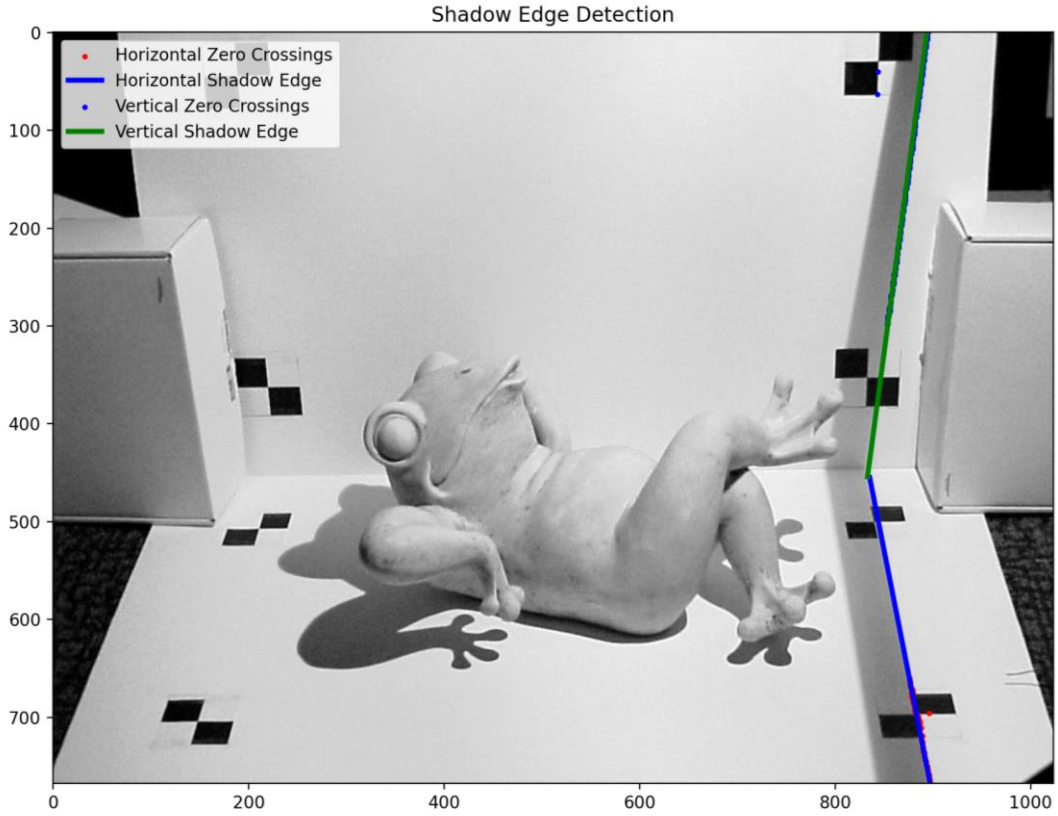
15663 Assignment 6

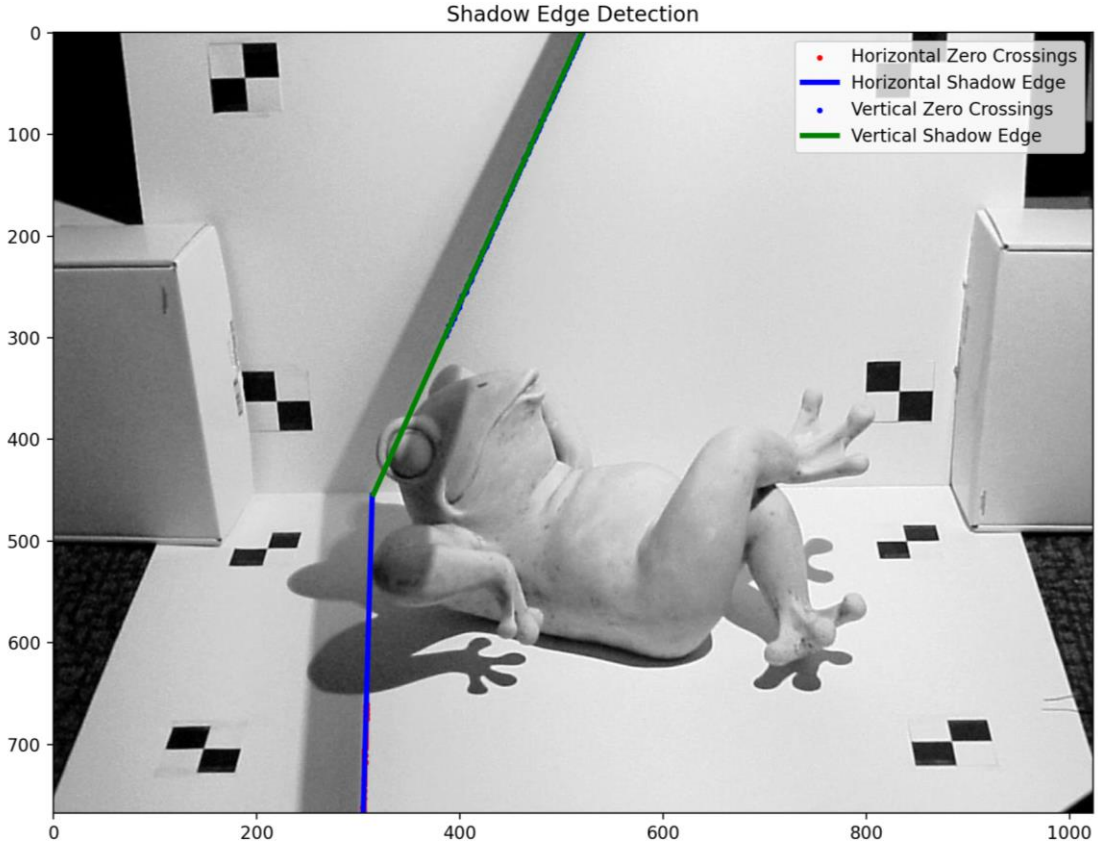
1. Implementing Structured Light Triangulation:

Shadow Edge Estimation:

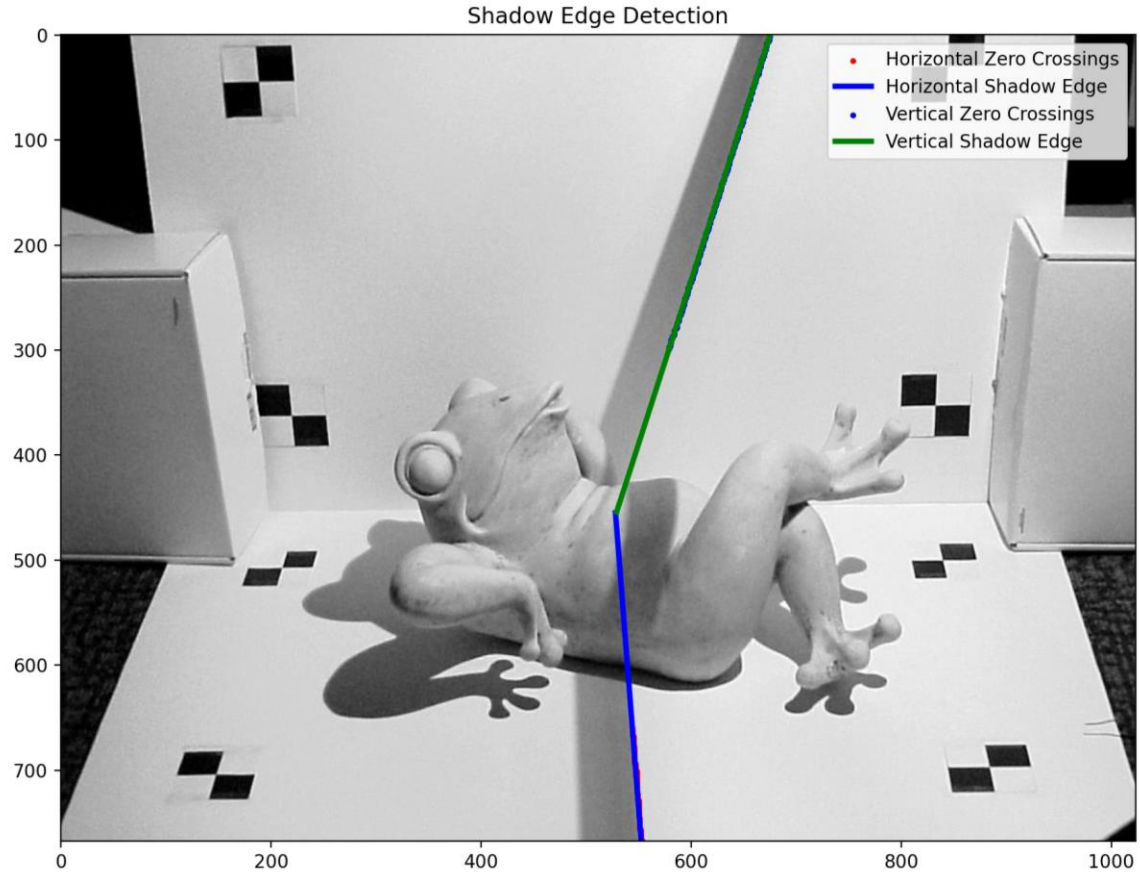
Frame 100:



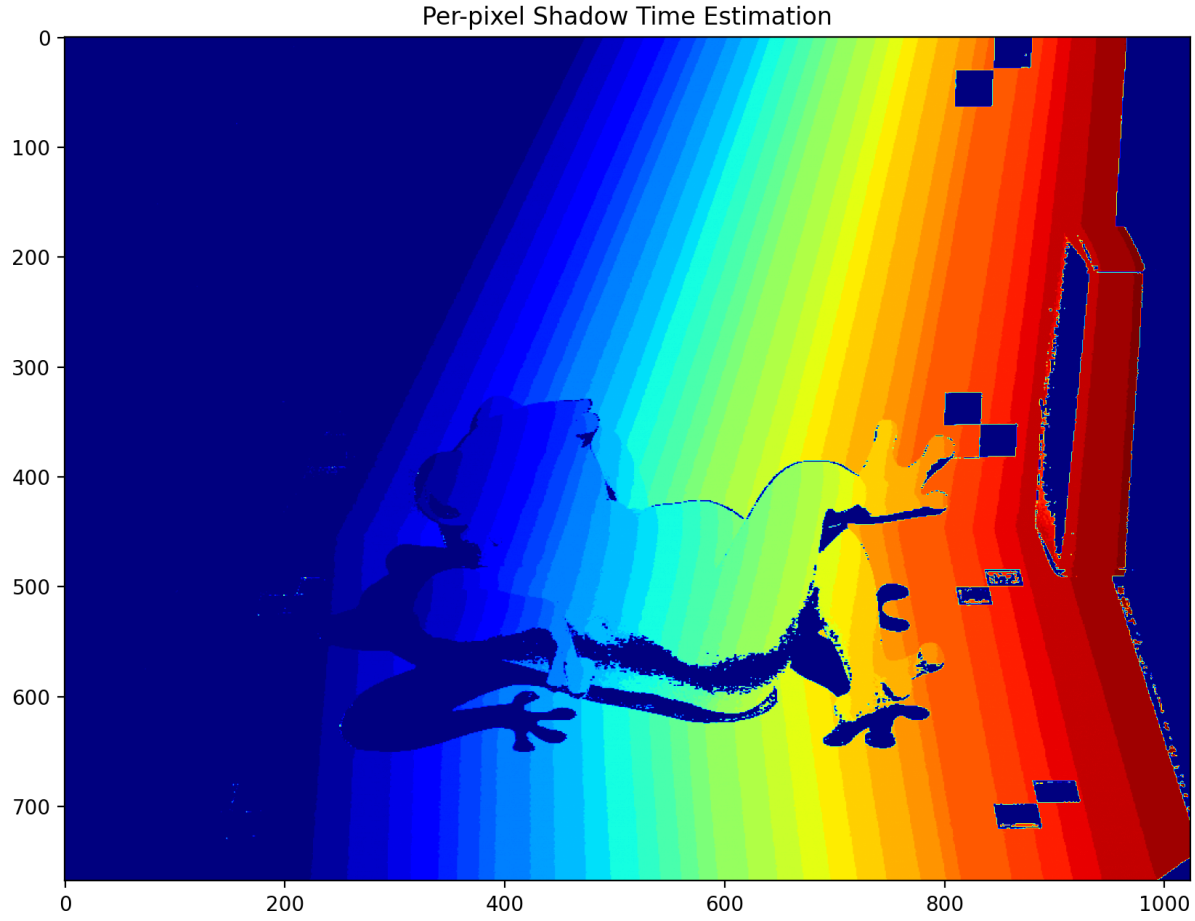
Frame 10:


Shadow Edge Detection
Horizontal Zero Crossings
Horizontal Shadow Edge
Vertical Zero Crossings
Vertical Shadow Edge
0
100
200
300
400
500
600
700
0
200
400
600
800
1000

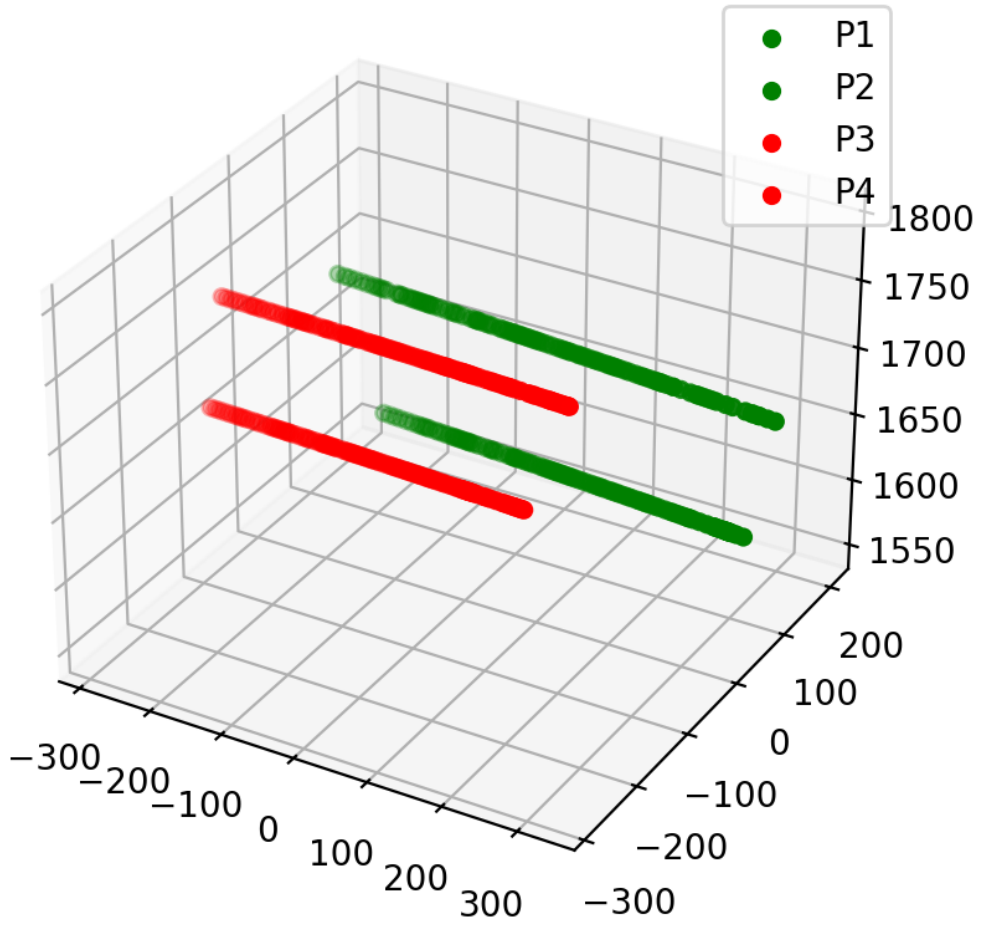
Frame 45:


Shadow Edge Detection
Horizontal Zero Crossings
Horizontal Shadow Edge
Vertical Zero Crossings
Vertical Shadow Edge
0
100
200
300
400
500
600
700
0
200
400
600
800
1000

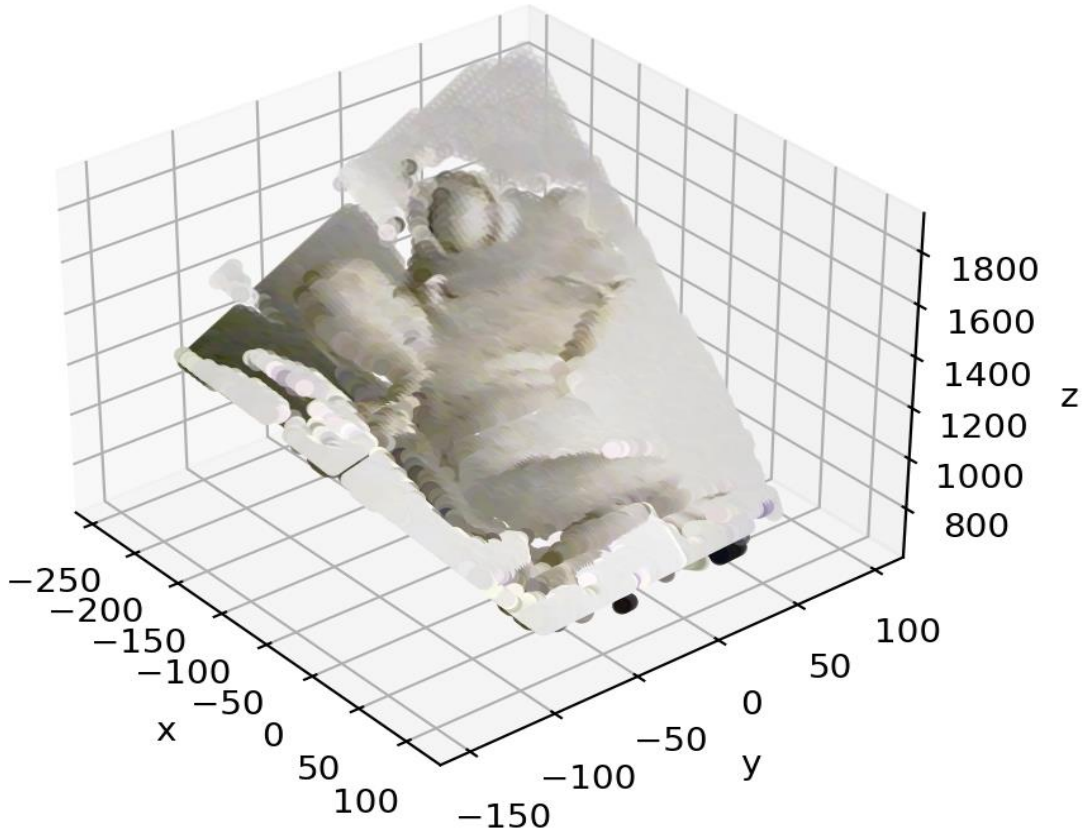
Per-pixel Shadow Time Estimation:

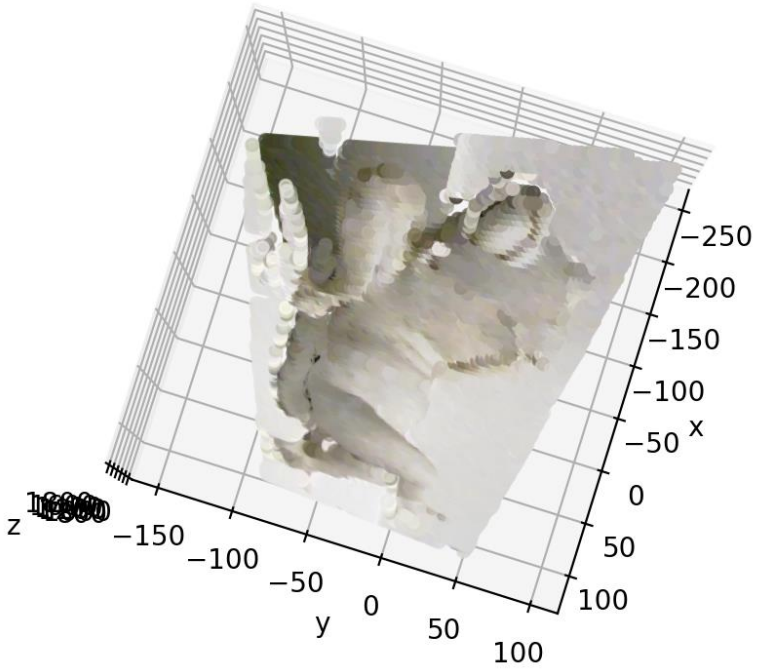


3D Shadow Points Visualization over time:



3D Reconstruction of Frog:



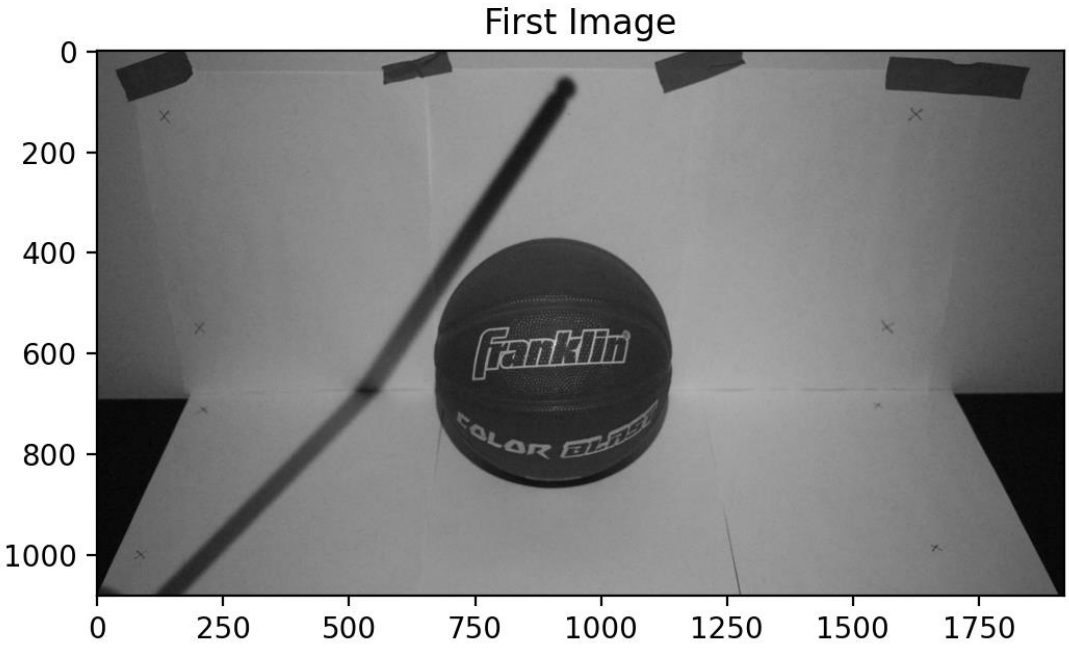


2. Building own 3D scanner :

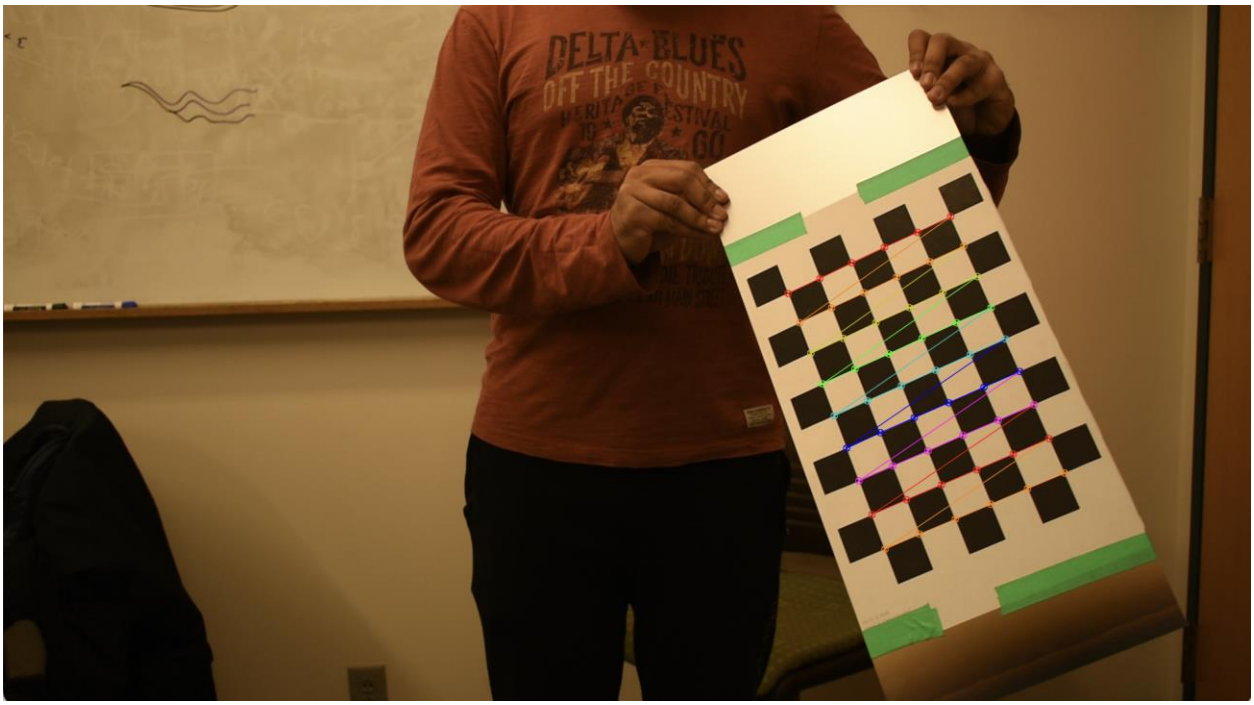
Setup:

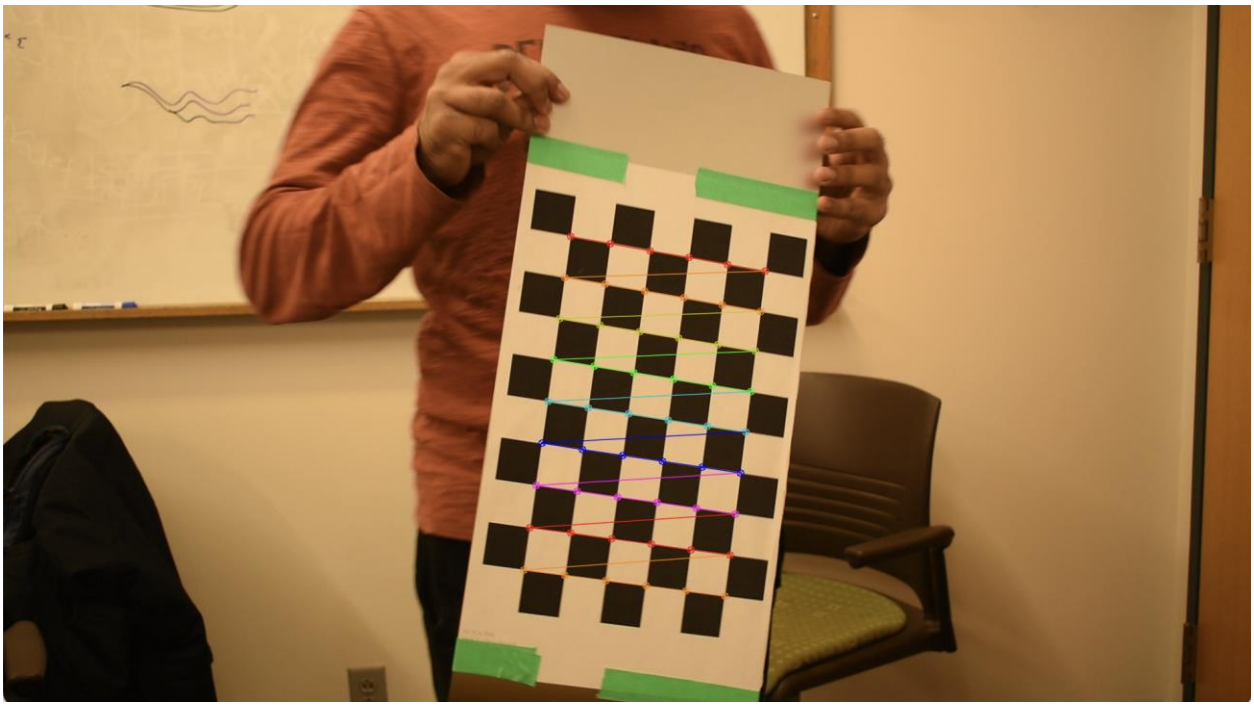
franklin
COLOR BLAST
amazon
basics

franklin
COLOR BLAST

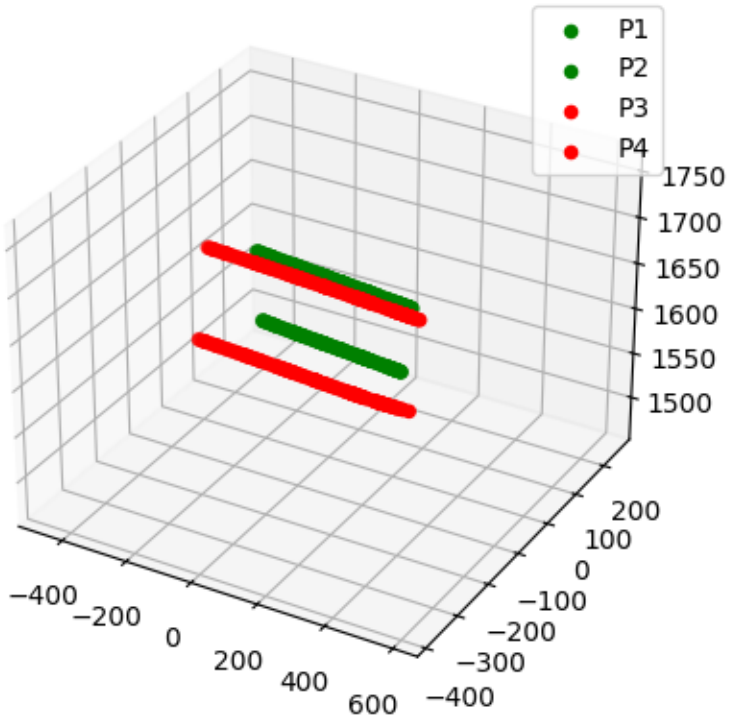


Camera Calibration:

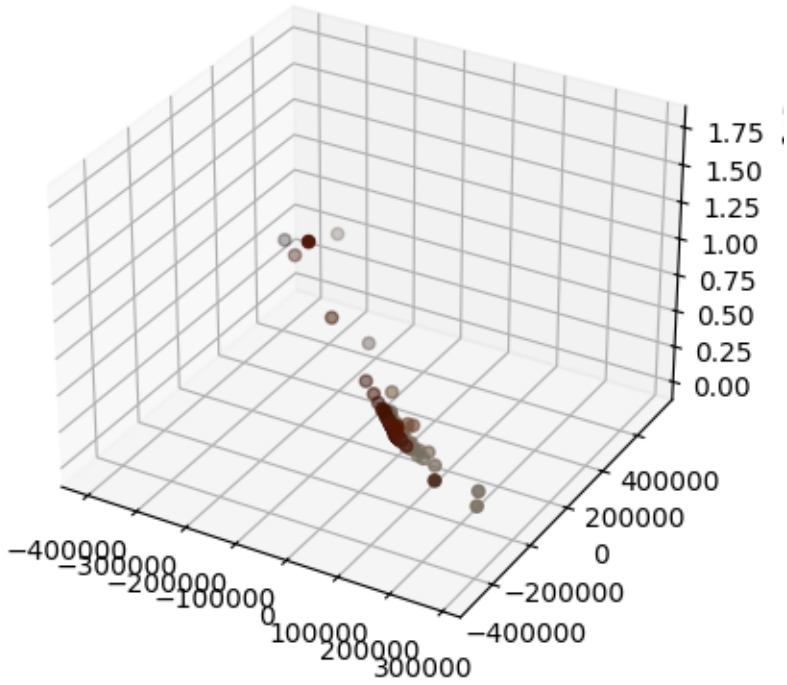




3D Point Visualization:


P1
P2
P3
P4
1750
1700
1650
1600
1550
1500
200
100
0
−100
−200
−300
−400
−400
−200
0
200
400
600

3D Reconstruction:



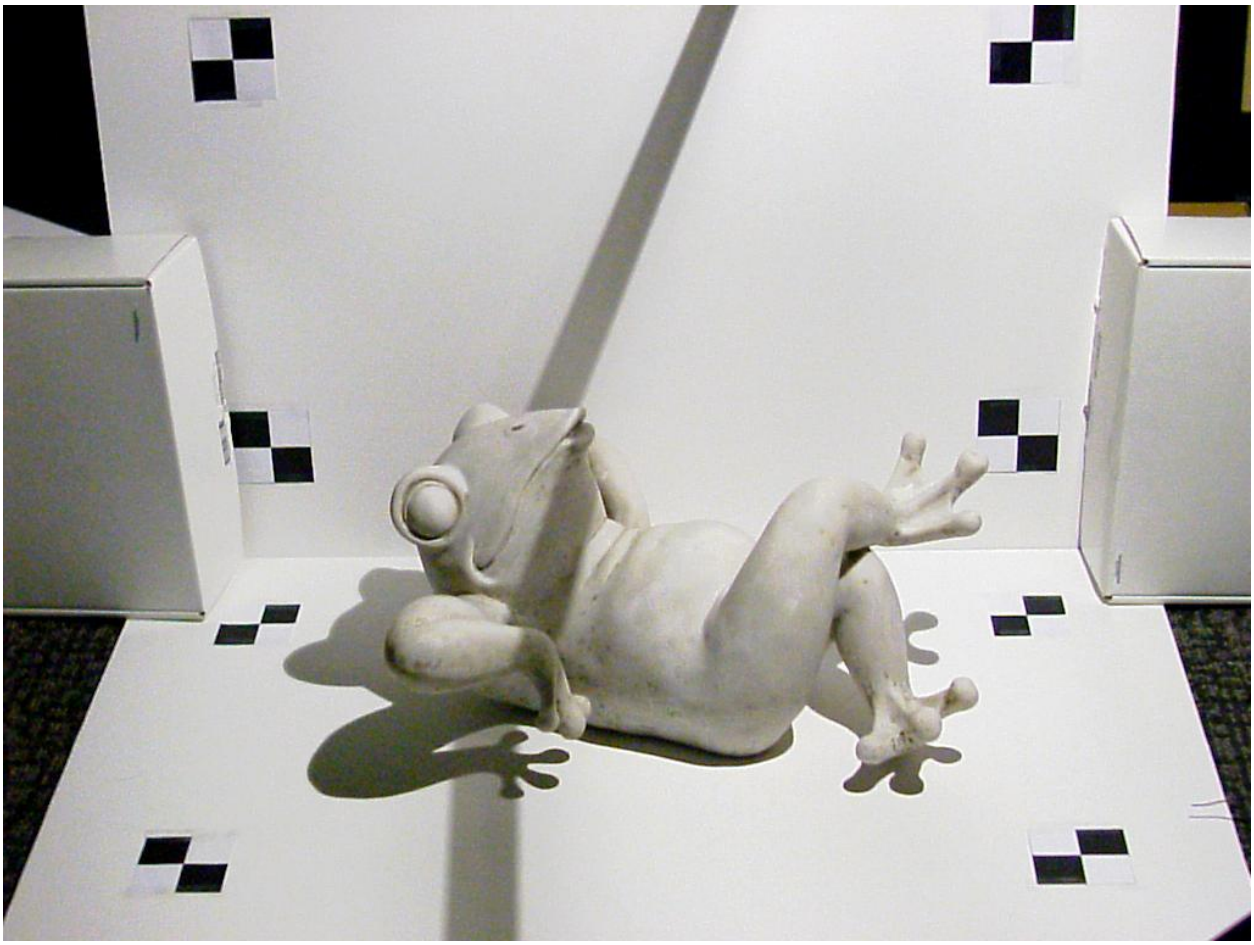
As you can see, the reconstruction failed in this case. I have verified all the steps until the intrinsic calibration. I suspect the issue to be either extrinsic calibration or the shadow plane construction.

