Assignment 6

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Please look at the code submitted along-side. There are numerous comments describing what we are doing and answering/elaborating on some answers as well as having the necessary visualizations. Some of the surface-figures/depth maps have often been flipped to make viewing as images easier, and more informative.

1. Part 1 : Implementing structured-light triangulation (100 points)

   (a) Video Processing (25 points) Shadow time and Shadow edge estimates

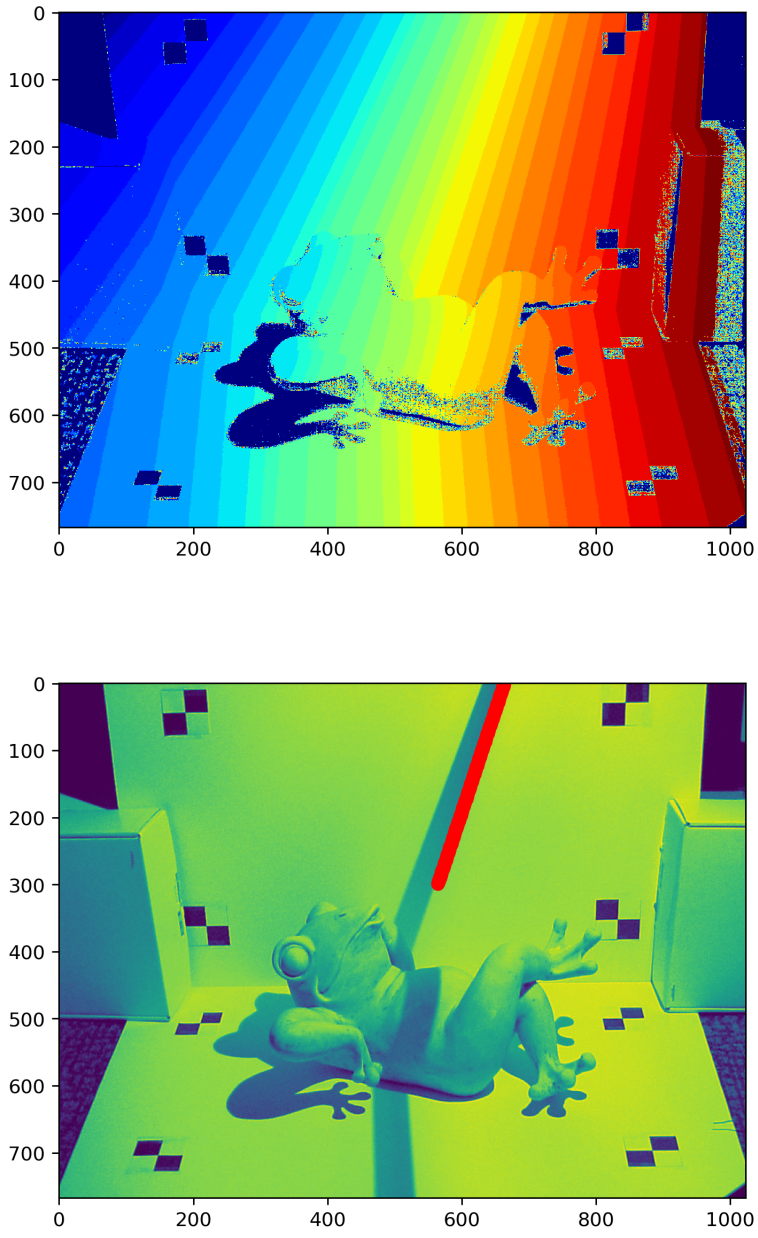
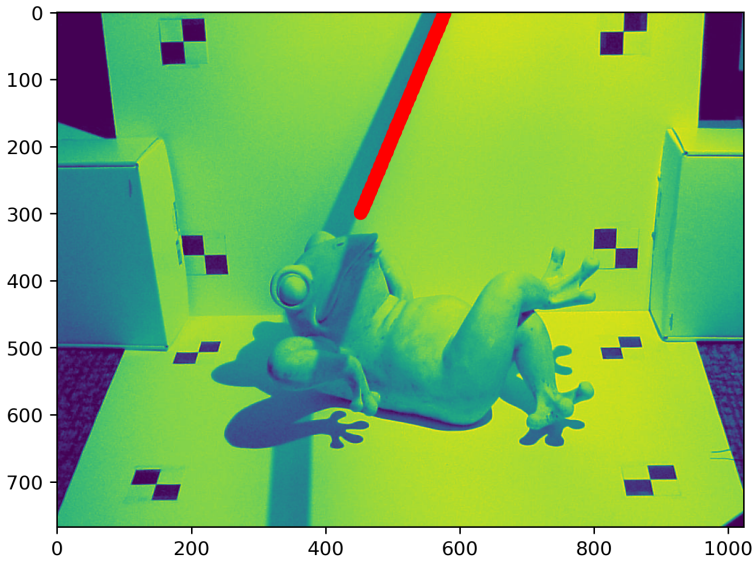


