

Final Project (Option 1)

Use the implementation of the photometric stereo algorithm provided in the course webpage (and detailed in Chapter 5) to recover the albedo and 3D structure of the objects seen in the images below. You will need to extend the code to obtain the desirable result. The images are also available on the course webpage.

- The first set of images is:

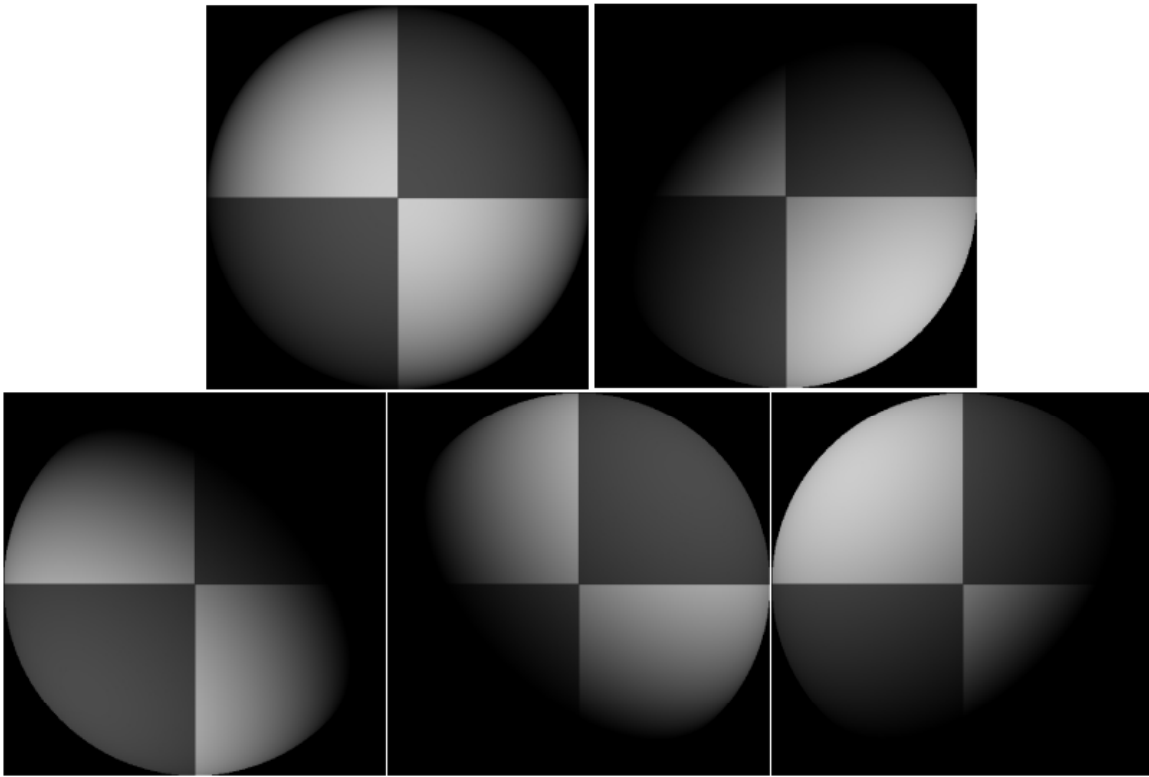
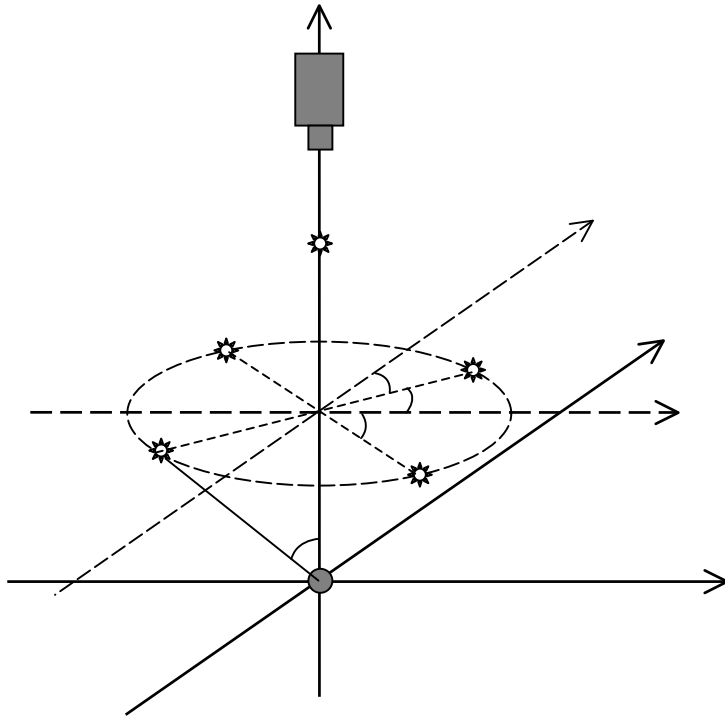
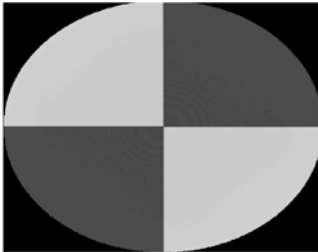


