelet transforms are a mathematical means for performing signal analysis when signal frequency varies over time. For certain classes of signals and images, wavelet analysis provides more precise information about signal data than other signal analysis techniques. Wavelets are commonly used in image processing to detect and filter white Gaussian noise, due to their high contrast of neighboring pixel intensity values. Using these wavelets a wavelet transformation is performed on the two dimensional image. In this project, the segmented image from the input is made to undergo wavelet transform to get compressed image. The image processed in this way can be “cleaned up” without blurring or muddling the details.

D. SVM

Support Vector Machine (SVM) is a supervised machine learning algorithm that can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n-dimensional space (where n is a number of features you have) with the value of each feature being the value of a particular coordinate.

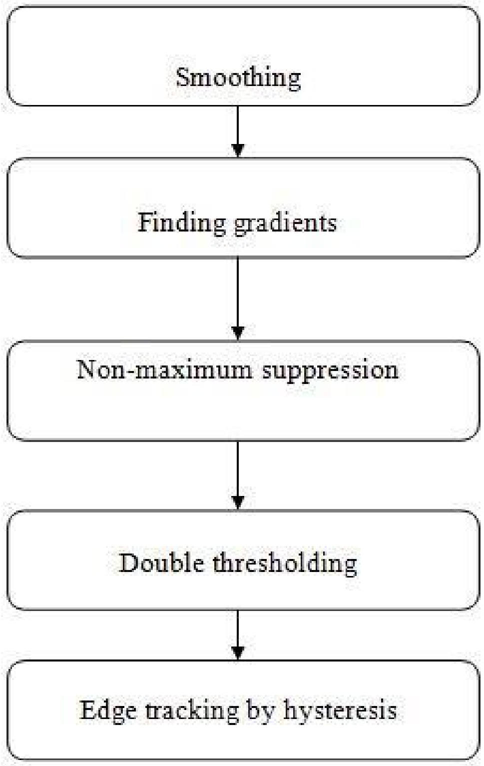

Fig 4 Steps involved in canny edge detection

V.RESULTS AND SCREENSHOTS

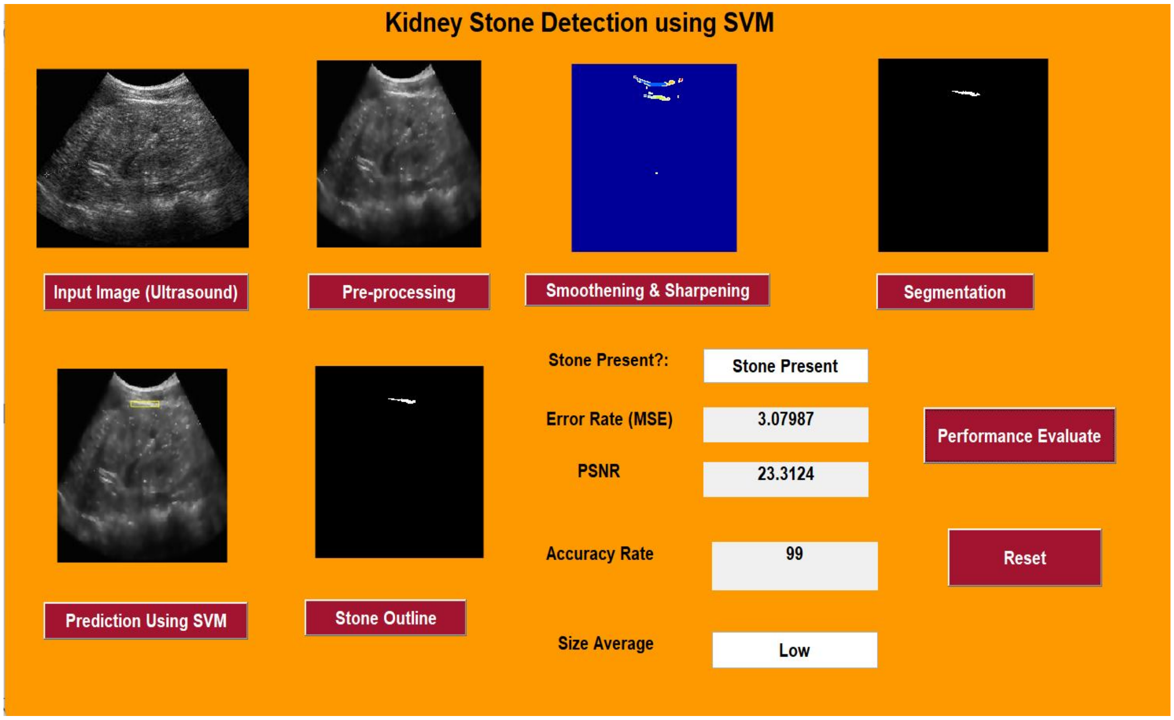

Fig 5 Shows that stone present in the kidney

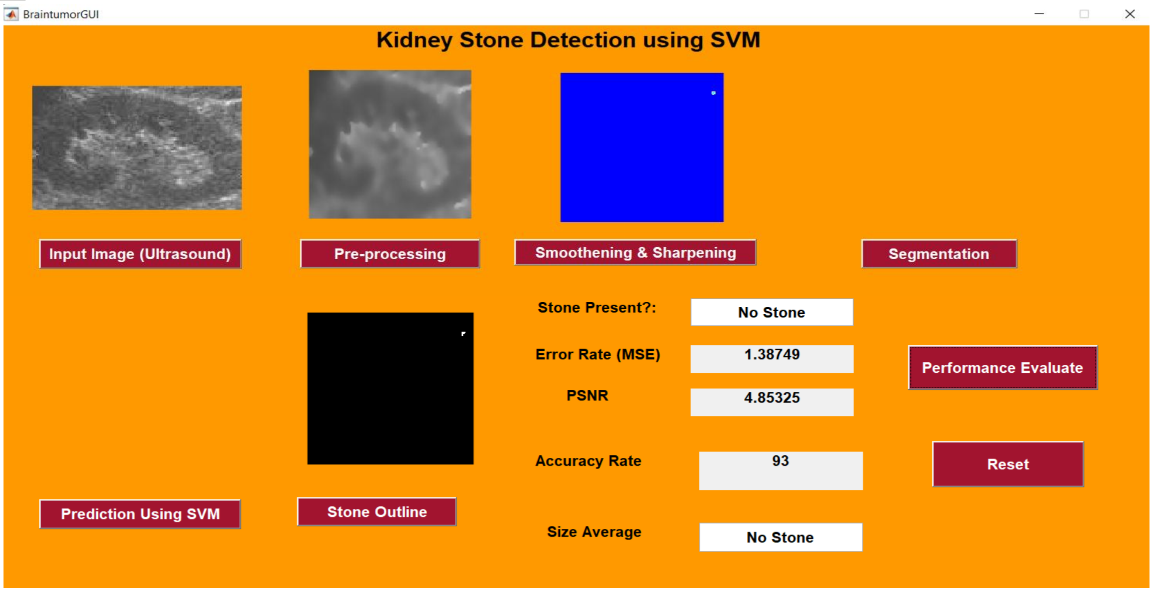

Fig 6 Shows that stone is not present in the kidney.

The above two images are our output images with presence and absence of stone in the kidney. In the images (fig 5) and (fig 6), the first image is input and the next one is the preprocessed image which is obtained after the completion of Gaussian filter and canny edge detection. The Gaussian filter is used to blur the image or to reduce noise by applying Gaussian function. It is a widely used effect in graphics software, typically to reduce image noise and reduce detail. The visual effect of this blurring technique is a smooth blur resembling that of viewing the image through a translucent screen. Gaussian smoothing is also used as a pre-processing stage in computer vision algorithms in order to enhance image structures at different scales—see scale space representation and scale space implementation. Canny edge detection is a multi-step algorithm that can detect edges with noise suppressed at the same time. Smooth the image with a Gaussian filter to reduce noise and unwanted