BenSOH.m Explanation

The BenSOH.m script starts by clearing variable history and workspace. The script imports a given image and prepares it for manipulation by up-sampling (inserting a row of zeroes between data and then inserting a column of zeroes between data) and applying a Gaussian filter (blurring the image). Following this, a reference field is defined as a plane wave (meaning that the wave fronts are parallel), allowing the data measured to be compared to something.

Next, hologram is defined so analysis on the field and intensity of the image can be done. The image itself is shown in Figure 1. A Fourier transform and Fourier shift are then applied to hologram, and stored in holo\_FT. The Fourier transform removes repetition in the image, and in particular removes filters. The Fourier shift moves zero-frequencies towards the middle of the image, which has the effect of creating a clearer pattern in the phase data and moving the data points in the hologram images towards the middle of the screen. The result is shown in figure two.

The image is then resized and a Gaussian filter is applied to holo\_FT. The effect of a Gaussian filter causes moderate blurring around the edges of the image, and slight blurring in the middle. A bandpass filter is also applied to the image, allowing only certain frequencies to pass through. The result is shown in figure 3.

Afterwards, a Fourier shift and an inverse Fourier transform are performed on holo\_FT. The Fourier shift has the same effect as described above. The inverse Fourier transform yields a pixel-by-pixel replication of the original intensity of the image. The result is stored in holo\_IFT. The result is show in figure 4. Finally, a plane wave is defined to match the reference field, and applied to holo\_IFT. The amplitude and phase of the original image, along with the amplitiude and phase of holo\_IFT are compared in figure 5.