IMAGE SET A

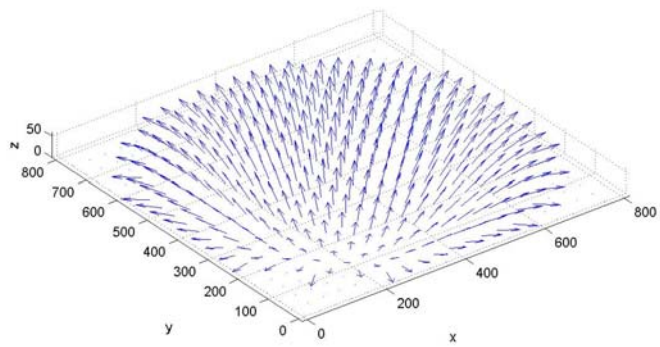
The first image is illuminated from atop. The other sources are rotated 60° from the z -axis and toward the xy -plane (the image plane), and then located at 45° (mid point) in each of the quadrants. The 3D positions of these light sources are further illustrated in the figure below.



Using the images shown above and the matrix of source vectors \mathbf{V} , recover the albedo and shape of the original object. A possible result is shown below.

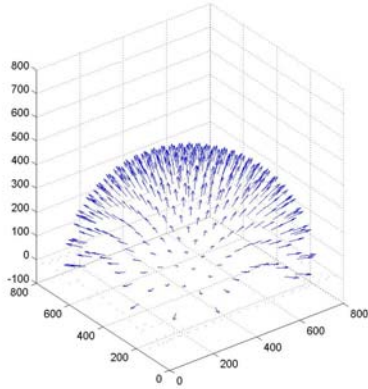


ALBEDO

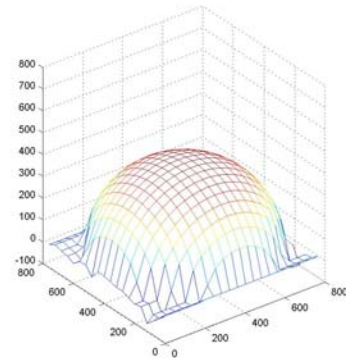


NORMALS

The shape can be recovered from the Normals shown above as:



Normals on Shape



SHAPE

- In our second example, the matrix \mathbf{V} is:

$$\mathbf{V} = 255 * \begin{bmatrix} 0.1 & 0 & 0.995; \\ 0.8 & 0 & 0.6; \\ 0.707 & 0 & 0.707; \\ -0.707 & 0 & 0.707; \\ 0 & 0.707 & 0.707; \\ 0.56568 & 0.56568 & 0.6; \\ -0.56568 & 0.56568 & 0.6; \end{bmatrix}$$

The second set of images is:

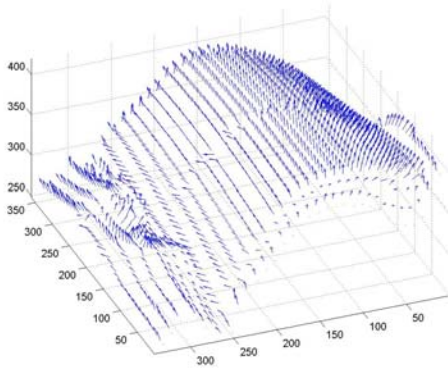


IMAGE SET B

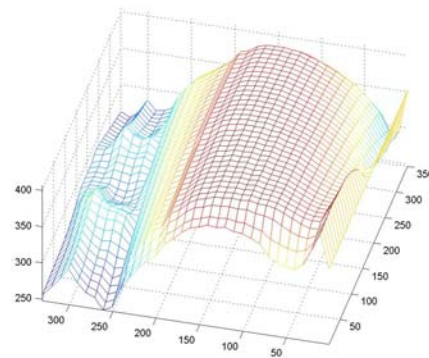
And the recovered albedo and shape are as follows.



ALBEDO



NORMALS



SHAPE

Write a short summary describing what you did and what you learned. The summary should not exceed three pages (12 point font). You may include 2 additional pages to show your results. Do **not** exceed these limits.

Make sure that your code shows all the results seen above: albedo, normal field, **and** depth-map (shape). Include your results in your final document as well. You need to show the results on both sets of images.

Optional: Write a program to map the 2D texture of the cup on top of the shape recovered by the SFS algorithm.

Deadline: Email your summary and code to the instructor by **noon on Monday, March 11, 2008**. Alternatively you can upload your summary and code in Carmen before the deadline.