

Efficient Identification of Acute Appendicitis Using Histogram Thresholding and Quasi-Euclidean Distance

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Abstract— The authors propose a novel method for identifying acute Appendicitis using Quasi- Euclidean distance measures. The raw ultrasound image is not clear enough to identify a disease effectively. It also has the constraint on positive detection to diagnose particularly the Appendicitis. Ultrasound screening is preferably applied because of its no ionizing feature. This is very suitable to the patient especially for the pregnant patient to avoid injured person to the infant. To segment out the image, histogram Thresholding is used and edge detection method is applied to enhance the image quality. Appendicitis outline is detected through computerized Quasi Euclidean algorithm in to find the measurement of its parameter. From the results, it can be said that, this method could extract the Appendicitis from ultrasound image and so that decision is useful for examiner to do factor measurement.

Keywords— Appendicitis, Histogram Thresholding, Edge Detection, Quasi-Euclidean

I. INTRODUCTION

Acute Abdomen is well-defined as a syndrome prompted by a wide variety of extreme conditions that require emergent medical or more often surgical management. CT scan had been found more trustworthy to diagnose for Appendicitis. For child patient a radiation exposure during the diagnosis double the risk to develop a fatal cancer which in sorts ultrasound screening as the desirable method to observe for Appendicitis in pregnant patient. Ultrasound is a non-ionization method for scanning which is very useful for pregnant patient. Apart from that, non-visualized image an examining can be counter attack by image processing.

Clearer image can be obtained by undergo some image processing on the blurry image which in turn can help in better visualization for accurate diagnosis and interpretation by the specialist or medical doctor. This paper defines the improvement of medical ultrasound image mainly for Appendicitis. This can be achieved by undergo some methods on image dispensation. They are

- 1) Image Separation.
- 2) Image Enhancement.

- 3) Distance Measurement.

II.APPENDICITIS

The adult Appendicitis is a long diverticulum averaging 10 cm in length that arises from the poster medial wall of the cecum in the region of 3cm below the ileocecal valve. The Appendicitis may lie in a retrocaecal, sub cecal, retroileal, perinea, or pelvic site which influences the clinical presentation. The maximum occurrence of the disease occurs in the 2nd decade, thereafter, disease occurrence declines with age. The primary pathogenic event in the best part of patients with acute Appendicitis is luminal obstruction Fecoliths, which outcome from the inspissations of fecal material and inert salts within the appendix lumen are the most common cause of obstacle and are present in 12% –58% of patients with acute Appendicitis.

Although operator skill is an important factor in all ultrasound examinations, it has particular importance in the check-up of the patient with right-lower-quadrant pain. Even so, the criteria for the US-based diagnosis of acute Appendicitis are a reliable well established. Ultrasound is also highly useful in identifying an alternate diagnosis. Symptoms of Appendicitis recurrently include pain in the lower right abdomen, nausea, loss of appetite and vomiting with or deprived of fever. There may be mild diarrhoea or constipation. The site of this tenderness could be privileged in appendicitis in pregnancy or even lower in those with very long Appendicitis.

Initial signs of Appendicitis are those indications that most people with this condition may identify and protest of they include lower right. There are a lot of methods to achieve the points, likewise only one method is used for each stated objective for better result.

For medical separation purpose, histogram Thresholding method is used. Averaging noise filtering 3X3 kernel method is implemented in image augmentation. Finally, image labelling and area pixel selection method is used for parameter measurement.

III. METHODOLOGY

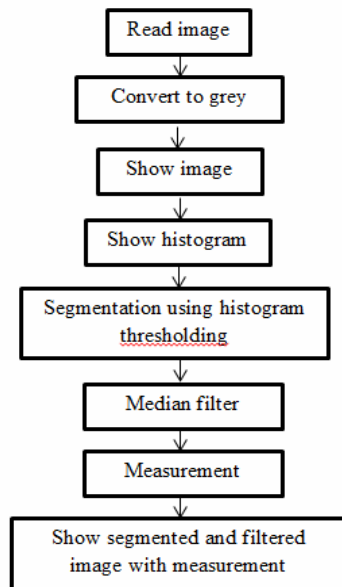


Figure 3.1 Overview of Proposed System

IV. EXISTING METHODS

A. ABDOMINAL X-RAY

An abdominal X-ray may identify the fecalith the hardened, calcified and pea- sized piece of stool that blocks the appendice opening that may be the cause of appendicitis and obvious in case of children.