Figure 1: Shadow-time, and a shadow edge



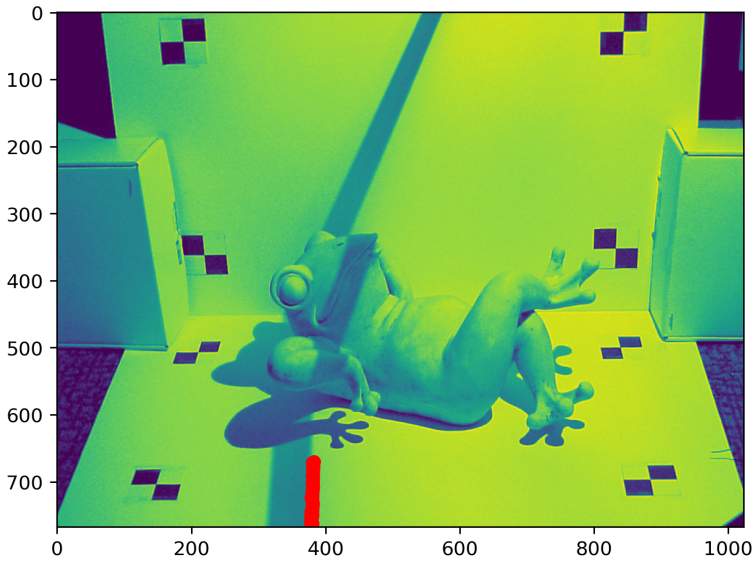


Figure 2: Shadow Edges

(b) Intrinsic and Extrinsic Calibration (50 points) All required points and parameters have been saved

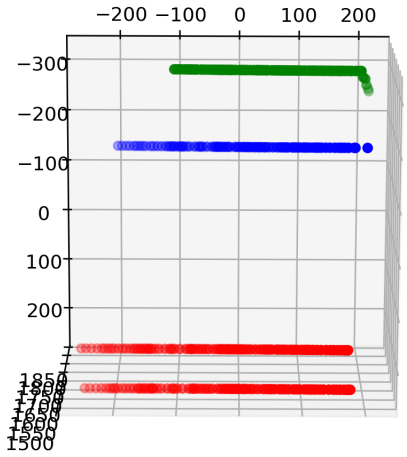


Figure 3: Some select 3d points displayed. (This is a sanity test to make sure our 3D detections make sense).

(c) Reconstruction (25 points) Reconstruction images, and choices made to improve reconstruction.

