University of Thi-Qar Journal Vol.12 No.3 SEP 2017
Web Site: https://jutq.utq.edu.iq/index.php/main
Email: journal@jutq.utq.edu.iq

Diagnosis of Atherosclerosis by using digital image processing

https://doi.org/10.32792/utq/utj/vol12/3/7

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Abstract

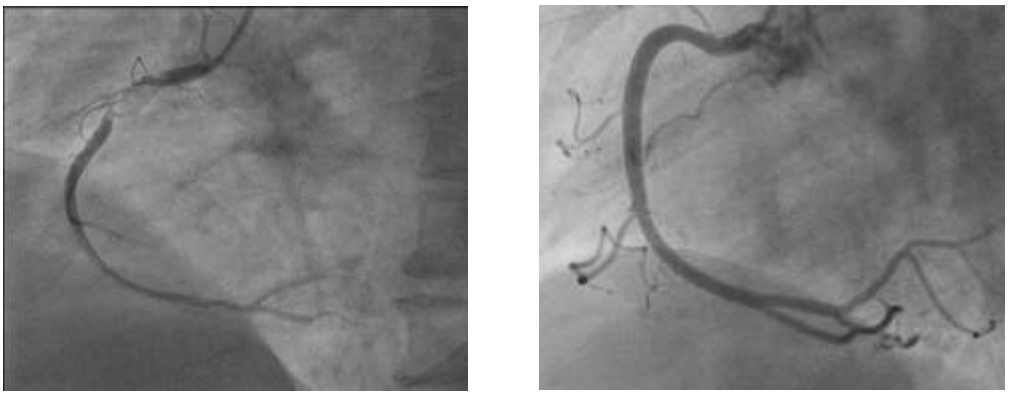
In this paper propose a method for the diagnosis of atherosclerosis as if that was normal or abnormal arteries, it has been the use of neural network technology after making optimizations, filter and remove the impurities of the arteries. Samples were taken from a group of patients in Nasiriyah Heart Center disparate ages and both sexes, which was 110 samples were 60 of them training samples which showed the results of 100% and 50 of these samples were tested results showed 92%

Keywords — Atherosclerosis; preprocessing; Atherosclerosis segmentation; feature extraction; diagnosis

1.Introduction

Atherosclerosis occurs due to a variety of reasons the most important of the deposition of large amounts of cholesterol and calcium in the blood ,It may happen because of obesity overcharged as a result of lack of exercise,

lack of exercise, and increased blood pressure increases the risk of developing atherosclerosis [1] [2]. Of the most important complications of Atherosclerosis is the lack of blood supply to the heart muscle that causes the occurrence of many diseases of the heart, including stroke, heart attacks and angina[3]. There are several ways to identify the Atherosclerosis of arteries techniques and then treated , including the use of X-rays after the injection of the dye in the arteries of the thighs or the hands of humeral can be observed clogging and stenosis areas the naked eye, also can use computer programs to calculate the diameter clogging stenosis of the arteries and calculate the ratios [4].In order to reduce the mortality rate due to hardening of the arteries, it is necessary to be diagnosed at an early stage. This paper proposes a system for the diagnosis of Atherosclerosis [5].



