

Abstract

Most medical images are currently stored on film. There is, however, a growing trend towards digitally based Picture Archiving and Communication System (PACS) which provides both convenient access to the images and flexible display capabilities. In this future environment there is a tremendous importance for compression of medical images. Four compression methods were examined in this work: Full-frame Discrete Cosine Transform (DCT), Block DCT (BDCT), Energy Threshold DCT (EDCT) and Full-frame Fast Fourier Transform (FFT). In order to evaluate the quality of the compressed images two criteria were examined, Root Mean Square Error (RMSE) and subjective evaluation by radiologists. An evaluation protocol is described that was used in the work for the radiologists' evaluation. Three Magnetic Resonance Images (MRI), Two Computed Tomographies (CT) and two mammograms were evaluated by five radiologists.

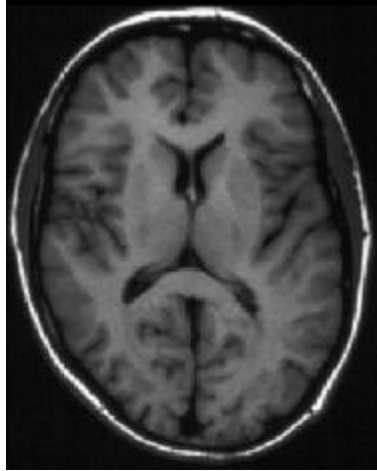
From the results it follows that

- ❑ Root mean squared error criterion is not a good criterion for evaluation of the quality of a compressed images.
- ❑ Images compressed with EDCT with compression rates of 25 were evaluated as acceptable from the clinical aspect. BDCT
- ❑ Full-frame DCT gives slightly worse results.
- ❑ FFT was found significantly worse than the DCT-based methods.
- ❑ 512X512 images were graded with no significant difference to the original image in compression rates of 20.

EXAMPLES OF IMAGES AND RESULTS



Skull Subdural Haematoma: original image (8 BPS)



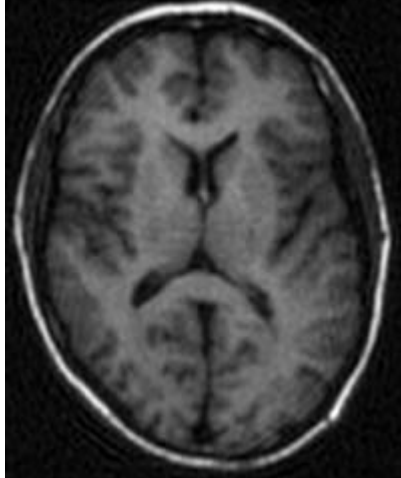
Normal brain MRI: original image (8 BPS)



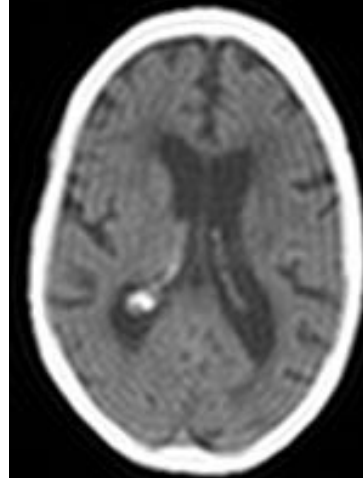
CT of head: original image



Block DCT – 0.38 BPS
Subjective grade: 8.4
(in the scale of 1-10)



Energy Threshold DCT – 0.29 BPS.
Subjective grade: 6.2 (in scale of 1-10)



DCT – 0.98 BPS, RMSE: 11.2
Subjective grade: 3.8 (in scale of 1-10)



EnrgThrDCT – 0.38 BPS, RMSE: 13.5
Subjective grade: 6 (in the scale of 1-10)