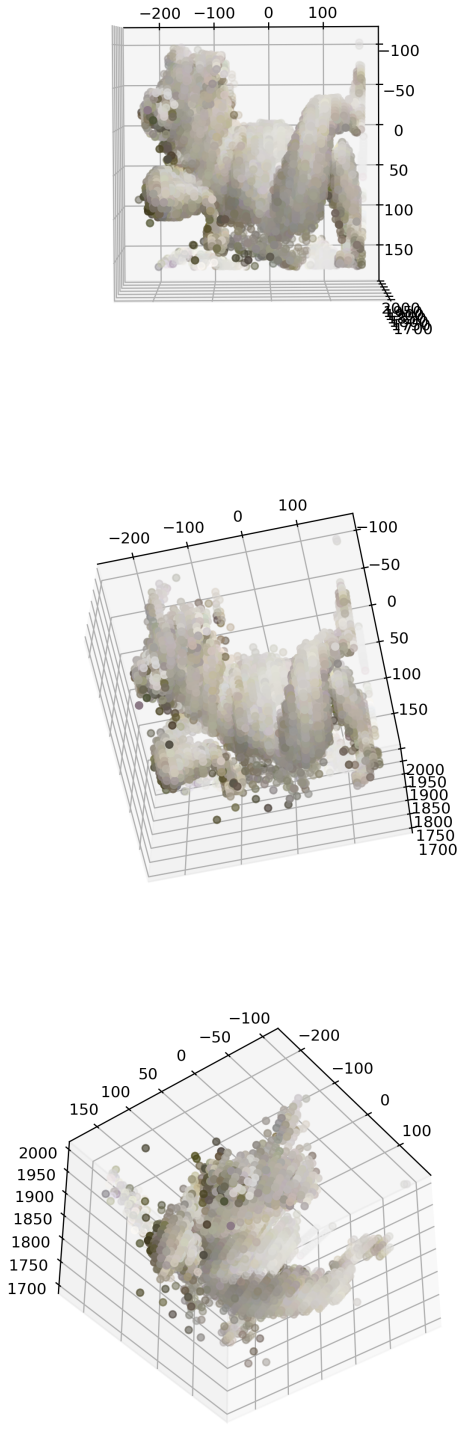


Figure 4: Some 3D point clouds

2. Part 2 : Building your own 3D scanner

   Set up images

