TOPIC:

An image processing technique to identify corona automatically without human intervention.

ABSTRACT:

Since the test images contain speckle noise, therefore it's difficult to detect the coronavirus manually, and hence it's required to use automated techniques in the detection of viruses in test images. Imaging is one of the available imaging techniques used for the diagnosis of lung abnormalities, which can be like a change in shape and position and swelling of the same. This paper proposes an image processing technique to identify corona automatically without human intervention. This project is further going to show the risk of being infected by the Coronavirus by looking at the health records of the user. Moreover, it will display the current data of the Coronavirus pandemic, the areas affected by Coronavirus, and the spread of Coronavirus. Also, it will display the safety measures and precautions to the user by using an android app. Data submitted to the android app will be used to detect corona by using image segmentation.

1. Introduction:

Coronaviruses are large particles with bulbous surface projections and are roughly spherical. The virus particles have an average diameter of around 125 nm. The envelope has a diameter of 85 nm, and the spikes are 20 nm long. The virus envelope in electron micrographs appears as a distinct pair of shells dense with electrons (shells completely invisible to the electron beam used for virus particle scanning).

The viral envelope consists of a lipid bilayer that anchors the structural proteins of the membrane (M), envelope (E), and spike (S). In the lipid bilayer the ratio of E: S: M is about 1:20:300. On average a particle with coronavirus has 74 spikes on the surface. A group of coronaviruses also have a shorter spike-like surface protein called the esterase of hemagglutinin.

The surface spikes of coronavirus are homotrimers of the S-protein which consists of a subunit of S1 and S2. The homotrimeric S protein is a class I fusion protein that mediates binding of the receptor and fusion of the membranes between the virus and the host cell. The subunit S1 forms the spike head and has a binding domain (RBD) for the receptor. The S2 subunit creates the stem that anchors the spike in the viral envelope and allows fusion upon protease activation. The proteins E and M are essential for the formation of the viral envelope and in maintaining its structural shape.

Inside the envelope is the nucleocapsid, which is assembled from multiple copies of the nucleocapsid (N) protein, bound in a continuous bead-on-a-string type conformation to the positive-sense single-stranded RNA genome. Once it is outside the host cell, the lipid bilayer shell, membrane proteins, and nucleocapsid shield the virus.

Ultrasonography is used in medical imaging modalities because it is flexible, compact, does not use ionizing radiation, and is fairly low cost. The big downside of the ultrasound image is that it consists of poor image quality that has low contrast and multiplicative speckle noise making it a difficult task for coronavirus detection. Speckle noise present within the picture degrades its consistency, thus affecting the perception and therefore the specialist diagnosis.

The primary contribution of this paper is to provide in-depth insight into the various urinary calculus detection techniques available in current literature, such as comparative analysis of parameters such as image processing techniques to automatically classify coronavirus without human interference.

The rest of the paper was organized as follows: The steps for detecting urinary calculus are given in section II. The parameters taken for evaluation are clarified in section III and comparative analysis to support these parameters is established. Information made by different authors in their research papers is given in section IV Literature Review. Section V contains a comparative study of such image processing technique parameters to automatically identify the coronavirus without human intervention. Finally, the results obtained after the literature review and comparative study wiped out this paper are concluded in Section VI.

How Image Segmentation can help Coronavirus Detection?

Speckle filtering is one of the most important and important steps within automated detection to provide an efficient coronavirus detection system. This will that any potential erroneous detection. Thanks to the variation in knowledge of judging specialists. The pre-processing is then accompanied by segmentation and morphological examination to automatically identify the coronavirus. Some researchers stress that noise-free images are created for segmentation. Once the ultrasound image enhancement and noise reduction are complete the area of interest will be obtained from the film.

Literature Review

This area provides a detailed overview of various current techniques for the identification of the urinary calculus using different images. The location of the urinary calculus during a physical body is a monotonous assignment as if it had been incorrectly identified this would prompt life danger. In order to eliminate or diminish incorrect recognition of urinary calculus along these lines, a significant number of scientists have provided their contribution by giving successful calculations for the identification of kidney stones. Robotization of the identification of the urinary calculus will decrease or roughly remove incorrect manual recognition. This will help to fix the difficulty better and more accurately and can spare human lives. Consequently, it affects the general public directly. In their paper, Mallala described a C-arm tomographic technique to create a tridimensional kidney structure.

