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Observation on Health Quality of Teeth Before and After Root Canal Treatment Using DIP Algorithms

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ABSTRACT
These days an exploration of dental infection is extremely useful in the clinical areas for programmed translation of illness inside less time and with more precise outcomes. Root canal treatment is a regularly clear system to mitigate dental torment and spare our teeth. There are numerous challenges in characterizing goal, for example, it is hard to translate ailments in light of the fact that there are exact moment varieties in X-rays, Poor image quality portrayal and division of every tooth in the radiographic image. The crude information got straightforwardly from X-rays obtaining gadget may yield a nearly poor image quality portrayal. On account of the part of a human (dental practitioner) understanding in light of his insight, experience and recognition which may vary from specialist to specialist, there are odds of the blunder in choosing the correct restorative treatment. Programming engineers alongside specialists have composed different institutionalized and logical instruments to limit the human blunder on account of the right treatment in light of visual perception. One of the points of this work is to Centre on the separated part (where the Root Canal Operation was done) of the tooth from computerized dental X-rays, finding the required data as highlights and helping the dental practitioner by utilizing the Digital Image Processing Algorithms.
Keywords :- Dental Images, Digital Image Processing, OrthoPantomoGraph, Root Canal Treatment.

I. INTRODUCTION

In the recent years, different techniques of processing on the image have been actively used for the diagnosis of oral diseases in dentistry. There are different analytic strategies for dentistry which incorporate, Computed Axial Tomography (Connecticut sweep or CAT examine), Ultrasonography (US), Scintigraphy, Panoramic Imaging, Intra Oral and Extra Oral Radiography and MRI. Medical imagery systems are useful and helping in confirming a different type of dental disease infections. By using the radiographs of teeth, experts can find the number of diseases. The disease such as Crack of the tooth, Abrasion, Dental Caries, Gingivitis, Periodontitis, Abscess, Interdental bone Loss, Supernumerary Dentition, Impacted teeth, cysts etc. Preliminary stage detection especially teeth enclosed space is very important.

Nowadays the cavity problem is also one of the dental disease and it is diagnosed by the X-ray images. The roots are analyzed by the dentists using the human vision techniques have been proposed by many researchers. In this work, the dental images are analyzed before and after the root canal operation for cavity problem by using the image processing techniques.

II. REVIEW OF LITERATURE

Stage-based image coordination [1] is effective dental radiograph enrolment calculation utilizing for human identification. Versatile histogram adjustment (AHE) [2] is subjective and quantitative examination between unique images and four image improvement in particular systems. Quick neural system (FNNs) [3] calculation depends on performing cross relationship in the recurrence area between input image and the info weight. Post-mortem (PM) and ante-mortem (AM) radiograph [4] are dental images handling to coordinates with the stake in light of some trademark or highlight of the radiograph.

Watershed division [5] including GLCM surface highlights extract a successful image preparing systems were utilized with from the examination of real nature images in MATLAB programming processed information and investigates images with some valuable calculations. Support Vector Machine (SVM) [6] based characterized a number of thirty-three highlights were phrased utilized. The centre around medicinal image enlistment [7] and also restorative image combination. Treating dental caries [8] in pre-school youngsters would expand development. Serious untreated dental caries is basic in pre-school youngsters in numerous nations.

The additionally discloses imaging strategies [9] to be a utilized as part of the application, for example, GLC Network for separating the highlights from the dental image. Introducing human distinguishing proof [10] by vigilant calculation utilizing image handling in MATLAB We coordinated all edges of the d1 image with different images and the outcomes demonstrate that from the contrast with different methodologies our radiographic approach displays the most reduced disappointment rate among all methodologies examined. Fake neural system [11] is Plaque recognizable proof is finished utilized to Centre on the discovery of plaque at its underlying stage to keep away from the development of Calculate. Image handling systems [12] will help check the x-beam and look at the degree to which caries sore is available and after that group, the sort of caries exhibit in the dental radiograph.