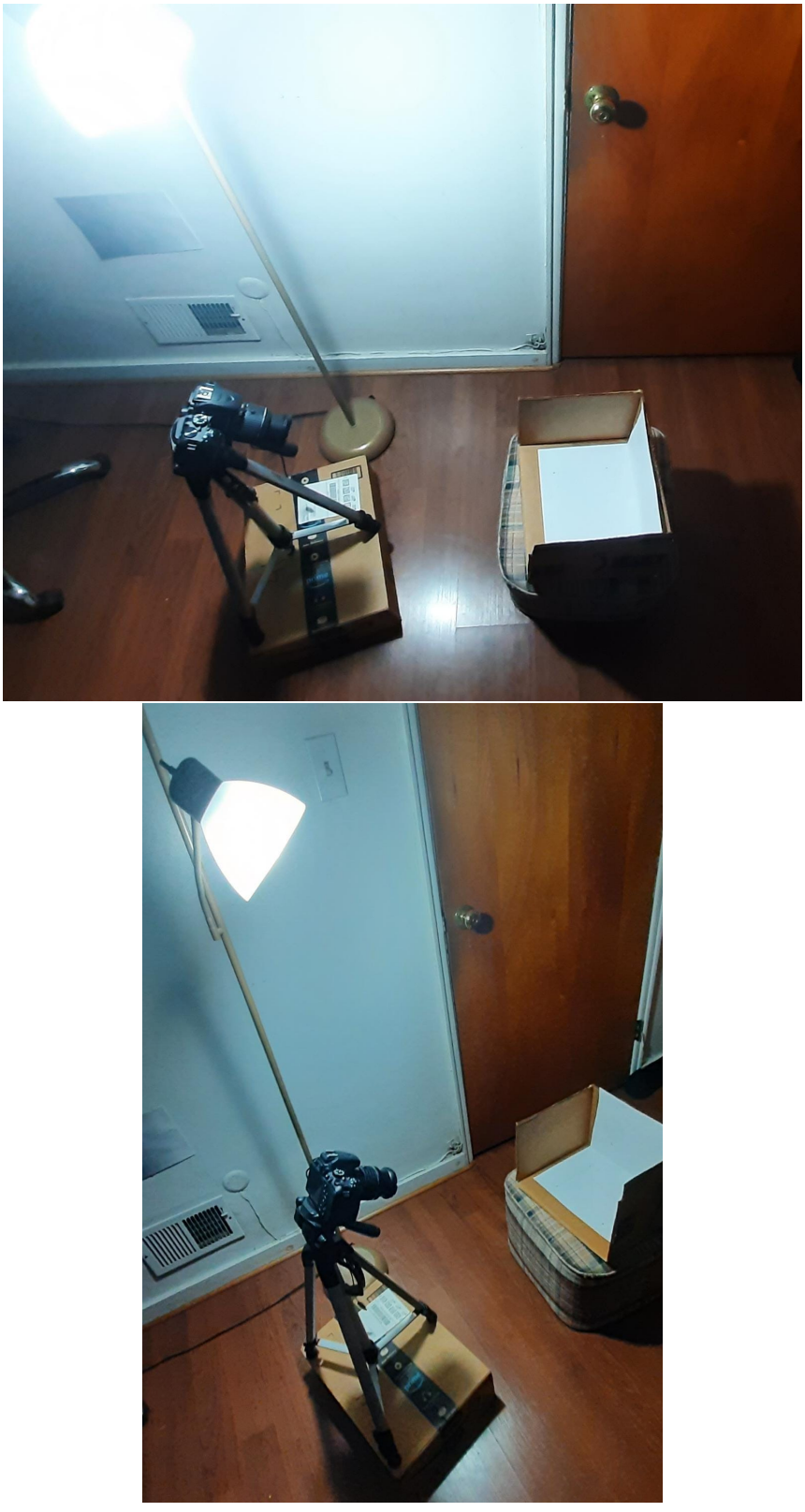
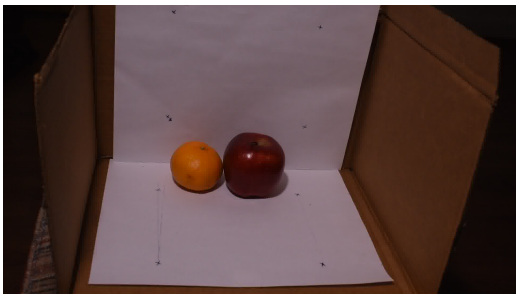
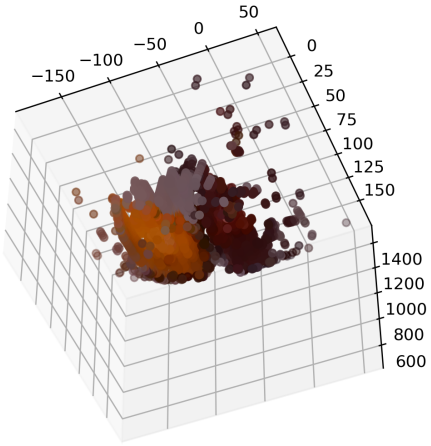


