Ahmedabad
University

ECE501 : Digital Image Processing

9 - Hybrid Multi-Frequency Image Illusion

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Abstract

This project examines the formation and optimization of hybrid images- visual illusion that combines the low frequencies of one picture and the high frequencies of the other picture. So far, we have concentrated on the selection of appropriate image pairs and the creation of a simple implementation pipeline, which consisted of image alignment, image frequency filters and fusion. The cutoff frequency and filter size were experimentally adjusted to give information on the effect of the parameters on perceptual balance and clarity. We want to now work on further understanding how various parameters affect the final image, how working with color images can affect the outcome and how we can increase the autonomy of the system by making its parameters adaptively chosen with logic- or optimization-based approach to minimize manual involvement, enhance visual fluent quality of merging images and allow one to gain consistency and perceptual dynamic hybrid illusions with different viewing conditions.

Contents

1 What We Have Done

This week, we have experimented on generalizing the hybrid image method to color images by processing the respective RGB channels individually, whereby the low-frequency and high-frequency parts of the corresponding images are merged in a sensible way such that the desired perception and richness of color are still maintained. We have also discussed how several parameters affect the hybrid image such as filter sizes, cut-off frequencies, image alignment, contrast, and blending ratios and are now working on fine-tuning of these parameters as that forms the key to controlling the interaction between features in each image, improving the clarity of the resultant image and the overall visual appeal and perceptual accuracy of the resulting image.

2 What We Aspire to Do

We now plan to generalize the hybrid image technique to color imaging, where every channel will play the proper role towards the ultimate perception. Next, conduct multi-resolution analysis by trying various Gaussian sigmas and using the Difference of Gaussians (DoG) procedure, which can be connected to the wavelet decomposition in order to represent the features in various scales in a more detailed manner. Also, taking into account the fact that perception will change with distance with low frequency components being visible at a farther distance and high-frequency details being visible at a closer distance, we want to work on how an image should appear at what distance from it. Further playing with the usage of other parameters like filter size selection, cutoff frequencies, alignment of image as well as contrast will also affect the hybrid image produced. And lastly, determine what characteristics matter to each image, usually, the high-frequency content highlights texture and edges, and the low-frequency content highlights shape and structure, such that the desired perceptual response is obtained.

References

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