III. METHODOLOGY

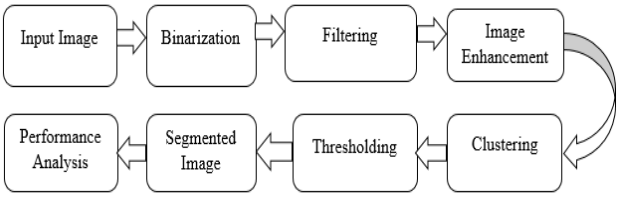


FIGURE 1. PROPOSED METHOD

The proposed algorithm having various steps to make the noiseless outcomes and accurate results. There is Gaussian Filter, Histogram Equalization K-Means Clustering methods are used in this algorithm. In this work based on dental X-ray images of caries and tooth decay are taken from the Orthopantomograph (OPG). The X-ray images are taken as the input image of the proposed algorithm and which is denoted as *I (u, v).*The input images are naturally in the form of RGB. For computational problems, we need to convert from RGB to Binary values. Three types of methods are as follows: Method 1: The **lightness** method midpoints the most unmistakable and least discernible shades: (max(R, G, B) + min(R, G, B))/2.Method 2: The **average** method just midpoints the qualities: (R + G + B)/3.Method 3: The **luminosity** method is a more present day variety of the customary method. It similarly midpoints the characteristics, yet it outlines a weighted ordinary to speak to human acknowledgment. We're touchier to green than different hues, so green is weighted generally intensely. The equation for iridescence is 0.21 R + 0.72 G + 0.07 B. In this work, the normal technique is proposed for the change of RGB to Gray. The input image is taken as *I (u, v),* and the Binarization process of the input image is

$$I_{10}(u,v) = \frac{I_R(u,v) + I_G(u,v) + I_B(u,v)}{3} \quad \text{--- (1)}$$

Because of patient oscillation or physical errors, the images having noises. In this work, the image filtering is done by using High pass Gaussian filter, which is given as follows

$$I_F(u,v) = \left(\frac{1}{\sqrt{2\pi\sigma}} e^{\frac{-u^2}{2\sigma^2}}\right) X \left(\frac{1}{\sqrt{2\pi\sigma}} e^{\frac{-v^2}{2\sigma^2}}\right) \quad \text{--- (2)}$$

Where I_0 is the cut-off frequency, $I_{10}(u,v)$ is binary image and I_F *(u, v)* is filtered image.

Histogram Equalization reassigns the splendour estimations of pixels in view of the image histogram, where the histogram of the resultant image is as level as could reasonably be expected. It gives all the more outwardly satisfying outcomes over a more extensive scope of images. Histogram evening out is particularly utilized as a part of this work to upgrade the difference of the image, it spreads the force esteems over the full range. The objective of histogram adjustment is to spread out the differentiation of a given image uniformly all through the whole accessible dynamic range. Let I_F (u, v) be a resultant image from sifting and its pixel forces running from 0 to L − 1. L is the quantity of conceivable force esteems, regularly 256. Allow p to connote the institutionalized histogram of I_F (u, v). So

$$P(n) = \frac{\text{number of pixels with intensity(n)}}{\text{total number of pixels}} \quad \text{--- (3)}$$

Where n = 0, 1…. L - 1. The histogram evened out image I_H (u, v) will be characterized by

$$I_H(u,v) = Floor\left((L-1)\sum_{0}^{f(i,j)} P(n)\right) \quad \text{--- (4)}$$

Where Floor () adjusts down to the closest number.
Packing is the route toward dealing with articles into clusters whose people are tantamount in some way or another". K-suggests is a standout amongst the clear unsupervised learning figuring's that deal with the prominent gathering issue. The principal thought is to portray k centroids, one for each cluster. These centroids should be put guilefully because of different zone causes a substituted result. The clustering function

$$I_C(u,v) = \sum_{v=1}^{k}\sum_{u=1}^{k} \|x_u^v - c_v\|^2 \quad \text{--- (5)}$$

In Eqn.5, $\|x_u^v - c_v\|^2$ is a picked remove estimated from an information point xuv and the bunch focus. cv is a marker of the separation of the n information focuses on their particular group focuses. Finally, by using thresholding process, we can eliminate all type of noises and its values are considered as follows,

$$I_T(u,v) = \begin{cases} 1 \text{ for } I_C(u,v) > T_{max} \\ 0 \text{ for } I_C(u,v) \le T_{min} \end{cases} \quad \text{--- (6)}$$

From Eqn.6, we set two values in between 0 and 1 in double thresholding process. Finally, $I_T(u,v)$ is the final output image and the feature of the images will be segmented clearly. The performance of the proposed segmentation algorithm will be analysed by the following operations Accuracy, Peak Signal to Noise Ratio (dB), Execution Time.

