Performance Evaluation of Image Quality Measurement Criteria

Azin Falahati*,Dr. Asadollah Shah Bahrami,

Image quality assessment (IQA) plays very important role in image processing systems. IQA methods are divided into two parts: subjective and objective. Human visual system is the ultimate quality receiver. In practice, subjective evaluation needs to solicit the opinion of human observers. However, such subjective evaluations are not only cumbersome and expensive, but also they cannot be incorporated into automatic systems that adjust themselves in real-time based on the feedback of output quality. As a result of this, objective evaluations is introduced. MSE and PSNR are two old metrics but unfortunately they are being used by many applications yet. Both MSE and PSNR are appealing because they have clear physical meanings and are mathematically convenient. During the last several decades, many researchers have tried to find a mathematical model to simulate HVS characteristics, and a great deal of effort has been made to develop new image quality assessment methods based on HVS. For example, estimation of the image quality based on segmentation error measure and also a Picture Quality Scale (PQS) based on the characteristics of HVS and the structure and distribution of distortion have been proposed. In addition, other visual models based on visual interests were proposed too. The majority of developed perceptual quality assessment models, however, are error-sensitivity approaches and follow a strategy of modifying the MSE measure so that errors are penalized in accordance with their visibility or interest. Recently, a new philosophy for image quality measurement was proposed, based on the assumption that the HVS is highly adapted to extract structural information the viewing field. According to this philosophy, the Structural Similarity (SSIM) is introduced to measure the distorted image quality, and simulation results show that it is more consistent with HVS than PSNR (MSE). However, study of SSIM show that, it fails in measuring badly blurred images. So an improved quality assessment called edge-based structural similarity (ESSIM) based on the edge information as the most important image structure information has been proposed. In this thesis a new metric based on contrast

sensitivity function and visual masking has been proposed that considers HVS characteristics by a higher correlation with human eyes

Keywords : Image quality, MSE, Convolution, Image Structure, Edge of Image, Similarity Measurent, Contrast Sensitivity Function.