Figure 5: Our Image Capture Set up

(a) Fruits





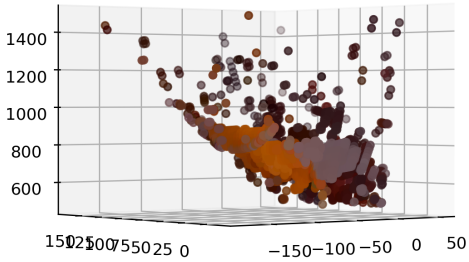


Figure 6: Fruits Capture. We can see the curve, and reconstruction quite well.

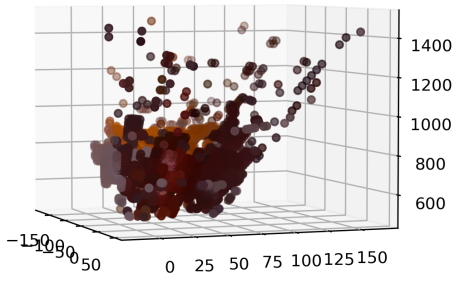


Figure 7: Fruits Capture. We can see the curve, and reconstruction quite well.

(b) Stand

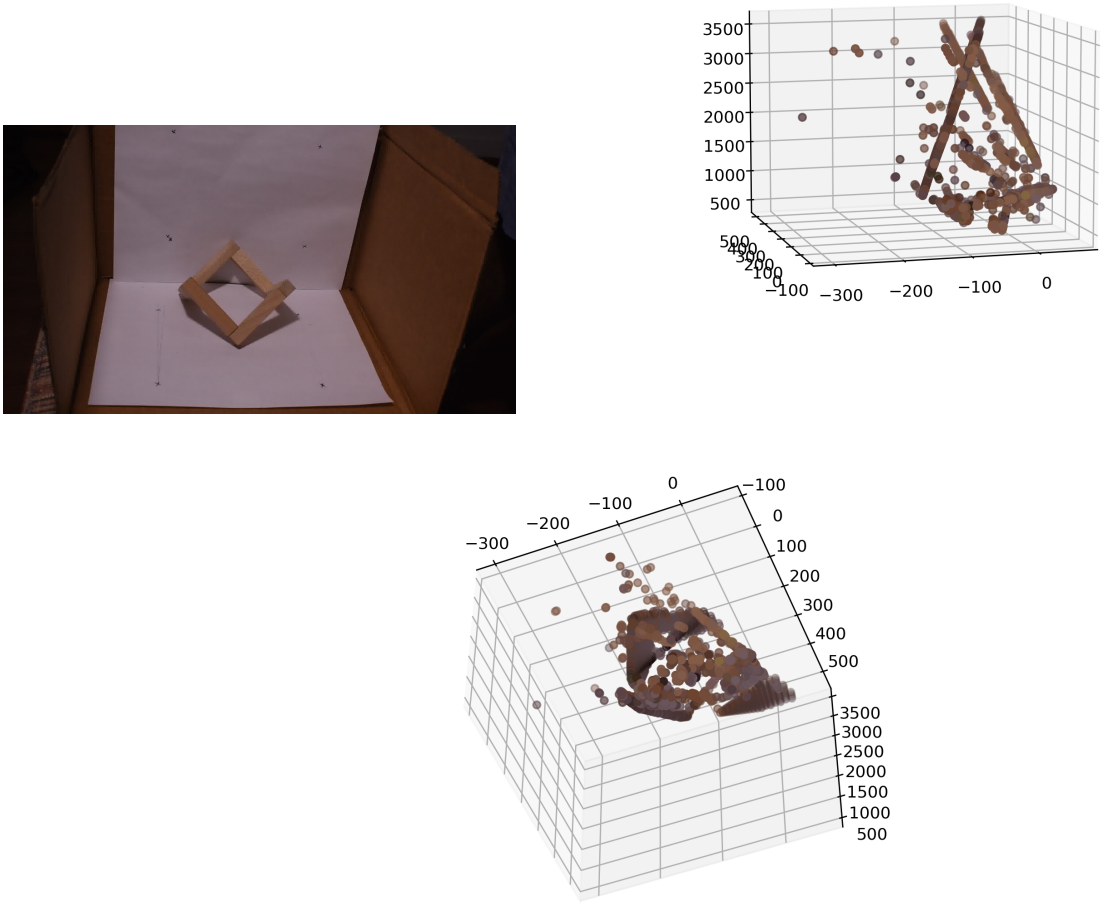


Figure 8: 3-d illusion stand capture. Our system performs very well in detecting the change in depth of our faces and generally captures shape well too.

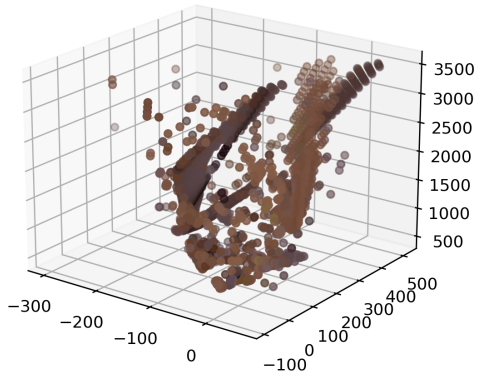
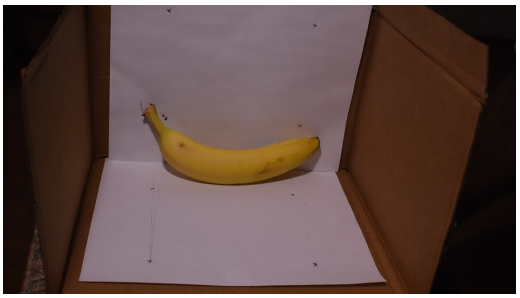
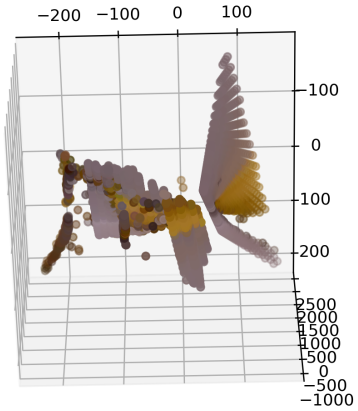