The consequence of their analyzes showed the potential to render volume data for urinary calculus discovery but computed tomography (C.T.) kidney outputs have a more prominent introduction to radiation than the usual presentation to normal X-beam radiation, particularly due to patients requiring continuous examination and young people with less evolved bones. Sadeghi also looked at the radiographic technique, which uses X-beam to scan for stone faster and more accurately for each. The aftereffect of their paper shows as dull and cloud basically 90 percent of urethral stones. The major obstacle in this way is that correct and precise identification is limited. In addition, uric corrosive stones may not be seen and littler stones are out of reach. Thus, the position of the urinary calculus is completed in an enhanced strategy by Cunitz's use of Doppler imaging arrangement. According to their paper, ultrasound is much superior to recorded tomography (CT) and KUB (kidney, ureter, and bladder) X-ray, and it can also prevent broad radiation control steps. They suggested a technique to improve the peculiarity and affectability of ultrasound by shading Doppler imagery and it provided a twinkling impact as outcomes of the various air pockets contained in urinary calculus holes and breakages.

The study also demonstrates that the use of sifting techniques in ultrasound images is crucial to detecting kidney stones. Sun planned a rotational sono-test that would take sonographic images of 4 similarly isolated edges about a fixed and pivoting hub. In physical terms, measuring renal volume is boring and troublesome. Their strategy is accomplished by limiting certain capacities for vitality. Their robotized technique for figuring renal stone is effective and accurate along these lines when physically contrasted. In addition, Marsousi is using this three-dimensional analysis to improve the detection of the urinary calculus using robotic techniques. Consequently, their methodology ends and splits the kidneys in "three-dimensional ultrasonic images of the stomach." Works of Tsao show that the location of tangible urinary calculus situations is critical for lithotripsy (ESWL) of the extracorporeal stun wave. Since it uses stun waves to constantly consider renal stone, the shockwave miss-hit can cause tissue damage or injury. Our analysis reveals that ultrasonic images include clamor at the location that should be evacuated.

Another Sapozhnikov research shows that inertial stone cavities assume an urgent job in ESWL. Cavitation in stone during shockwave lithotripsy can cause tissue injury. The result of their paper shows that the size and central area determined in vivo are often more accurate with the use of high-power-centered ultrasound (HIFU). Though in their paper Singh spoke of ultrasonic parameters of renal calculi. For various renal calculus samples, they determined ultrasonic speed constriction, impedance, dynamic versatility module, transmittance, and in vivo reflectance coefficient. These parameters help plan a superior lithotripter in ultrasonics. The accuracy of the strategy used in their examination is ±1%. Rahman's suggested decrease in dot commotion and division of ultrasonic images of the kidney also enhances the position of the urinary calculus as it upgrades the image character.

In addition, Vishwanath removed some levels of vitality that provide a trace of the proximity of urinary calculus in a specific area and subsequently their paper applied Multilayer Perceptron (MP) and Back Propagation (BP) to establish precise stone distinguished to 98.8%.

2. Proposed Methodology

A. Image Acquisition

Firstly, coronavirus images are acquired by means of a digital camera with a required resolution for better quality or by the scanner. The image of the input photo is then resized to 256x256 pixels. The creation of a database of images is strongly dependent on the application. The image database itself is responsible for the classifier's improved efficiency which determines the algorithm's robustness.

B. Image Pre-processing

The image enhancement techniques are widely known as methods for the spatial domain and frequency domain. The pre-processing step in spatial domain methods refers to the plane of the image itself and to manipulating each pixel in an image. Spatial domain operations include image spatial filtering and transformation of intensity. We began with the gray level mapping of the image for the purpose of pre-processing, in which the intensity transformation of the image pixels is carried out in accordance with spatial domain operations. For pattern analysis and identification, it is applied to obtain the accurate resolution of the tissue pattern. This has also distinguished between the speckle noise present in the picture and the patterns of the tissue on the basis of which it can help to show an anomaly in the tissue. In the background of grayscale images, this phase of point processing is also known as pixel processing. This plans to modify the gray levels at the pixels' spatial position resulting in a new gray level adjustment that matches the gray level. The thresholding of an image is performed in Grey level modification, where the target pixel is labeled with a "1" value and a background pixel is labeled with a "0" value. To distinguish between the areas we use a threshold filter to set the high contrast of grayscale images into black and white images. Then we use the histograms to analyze the adjustment of the gray level along with the pixel visualization of each value and minor component.

