Automatic Selection Of The Best Despeckle Filter Of Ultrasound Images

Yasser M. K. Omar, Ph.D.
College of Computing and Information Technology Arab Academy for Science Technology and Maritime Transport Cairo, Egypt
dr_yasser_omar@yahoo.com

Ghada Nady Hussien Abd El-Gwad
College of Computing and Information Technology Arab Academy for Science Technology and Maritime Transport Cairo, Egypt
eng.ghadanady92@gmail.com

Rationale

Ultrasound image is considered as widely available medical image. The images are produced by the interference echoes of a transmitted waveform which is used in various medical imaging devices such as x-ray, CT, and, MRI scanners. It is very safe for human. Devices of ultrasonic are frequently used by healthcare professionals. The main applications of ultrasound during this time were to develop SONAR for underwater navigation, communication and to detect other vessels.

Ultrasound image is contained noise called “speckle noise”. Speckle noise in ultrasound images reduces the contrast and quality of resolution. Speckle noise is a multiplicative noise which is difficult to remove compared to additive noise. The speckle noise is converted to additive noise by applying log transformation. Thus, speckle noise can be removed from ultrasound image. The numbers of techniques have been proposed for despeckling noise filter in ultrasound image. The most commonly used despeckle noise filter techniques: linear filter technique, non-linear techniques, diffusion filter technique and wavelet filter technique. Experts face a lot of difficulties for selecting the appropriate technique manually. Although there are different despeckle noise techniques to remove noise but they are not suitable to work with all images.

Methods

This paper contributes in Ultrasound images to help expertise selecting best despeckle noise technique. The paper starts by implementing the main four despeckle techniques. The results are evaluated based on the expertise opinion. Moreover, to tackle the goal of automatic selecting the appropriate technique we extract features such as entropy, homogenous, contrast, mean, variance, energy and, correlation. The extracted features represented as input and the dominant expertise opinion represented as an output were submitted to various machine learning algorithm for training and testing.

Results

The machine learning was used with SVM and Decision tree. As the result, it was concluded that to select the best technique. The best accurate and efficient models were obtained from linear SVM and also were recorded in the testing and validating accuracy rate of 98%.

Conclusions

So the results shows that we can building a classifier system that enables to calculate the best technique for removing specular noise based on the features extracted from the input image and SVM.