Figure 9: 3-d illusion stand capture. Our system performs very well in detecting the change in depth of our faces and generally captures shape well too.

(c) Banana





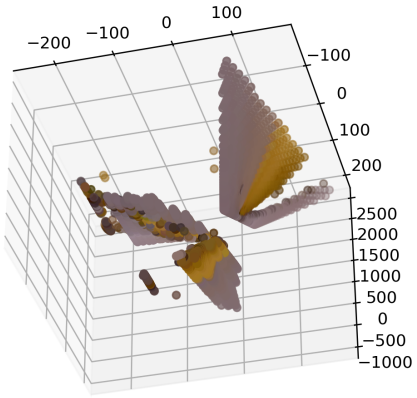
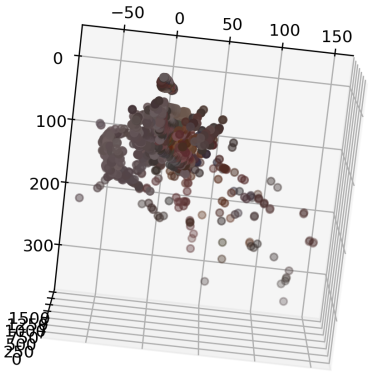


Figure 10: Banana Capture. Our system does not do very well, and returns rather planar looking captures. This is perhaps because of the orientation of light-shadow casting object, as well as our set-up's brightness not being good enough.

(d) Mug



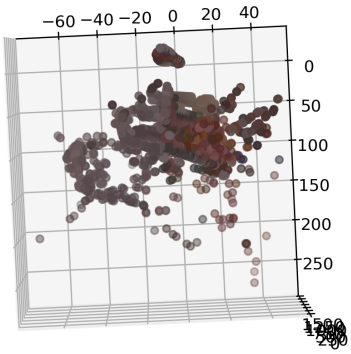


Figure 11: Our mug's shape, and features are generally captured well (depth difference b/w face and handle, and handle shape for example). Our display filtration does not work as well in this case as the colors of the bug and the background are sometime too similar for a simple color ranged filtration.

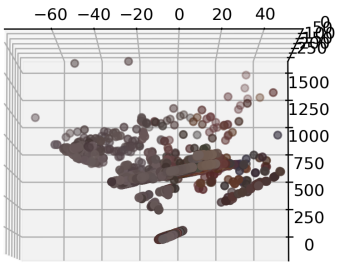


Figure 12: Our mug's shape, and features are generally captured well (depth difference b/w face and handle, and handle shape for example)). Our display filtration does not work as well in this case as the colors of the bug and the background are sometime too similar for a simple color ranged filtration.

3. Part 4 : Direct-Global Separation

We don't do radiometric calibration, but still get some basic results. Particularly, our directional images often have a higher degree of specularity, and our global images have a higher degree of flat coloration as we'd expect.
We assume standard srgb linearization (We get better outputs with this and not using anything at all).
Two of the images here have already been shown above. A third, with a candle involved, is added here.