C. Textural features

The textural characteristics help to classify the different regions of the picture, based on their textures. Any image's texture analysis may be characterized by scale, standard deviation, image entropy, these values in combination give the local variability of the image's intensity values. In our methodology, we will use the range file() function, stdfilt() function, and entropyfilt() function for the purpose of texture filtering and to quantify the statistical randomness. After then we will set the threshold value in order to segment the image.

D. Unsharp Filtering

The unsharp filter is a simple sharpening agent that derives its name from the fact that it improves edges (and other high-frequency components in an image) through a mechanism that subtracts from the original image an unsharp or smooth version of an image. In the photographic and printing industries the unsharp filtering technique is commonly used to crispen edges.

E. Anisotropic Diffusion Technique

This is a non-linear filtering technique that Perona and Malik have introduced to suppress the noise from the speckle.

This technique has the advantage of suppressing the noise while leaving the fine structural features of the image intact. This technique was applied to the ultrasonic image.

F. NCUT Segmentation

Here we use the technique of segmentation suggested by J. Shi, J. Malik, known as the technique of NCUT segmentation. In NCUT the picture partitioning criterion is to reduce the intergroup weight sum of connections while maximizing the intragroup weight sum of connections. For the paper, we use the Timothee Cour software which is used to segment the image using the NCUT method.

G. Edge Detection

Detection of edges is done using the Sobel Edge Detection. Sobel operator calculates the approximate magnitude of the 2D spatial gradient at each point of the input image. Thus, we get the points the image changes at. The gradient is a 2D matrix with pairs of horizontal and vertical components at each point of the image. A pair of masks with 3X3 convolution is used.

H. Edge Thickening

After applying Sobel Edge Detection the resulting image we obtain has discontinuities and gaps between the edges. This can cause problems in Floodfill Technique by making some undesirable and erroneous foreground portions of the probability map black, and some background portions white. Thus, edge thickening is performed using some morphological functions which fill in the edge gaps and thus make the image error-free.

I. Median Filtering

Smoothing filters take an average of an image's pixel values in a given neighborhood and blur the edges and sharp details. Median filtering, however, replaces an image's center pixel value with the pixel value median in a specified neighborhood. First, the pixel values are sorted in ascending order in a given neighborhood and the mean pixel value is replaced with the pixel value in the middle. That eliminates the noise in an image and preserves the sharpness of the edge.

J. Eroding and dilating

Eroding and dilating are the two morphological operations that are being used to enhance picture transparency in this method. The operations of erosion and dilation are performed on the small number matrix called structuring elements or the kernels. The structuring erosion process continues with the conversion of boundary pixels into background pixels. And the dilation procedure is used to change the pixels which border the image pixels of the background. Generally, the erosion process renders the picture smaller but the dilation is used to expand or combine the artifacts.

K. Segmentation

Segmentation is used to extract characteristics from different regions of the image. The proposed work seeks to use the clustering technique k-means to divide the image into its constituent regions or objects.

K-means Clustering Technique

In the clustering technique of k-means, images are divided into four clusters, in which one cluster contains most of the diseased parts of the image. The clustering algorithm for k-means was developed by J. MacQueen (born in 1967). The clustering algorithms in the k-means group the objects (pixels) into 'k' number of groups based on the set of functions. Classification is conducted by minimizing the sum of distance squares between the data objects and the cluster in question.

The RGB image is converted into L*a*b color space so that the color information is only stored in two channels i.e. * a and * b components and the processing time for segmentation of the image is reduced. The analysis indicates picture clusters. To measure the function parameters, all the clusters are again divided into the Hue, Saturation, and Intensity images.