details and textures. Intensity Gradient of the Image is calculated and non-maximum suppression is applied to remove any unwanted pixels which may not constitute the edge. Hysteresis Thresholding is applied in which are all edges are really edges and which are not. For this, we need two threshold values, minVal and maxVal. Any edges with intensity gradient more than maxVal are sure to be edges and those below minVal are sure to be non-edges, so discarded. The image produced is free from noise and all the edges of ultrasound image are identified and these sent to SVM for further classification. The mean-square error (MSE) and the peak signal-to-noise ratio (PSNR) are used to compare image compression quality. The MSE represents the cumulative squared error between the compressed and the original image, whereas PSNR represents a measure of the peak error. The lower the value of MSE, the lower the error.

VI. CONCLUSION

In this paper, the survey of different algorithms and classifications are analyzed followed by the detection of stone present in the kidney. From this implementation, the existing system limitations are inferred and a new design is proposed to address the limitations. We used the real lab kidney ultrasound images for identification of stone in the kidneys. We used Gaussian filter and canny edge detection for segmentation process and SVM as classification algorithm in MATLAB. We used MSE with PSNR for error rate prediction. By using SVM classification we obtained an accuracy in between 90 -99%.

REFERENCES

[1] Aravinda B, Chithralakshmi C. 2016. Sensor Based Accident Prevention System Students. IJIREEICE
[2] Ranga sreedhar galla. 2017. Diminishing road accidents on sharp curves using Arduino.Gokaraju Rangaraju Institute of Engineering and Technology department of Electrical and Electronics Engineering, Telangana.
[3] Harshada Targe, Anushka Mahajan et.al. 2018. Advance Road Safety For Ghat Road's At Hairpin Bend. ICECE Maharashtra, India.
[4] Chitransh Srivastava, Nikhil Acharya et.al. 2016. Implementation of collision avoidance system for hairpin bends in Ghats using proximity sensors.
[5] Prof. Lakshmipraba Balaji, et. al.,2017. Smart highway systems for accident prevention using IoT. Management & Research, Akurdi, Pune, India.