B. ULTRASOUND SCANNING

An ultrasound is a painless procedure that uses sound waves to identify organs within the body. Ultrasound image can identify an inflamed appendix or a swelling. During appendicitis, the appendix can be seen in only 52% of patient's. Ultrasound is cooperative for women for it can eliminate the existence of situations including the ovaries, Fallopian tubes and Uterus that can mimic appendicitis.

C. COMPUTERIZED TOMOGRAPHY (CT)

Patients are not pregnant, CT scan of the area of the appendix is useful in diagnosing appendicitis and peri-appendice abscesses as well as in without other diseases inside the abdomen and pelvis that can mimic Appendicitis.

D. LAPAROSCOPY

Laparoscopy is a surgical method in which a Small fiber optic tube with a camera is

inserted into the abdomen through a small puncture made on the abdominal wall. Laparoscopy allows a straight view of the appendix as well as new abdominal and pelvic organs. If appendicitis is found, the reddened appendix can be detached with the laparoscope. The difficulty of laparoscopy compared to ultrasound and CT is that it requires a general anesthetic. There is no one test that will make diagnosis appendicitis with confidence. Therefore, the advance to hypothetical appendicitis may include a period of observation tests as earlier discussed or surgery.

V. PROPOSED WORK

To encapsulate our method authors defined below, the algorithm is as follows.

1) Image Capturing

Image Capturing is a process to secure the digital image into Mat lab. Ultrasound image from the database is acquired through imread command in mat lab. The precise path of the image should be given as the argument to imread command. In matlab capture an image is displayed using imshow command by passing a variable as the dispute and the image can moreover be display in the image viewer using imtool command.

2) Image Extraction

Appendicitis is marginally brighter than its contiguous areas, produces a sharp peak of unusual gray level intensity pixels.

3) Image Pre-processing

The pre-processing method eliminates the imperfect, noisy and unreliable data from the image in the training and test phase. In the images are too blaring or blurry, they should be filtered and improved and for removing the unwanted portions of the image.

4) Image Enhancement

The pre-processed images will have some noise which should be unconcerned for the further processing of the image. In conventional enhancement techniques such as low pass filter, median filter, adaptive median filter, and normalization method are employable for this work.

5) Measuring Distance

In this paper, Appendicitis is spotted using the distance measure in mandate to confirm the patient is detected with appendices. The distance is

predominant to bring out the diagnosis. After that Commendation of Diagnosis.

VI. QUASI-EUCLIDEAN DISTANCE

Euclidean distance is the average distance between two points that one would measure with a ruler, and is given by the Pythagoras formula. In Cartesian coordinates, if $P = (p_1, p_2, \dots, p_n)$ and $Q = (q_1, q_2, \dots, q_n)$ are two points in Euclidean n -space, then the distance commencement from P to Q given by PQ

$$d(p, q) = d(q, p) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \dots + (q_n - p_n)^2} = \sqrt{\sum_{i=1}^n (q_i - p_i)^2}.$$

Two dimensions

In the Euclidean plane, if $P = (p_1, p_2)$ and $Q = (q_1, q_2)$ then the distance is given by

$$d(p, q) = \sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2}.$$

This is equivalent to the Pythagorean Theorem. Alternatively, it follows from (2) that if the polar coordinates of the point P are (r_1, θ_1) and those of Q are (r_2, θ_2) , then the distance between the points is

$$\sqrt{r_1^2 + r_2^2 - 2r_1r_2 \cos(\theta_1 - \theta_2)}.$$

The Quasi-Euclidean metric procedures the total Euclidean distance along a locate of perpendicular, parallel, and diagonal line segments. Type of distance metric method can have any of these values.

$$|X_1 - X_2| + (\sqrt{2} - 1) |Y_1 - Y_2|, |X_1 - X_2| > |Y_1 - Y_2|$$

$$(\sqrt{2} - 1) |X_1 - X_2| + |Y_1 - Y_2|,$$

$T = \text{graydist}(\dots \text{method})$ specifies an alternate metric distance. Technique determines the chamfer weights that are assigned to the local neighbourhood during outward transmission. Each pixel's involvement to the geodesic time is based on the chamfer weight in particular track multiplied by the pixel intensity.