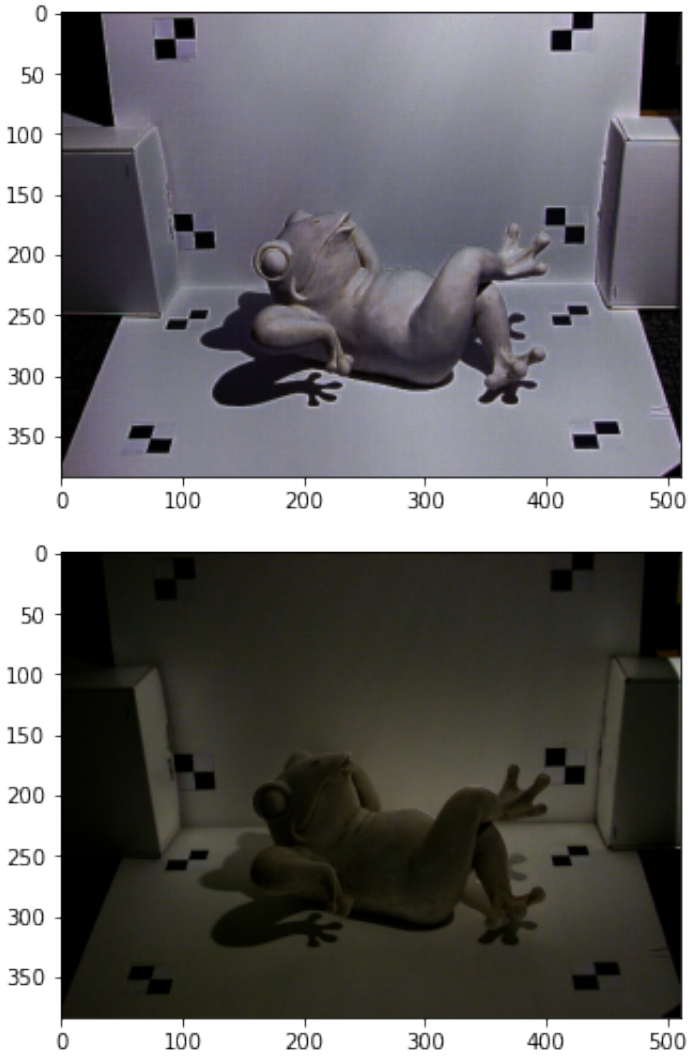


Figure 13: Directional and Global Component

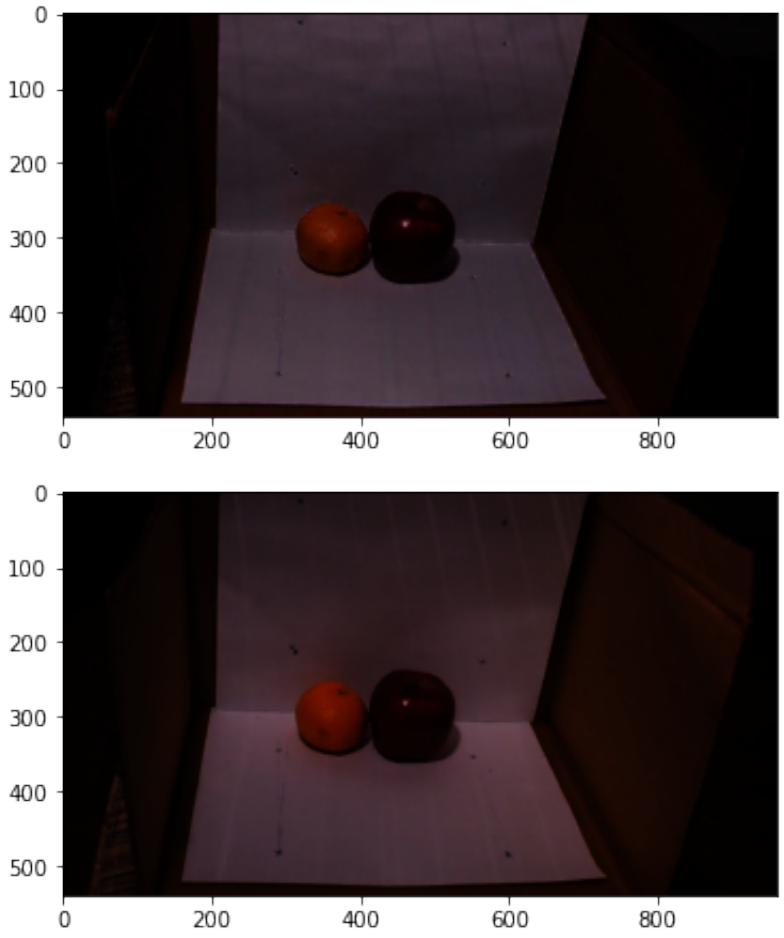


Figure 14: Directional and Global Component

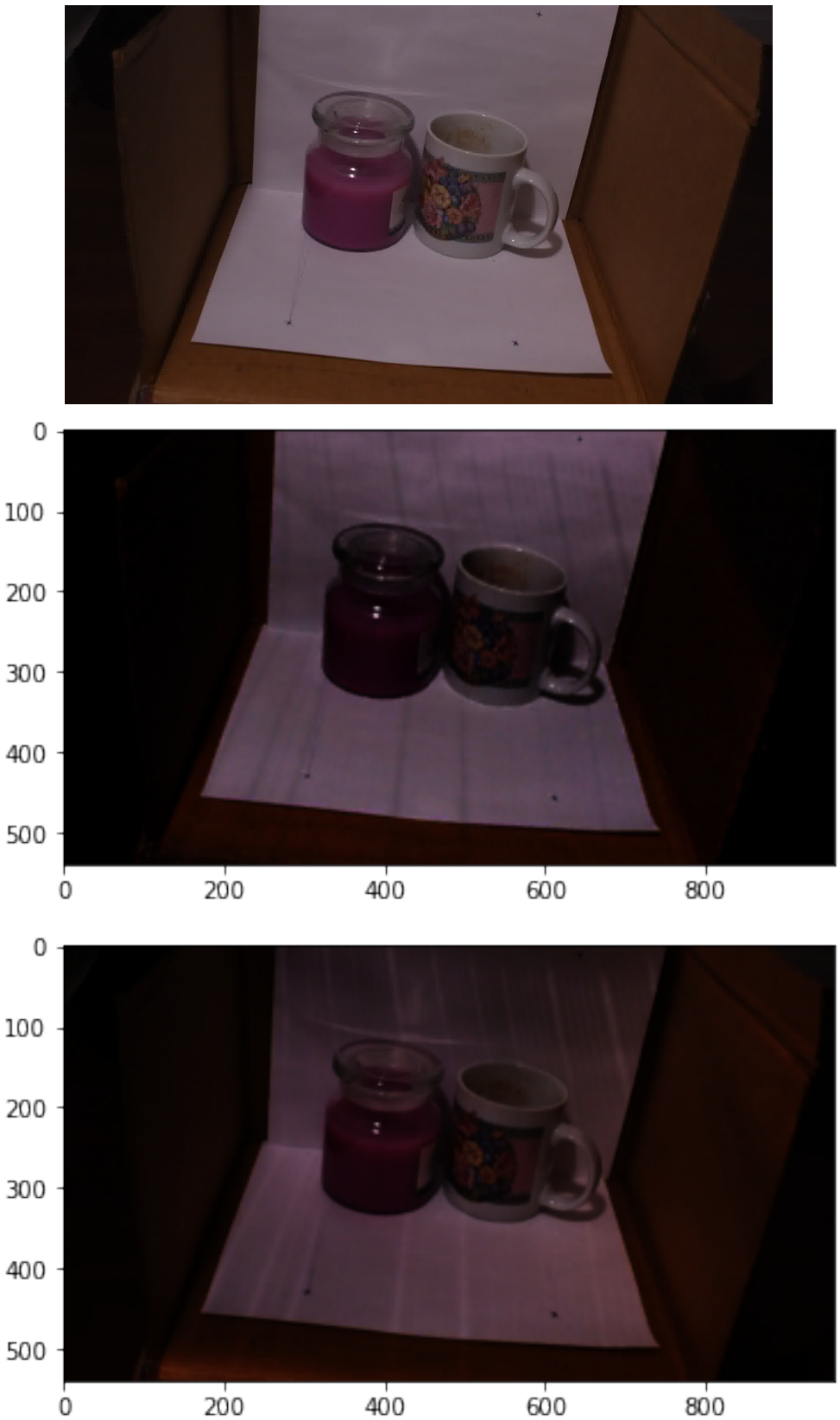


Figure 15: Directional and Global Component. As we'd expect, the candle gets all its color from the global component and very little from the directional component. Specularity can be isolated mainly to directional component.