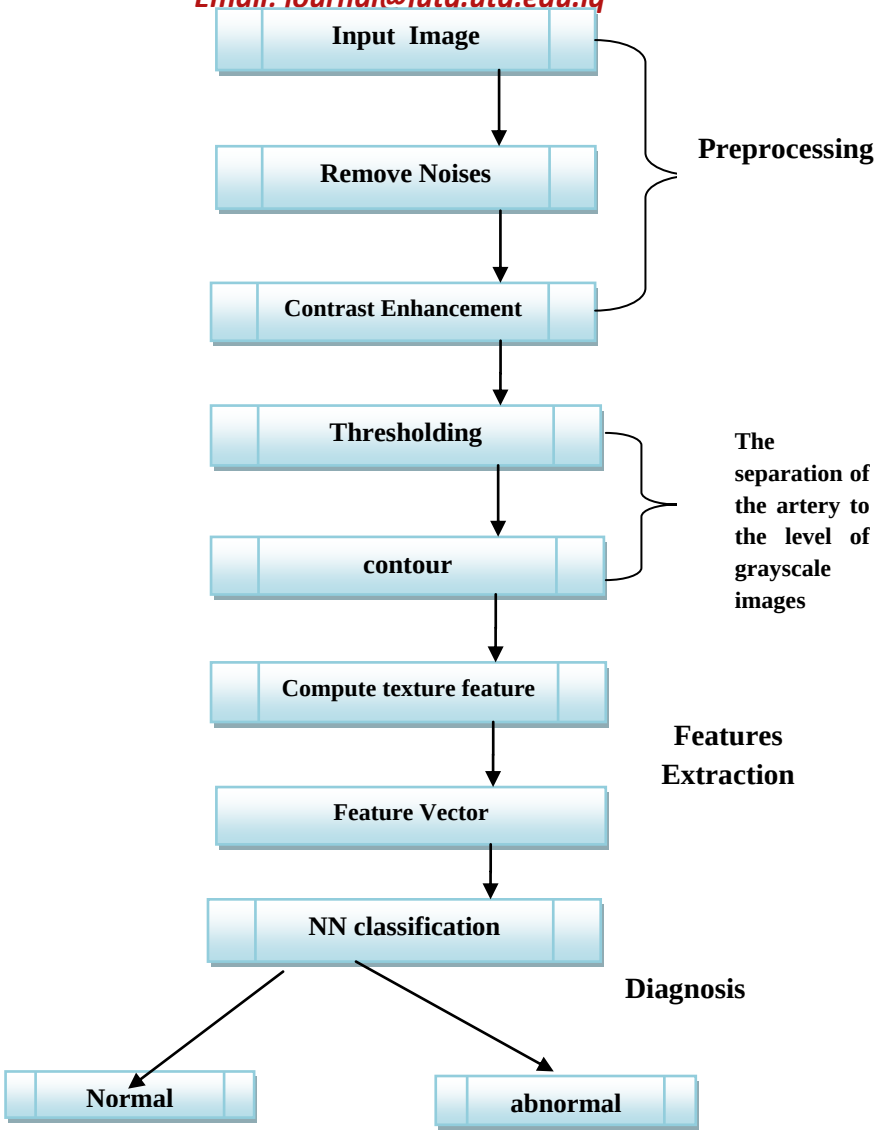
(a) (b)

Fig(1) : Atherosclerosis . (a) abnormal. (b) normal .

2. The Proposed algorithms

This section gives an overview of the proposed algorithm for the diagnosis of atherosclerosis. The proposed structure of the system in Figure 2.The first phase of the detection of atherosclerosis system is the input

image. given by an image in digital form as an input to the system. The next stage is processed, which includes noise reduction remove some of the excess forest arteries. While, the forest is removed by using filters[6] . After filtration, the subject of the image segmentation. segmentation separates the injured artery background as a result of the similarity between the color of the arteries and gray background, and the distinction between atherosclerosis . Feature extraction techniques used here is the contrast and the standard deviation . Given the specific features as input to the neural network classified (NN) . Seeded classified databases due to sclerosis in the artery-winning, whether normal or abnormal . There are some unique features that characterize atherosclerosis. These features are extracted using feature extraction techniques. The way GLCM features texture[7] [8] . Given the specific features as input for NN workbook . Seeded classified databases due to the two types of arteries (normal ,abnormal).



Fig(2): model Atherosclerosis the structure of the system.

