



**Ahmedabad**  
**University**

ECE501 : Digital Image Processing

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## 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. During the first stage, we concentrated on the selection of appropriate image pairs and 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. Going forward, we will be working towards increasing the autonomy of the system by making its parameters adaptively chosen with logic- or optimization-based approach. This will 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.

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# 1 What We Have Done

This week was spent selecting the right pair of pictures to merge into hybrid ones and on the creation of the first draft of our code to do the same. We experimented with multiple combinations of source pictures to determine the effect of alignment, contrast, and texture on the final illusion. The pipeline of reading, filtering, and fusion of the two images using frequency-domain operations is included in our first code. Through this rudimentary draft we are able to experimentally change the values of cutoff frequency and filter size to understand the impact that these two factors have on the final hybrid image. These preliminary measures have helped us to determine the position of the equilibrium of the low-frequency and high-frequency components in determining the intensity of the hybrid illusion. The pairs of images we have selected for creating the hybrid images are shown below.

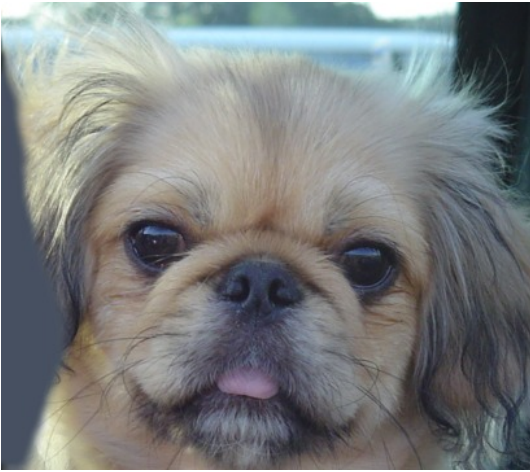


Figure 1: The image of Dog



Figure 2: The image of cat

# 2 What We Aspire to Do

We now plan to make changes in the code to make our system more autonomous by letting it decide the appropriate parameters for the generation of hybrid images in an adaptive manner. What we would like to do is to implement logic or optimization based techniques where the program will automatically regulate the filter strengths and frequency thresholds according to the characteristics of the input images. This will reduce manual adjusting and improve the quality and consistency of the hybrid illusions. We also plan on streamlining the procedures of alignment and normalization in such a way that the merged output may appear smoother with the different combinations of the images. Lastly, we expect to develop a desirable hybrid image model that can be intelligently programmed to develop believable perceptual imagery of an evolving viewing range depending on the variation of its parameters.

## References

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