VII. CHESSBOARD DISTANCE

The Chebyshev distance linking two vectors or points P and Q with standard coordinates

P_i and Q_i , respectively, is

$$D_{\text{Chebyshev}}(p, q) := \max_i (|p_i - q_i|).$$

This generation the limit of the L_p metrics:

$$\lim_{k \rightarrow \infty} \left(\sum_{i=1}^n |p_i - q_i|^k \right)^{1/k},$$

Hence it is also known as the L_∞ metric.

Scientifically, the Chebyshev distance is a metric induced by the uniform norm or supremum norm. It is a pattern of an injective metric.

In two dimensions, i.e. plane geometry, if the point's P and Q have Cartesian coordinates $= (x_1, y_1)$ and (x_2, y_2) , their Chebyshev distance is

$$D_{\text{Chess}} = \max(|x_2 - x_1|, |y_2 - y_1|).$$

Under this metric, a circle of radius r , which is the position of points with Chebyshev distance r from a centre point, is a square whose sides have the length $2r$ and are parallel to the coordinate axes. On a chess board, everywhere one is using a Discrete Chebyshev Distance slightly than a incessant one the circle of radius r is a square of side lengths $2r$, measuring from the centres of squares and thus each side contains $2r+1$ squares.

VIII. EXPERIMENTS AND RESULTS

An experiment has been conducted on sonographic scan image based on the projected flow diagram as shown in Fig 3.1. The sonographic image is first capture as an input image and then decorrelation elongate has been used to remove the noise constituent from that image. Decorrelation stretch has been used to situate the edge feature in the ultrasound scan image. Using this technique the noise division is removed from the image.



Normal image



Appendicitis images

Figure 8.1 Normal Image vs. Appendicitis images



Figure 8.2 Appendicitis images shown by Proposed Systems

The images are classified in two different sizes based on the thickness of appendicitis with larger than 6 mm and a lesser amount of than 6mm. The projected system is tested with 200 instances and the results obtained are out of 200 instances, 168 instances show thickness considered as greater than 6mm. Table shows the results out of the experimental study conducted for finding acute appendicitis using sonographic images from 168 patients.

SIZE	PATIENTS	PERCENTAGE
$\geq 6\text{mm}$	168	84%
$\leq 6\text{mm}$	32	16%

Table 8.1 Appendicitis Thickness

SIZE	Q-EUCLIDEAN	CHESS BOARD
$\geq 6\text{mm}$	168	123
$\leq 6\text{mm}$	32	77

Table 8.2 Comparison of Proposed Method with Chess board

Comparison of Proposed Method with Chess board results are validate by calculating the deviation of the results. Show that the proposed method nearly excellent results than the chess board distance.

N=200	PROPOSED METHOD	SONOLOGIST REAL RESULT	DIFFERENCE
MEAN	0.84	0.80	0.04
VARIANCE	103.89	95.68	8.21
STD DEV	10.19	9.78	0.41
STD ERR	0.26	0.26	0.00

Table 8.3 Comparison of Proposed Method with Real Result

The standard error and standard deviation clearly show that the proposed method nearly excellent results.

IX. CONCLUSION

The Proposed Systems shows detection of the appendicitis in ultrasound image. The outline of the appendix is clearly seen at the end of the process. Examiner can indicate the appendix parameter measurement that is display on the image. A new approach on ultrasound appendix image processing using image segmentation and image measurement had been developed.

This is suitable for the examiner, compared with real result, chess board and the proposed system offers many advantages including enhanced accuracy, greater noise reduction and faster speed. From the detection, measurement can be done and to calculate its length. The proposed system is expected to making the decision at the time of diagnosis for physicians.

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