IV. RESULTS AND DISCUSSIONS

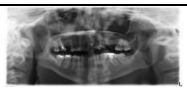
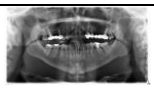
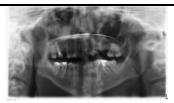
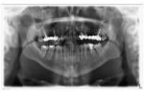
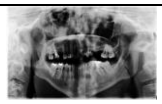
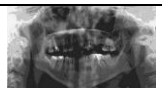
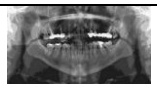
In this work, the dental image of the eight patients is taken. Once they had a cavity problem, their diseased dental image is taken from Orthopantomograph (OPG) and after the root canal Operation their cured dental image was also taken for monitoring the health conditions. The following Table 1 gives the information of those patients.

TABLE 1
THE INFORMATION ABOUT THE INPUT DENTAL IMAGE

TABLE 2

S. No	Patient Name	Age	Gender	Type of Root	
				No. of Single Rooted Teeth	No. of Double Rooted Teeth
1.	Mervin. A	32	M	6	1
2.	Narayanan. M	45	M	8	2
3.	Meenakshi. B	38	F	1	1
4.	Lakshmi. A	41	F	1	1
5.	Kannan. K	26	M	1	-
6.	Mangalam. S	52	F	2	1
7.	Radhi. N	29	F	5	4
8.	Chandran. M	37	M	1	-

RESULT IMAGES FOR PATIENT MERVIN. A

Process	Before Root Canal	After Root Canal
Input Image		
Filtering		
Enhancing		
Clustering		
Thresholding		

By using the Digital Image Processing Algorithms, the dental images on before and after root canal operation is easily segmented in the above results. From Table 3, the segmented images are tabulated for those eight patients. The roots are clearly segmented in the after RC column. The performance of the proposed algorithm is based on accuracy, SNR and its elapsed time and they are tabulated in Table 4. The accuracy is mostly greater than 0.7 and very nearer to 1. For the patient Chandran, it reached to 0.92. So, the proposed method is more accurate. Then Signal Noise Ratio (dB) is also tabulated in Table 4. The Lowest SNR value will be the good and noiseless system. Comparatively, For the Patient Narayanan, the very low SNR value (4.86 dB) is achieved.

TABLE 3
FINAL SEGMENTED RESULT IMAGES

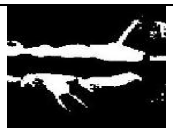
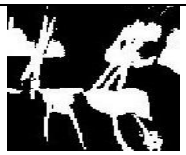
S. No	Patient Name	Before Root Canal	After Root Canal
1.	Mervin. A		
2.	Narayanan. M		
3.	Meenakshi. B		
4.	Lakshmi. A		
5.	Kannan. K		
6.	Mangalam. S		
7.	Radhi. N		
8.	Chandran. M		

TABLE 4
PERFORMANCE ANALYSIS OF THE PROPOSED ALGORITHM

S. No	Patient Name	Accuracy	SNR (dB)	Execution Time (Sec)
1.	Mervin. A	0.83	12.19	0.31
2.	Narayanan. M	0.86	4.86	0.28
3.	Meenakshi. B	0.79	15.75	0.35
4.	Lakshmi. A	0.72	19.26	0.39
5.	Kannan. K	0.76	13.24	0.32
6.	Mangalam. S	0.96	6.85	0.21
7.	Radhi. N	0.73	16.31	0.33
8.	Chandran. M	0.92	5.23	0.24

The time execution of the proposed system is from 0.21 seconds to 0.39 seconds. Finally, the health quality of the

teeth before and after the root canal operation is observed accurately, the outputs are having low noise ratio and the proposed system is rapidly executed.

V. CONCLUSIONS

Finally, the X-Ray images of dental images are analysed and the health conditions of the teeth before and after the Root Canal operation is observed by the Image Processing Algorithms. The Cavity diseased and cured dental images are segmented accurately and the outcomes are noiseless. This proposed method will surely help to the dentist to analyse the health condition of the teeth This work also used to the software developers to minimize the human error on the basis of visual perception. For a machine, this work will be an efficient algorithm to segment the diseased and cured dental image from its original X-ray images. The proposed method will be extended for the time consumption. The difficulties of this proposed method should be reduced. So the more accurate and noiseless environment will be designed. These simulation results will be interfaced with hardware monitoring systems.

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