A New Algorithm of Shape-from-shading (SFS) Based on Simulated Annealing

Abstract:
Compared to traditional SFS methods, we first preprocess the proportions of Lambertian and specular components in the hybrid reflection model, to obtain better surface normal, then recover the shape of objects.

In this paper, we developed a probability algorithm based on simulated annealing, assuming the posteriori probability of each component as its proportion. Once the algorithm converges, and the proportions become available, we reconstructed the specular reflectance to remove highlights from the original image. We then re-applied the shape-from-shading technique to the adjusted reflectance components to achieve better recovery results

Highlights Removal:
Locate the highlights zone and then remove highlights from the original image to get better SFS results.

Tools: Open CV, C++, Matlab

Executive Files: see attachments.

Experiments(demo only):

1 Vase

Original image
(picture from paper
Hossein Ragheb[1])

Image after specular removal

difference

figure 1

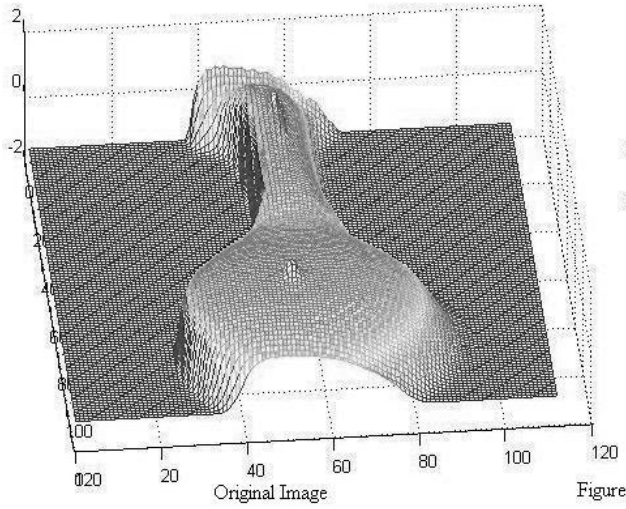
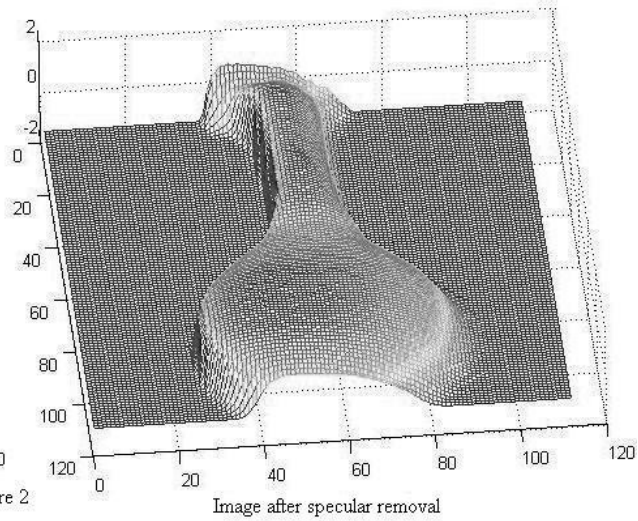


Figure 2



2 Human face

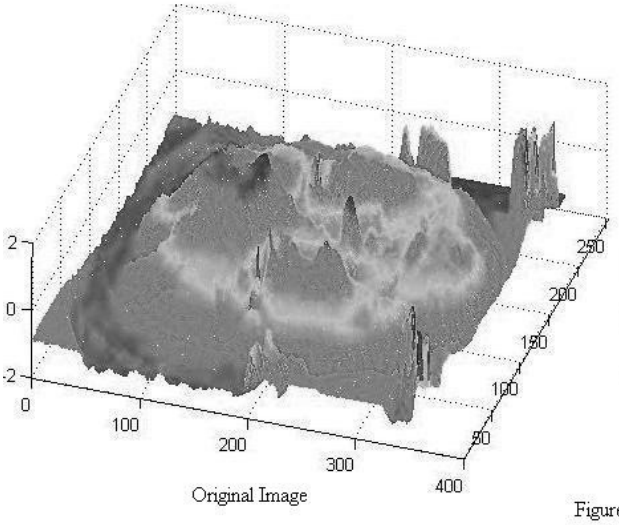
Original image

(picture from Yale Face Database)

Image after specular removal

difference

figure 3



Original Image

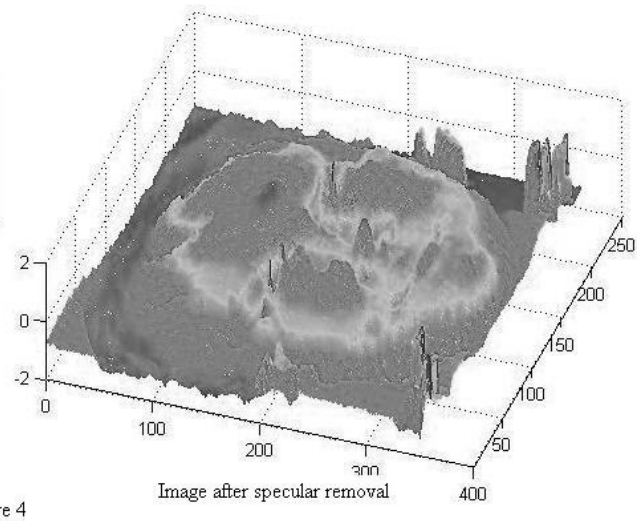


Image after specular removal

Figure 4