L. Feature Extraction

Extraction of the function requires simplifying the number of resources needed to accurately represent a broad data set. To obtain statistical texture characteristics, the gray level co-occurrence matrix (GLCM) is formulated. Such texture characteristics are determined in this study from the statistical distribution of observed combinations of strength at specified positions relative to other ones. Statistics are classified into statistics of the first, second, and higher-order according to the number of strength points of each mix. Gray numbers are an important component in GLCM. Different statistical texture characteristics are extracted namely energy, covariance, sum entropy, the entropy of differences, entropy, correlation measurement of information; inverse difference, and contrast.

3. References

[1] A report of the expert consultation on viticulture in Asia and the Pacific. May 2000, Bankok, Thailand. RAP publication:2000/13.

[2] J. K. Patil1 and R. Kumar, “Advances in image processing for detection of plant diseases”, Journal of Advanced Bioinformatics Applications and Research, ISSN 0976-2604Vol 2, Issue 2, pp 135-141, June-2011.

[3] Weizheng, S., Yachun W., Zhanliang C., and Hongda W.,” Grading Method of Leaf Spot Disease Based on Image Processing” International Conference on Computer Science and Software Engineering - Volume 06 ,PP. 491-494,December 2008.

[4] S. S. Sannakki, V. S. Rajpurohit, V. B. Nargund,and P. Kulkarni, “Diagnosis and Classification of Grape Leaf Diseases using Neural Networks”, IEEE 4th ICCCNT, 2013.

[5] Prof.Sanjay B. Dhaygude, Mr.Nitin P. Kumbhar, “Agricultural plant Leaf Disease Detection Using Image Processing”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering , S & S Publication vol. 2, Issue 1, pp: 599-602, 2013.

[6] Mokhled S. Al-Tarawneh “An Empirical Investigation of Olive Leave Spot Disease Using Auto-Cropping Segmentation and Fuzzy CMeans Classification”, World Applied Sciences Journal , vol.23, no.9, pp:1207-1211,2013.

[7] S.M.Ramesh, Dr.A.Shanmugam, “A New Technique for Enhancement of Color Images by Scaling the Discrete Cosine Transform Coefficients”, International Journal of Electronics &

Communication Technology, IJECT Vol. 2, Issue 1, March 2011.
[8] Haiguang Wang, Guanlin Li, Zhanhong Ma, Xiaolong Li, "Image Recognition of Plant Diseases Based on Back propagation Networks, 5th International Congress on Image and Signal Processing, pp-894- 900, Chongqing, China, 2012
[9] JAI Global, (2016, May) AD-080GE product page. {Online}. Available: http://www.jai.com/en/products/ad-080ge.
[10] L. S. Magwaza, et al., "NIR spectroscopy applications for internal and external quality analysis of citrus fruit a review," Food and Bioprocess Technology, vol. 5, no. 2, pp. 425-444, February 2012.
[11] W. Gao, et al., "An improved Sobel edge detection," 3rd IEEE International Conference on Computer Science and Information Technology (ICCSIT), vol. 5, pp. 67-71, July 2010.
[12] J. Sauvola, and M. Pietikinen, "Adaptive document image binarization," Pattern recognition, vol. 33, no. 2, pp. 225-236, February 2000.
[13] Anand H. Kulkarni, Ashwin Patil R. K. "Applying image processing technique to detect plant diseases" International Journal of Modern Engineering Research (IJMER) Vol.2, Issue.5, Sep-Oct. 2012 pp3661-3664 .
[14] Pradnya Ravindra Narvekar, Mahesh Manik Kumbhar2, S. N. Patil "Grape Leaf Diseases Detection & Analysis using SGDM Matrix Method" International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3237:2007 certified organization) Vol.2,Issue 3, March 2014.
[15] Tejal Deshpande, Sharmila Sengupta, K. S. Raghuvanshi "Grading & Identification of Disease in Pomegranate Leaf and Fruit" International Journal of Computer Science and Information Technologies, Vol. 5 (3), 2014, 4638-4645.
[16] Vinita Tajane, Prof. N.J. Janwe "Medicinal Plants Disease Identification Using Canny Edge Detection Algorithm, Histogram Analysis and CBIR" International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 6, June 2014.