4. Direct-Indirect Seperation :

Image 1 :

Image without shadows:

Image with stick shadow:



Global Illumination

Direct Illumination

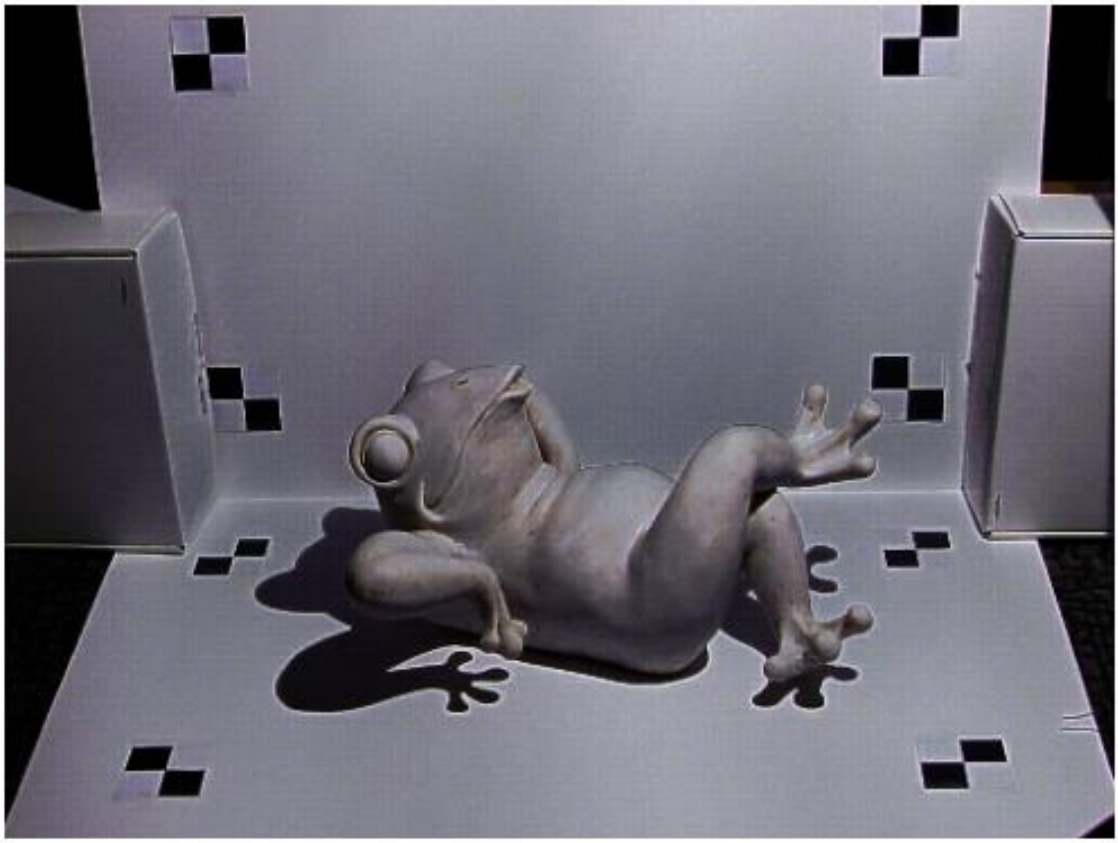


Image 2:

Image without shadows:

Image with stick shadow:

Franklin

Direct Illumination

Global Illumination

The edges of the ball reflects more light in case of global illumination due to interreflections

Image 3:

Image without shadows:

Image with shadow stick:

Direct Illumination

Global Illumination

If we observe the washing liquid bottle and the transparent cover, in direct case, they are mostly dark because most of the light undergoes subsurface scattering. But in case of global illumination, sub surface scattering helps in visualizing the inner properties more clearly even compared to the actual captured image. This is especially evident when we observe the text on the ball inside the cover, which is easily readable from the global illumination image.