The separation of the artery to the level of grayscale images

3. Processing

The purpose of the processing is to enhance the image and remove effects and unwanted noise, which are an obstacle in the diagnostic process, which is considered the first step in the diagnosis of atherosclerosis disease process. So that the image appear more convenient than the original image, This is done using filters to filter the image and the filter used in this research is median filter then be The separation of the object from the rest of its branches to extract features a second step[9]. The object represents the arteries that feed the heart muscle to extract the features of this artery. The use of contour lines in addition to the Laplacian Gaussian (Log), which showed good results in identifying the edges of the artery and get rid of the unwanted parts of the image[10]. The figure below shows the pre-processing

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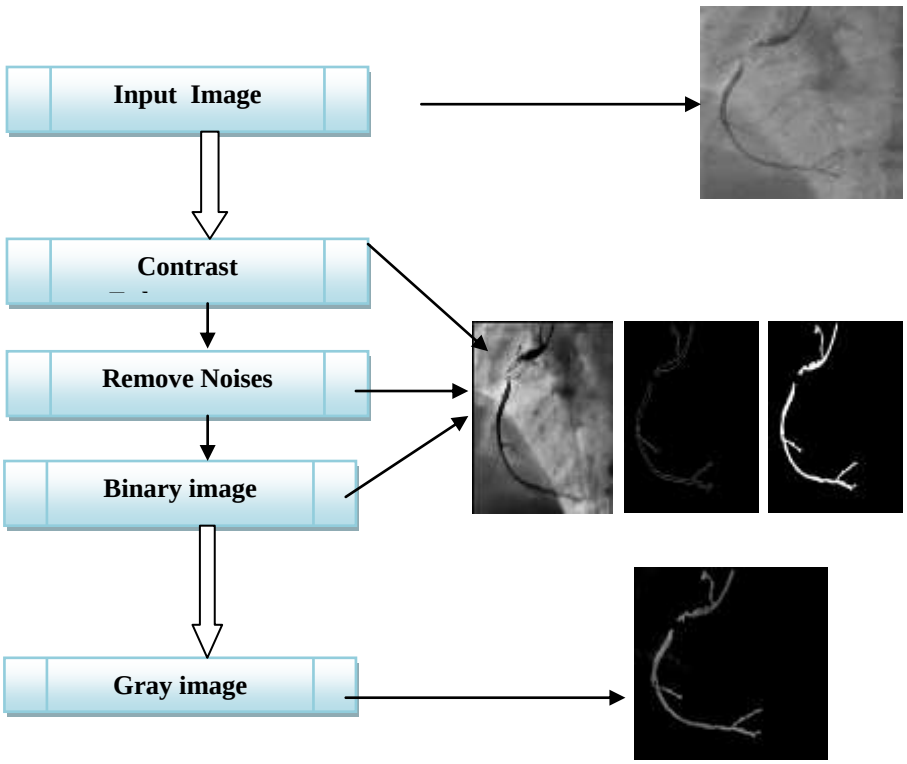

Figure (3): The main pre-processing steps.

4. Artificial Neural Network (NN) Technology

Neural network used in programs that do not have a clear algorithm to solve it is therefore a good indicator of choice, it is to simulate an overall manner in the neuronal of biological networks (Animal or human) nervous system, this simulation is the physical simulation of cell-by-cells. It differs from conventional machines running on the replace, enhance or strengthening the human mind quickly calculate. Neural network in ways that are different process, looking NNs biological side to simulate a simple brain or deal in this way text and media technology to address the evidence and according to the "performance in dealing with complex problems[11][12].

5. Total Experimental Results of Recognition Atherosclerosis Lesions

After sixty datasets (thirty for normal artery and thirty abnormal) were given as inputs to the neural network for classification, we trained NN using known datasets and desired outputs. The classifier classifies the given datasets into Natural arteries and abnormal . The obtained results from training are 100%. When we test the NN on 50 cases (twenty five for normal and twenty five for abnormal), we found that four of these cases fail in testing (two for normal case and two abnormal case) . So the accuracy of the system is 92%.

Tables (4.1)-(4.2) show the classification results from NN classifier.

Table (4.1): Classification result from NN for clogging lesions in training stage.

Type of artery	Classification Result (%)
Normal	100%
abnormal	100%

Table (4.2): Classification result from NN for clogging lesions in testing stage.

Type of artery	Classification Result (%)
Normal	92%
abnormal	92%

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