Image Quality Assessment using Visual Attention Models

Description

Image quality assessment (IQA) has a great importance in several image and video processing applications such as filter design, image compression, restoration, denoising, reconstruction, and classification. The aim of image quality assessment is predicting image quality of display output perceived by the final user. Multimedia contents are subjected to a variety of artifacts during acquisition, processing, storage and delivery, which may lead to reductions in the quality. IQA can be used to dynamically monitor and adjust the image quality, so that the output quality of the image or video presented to the user can be maximized for available resources such as network and bandwidth requirements.

Visual attention models aim to automatically detect visually interesting regions in images and videos. They have many practical applications, especially in the design of active machine vision and automatic visual surveillance systems [1]. Figure 1 shows saliency maps when we implement different visual attention models [1].
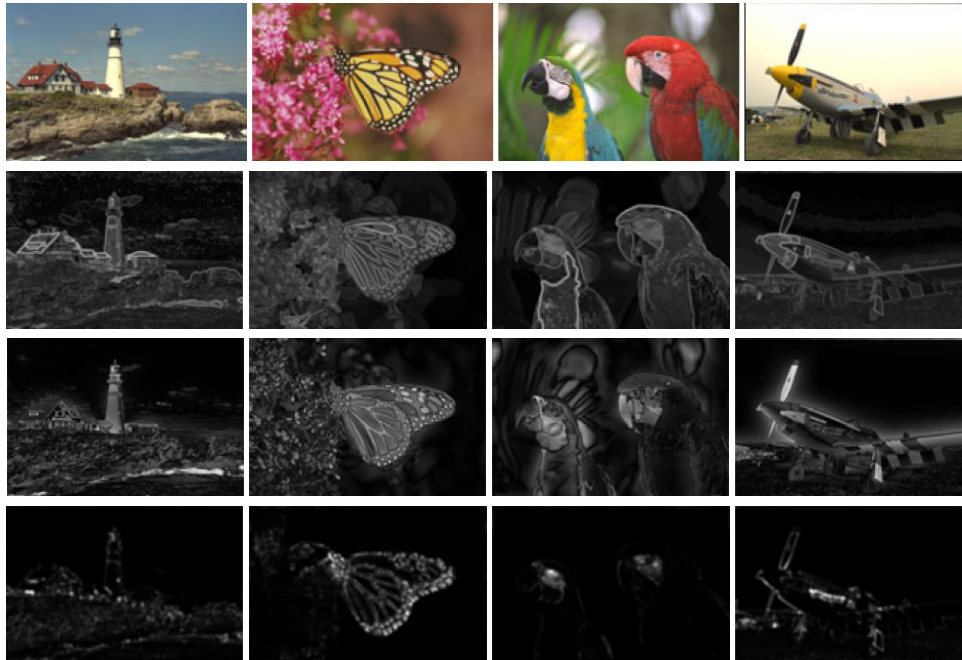

Figure 1: Original images (top row) and saliency maps resulted from differen visual attention models [1].

The **aim of this project** to compare different visual attention models on quality assesment of the images. For quality assesment, SSIM (structural similarity) [2] and VIF (visual information fidelity) [3] metrics will be used. SSIM and VIF are metrics for comparing 2 images in terms of quality. Saliency maps will be produced from visual attention models. The SSIM and the VIF will be modified by the weighting factors of the saliency maps. Then, resulting metrics (modified SSIM and VIF) will be compared using two public image databases as test bed: These databases contain subjective scores (human opinion) for each image. Figure 2 shows a comparison plot of modified SSIM and subjective scores

The Matlab codes of SSIM and VIF as well as visual attention models to generate saliency maps will
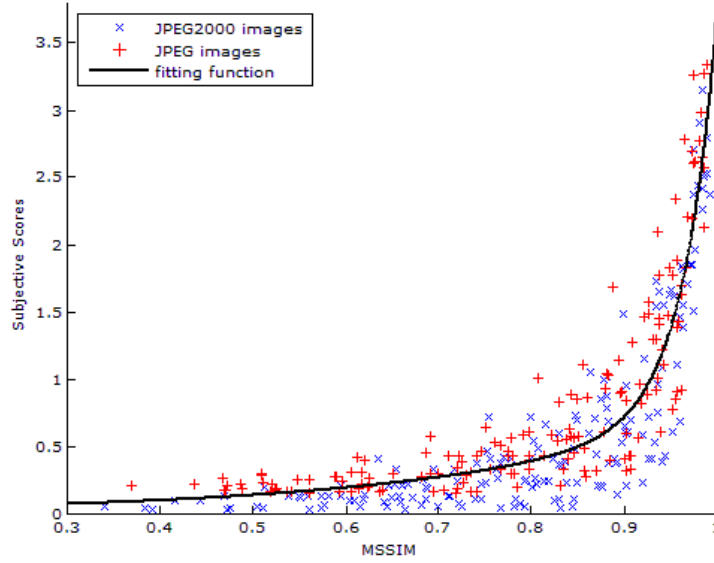
Figure 2: Scatter plot of comparison of SSIM with modified SSIM.

be provided. Student will be responsible for comparing SSIM and VIF with modified SSIM and VIF for the images in databases.

References

[1] M. Milanova, E. Mendi, "Attention in Image Sequences: Biology, Computational Models, and Applications", in: Book Chapter "Advances in Reasoning-based Image Processing Intelligent Systems: Conventional and Intelligent Paradigms", R. Kountchev, and K. Nakamatsu (eds.), Volume 29, Part 1, pp. 147-170, Springer Book Series: Intelligent Systems Reference Library, 2012.

[2] Z. Wang, A. Bovik, H. R. Sheikh, E. P. Simoncelli, "Image quality assessment: from error visibility to structural similarity", IEEE Transactions on Image Processing, vol. 13, no. 4, pp. 600-612, 2004.

[3] H. R. Sheikh, A. Bovik, "Image information and visual quality", IEEE Transactions on Image Processing, vol. 15, no. 2, pp. 430-444, 2006.