# Reaction Report 1: Hybrid Image

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Date: September 9th, 2012

## 1 Major Contribution

In my opinion, the major contribution of this paper is to analyze and discuss the basic rules of constructing a successful hybrid image. Identifying the mathematical formula of how to combine two target images is only a significant part in building a hybrid image. By practical implementation, we can easily recognize that the size and alignment of the target objects that we plan to combine, the color of the images as well as choosing the cut-off frequencies for both images are equivalently of great importance. For instance, if we choose a bigger sized object in the high-pass filtered image which should be shown in the near distance and a smaller sized object in the low-pass filtered image that is meant to be seen in the far distance, when we add these two objects, the final hybrid image turns out to be not as expected, that the high-pass filtered image components can still be recognized in the far distance. Color influence also plays a significant role in creating a good hybrid image. We employ the gray-level image in the low-pass filter and the color image in the high-pass filter. Since humans optical focus prefer to color components, in the short distance the low-pass filtered content will be clearly recognized in the resulting hybrid image. In general, as a way to construct a successful hybrid image, not only should we use mathematical expression to combine the images, but also we need to take these vital rules into consideration when choosing the target images and completing the combining process.

## 2 An Interesting Extension

By reading this paper, I figured out an interesting point which might be of great value in application. It was also mentioned in this paper that the hybrid images can be used to display text that can only be seen in short distance. I think this feature can be implemented in the smartphones password protection. Nowadays, the smartphones screen becomes bigger and bigger which provides a convenient way for other people to steal the passwords. Employing the specific hybrid image to present the screen of entering password may avoid being peeped from far distance. The high-pass filtered image should be the original zero to nine numbers with random order. Since, if we still use the same order of numbers, the peeper can identify the number sequence by observing the location for each pressed number. And the low-pass filtered images might be the different number sequence combined with letters or symbols. Therefore, the peepers from far away could only see several unrecognized codes and the owners can relievedly input their private passwords. Besides, in order to add the contrast and reduce the difficulty of identifying the numbers from near distance, the high-pass filtered objects could be used in color. Also the cut-off frequency for the low-pass filter could be adjusted to a comparatively low value which might guarantee that the low-pass filtered components will be showed up in not quite far distance. However, there exists an embarrassing situation that other people might still side-glance the high-pass filtered objects through other directions in near distance. This flaw might be eliminated by choosing specific materials of the screen with diverse refraction rates that will produce distinct images by observing through different directions.