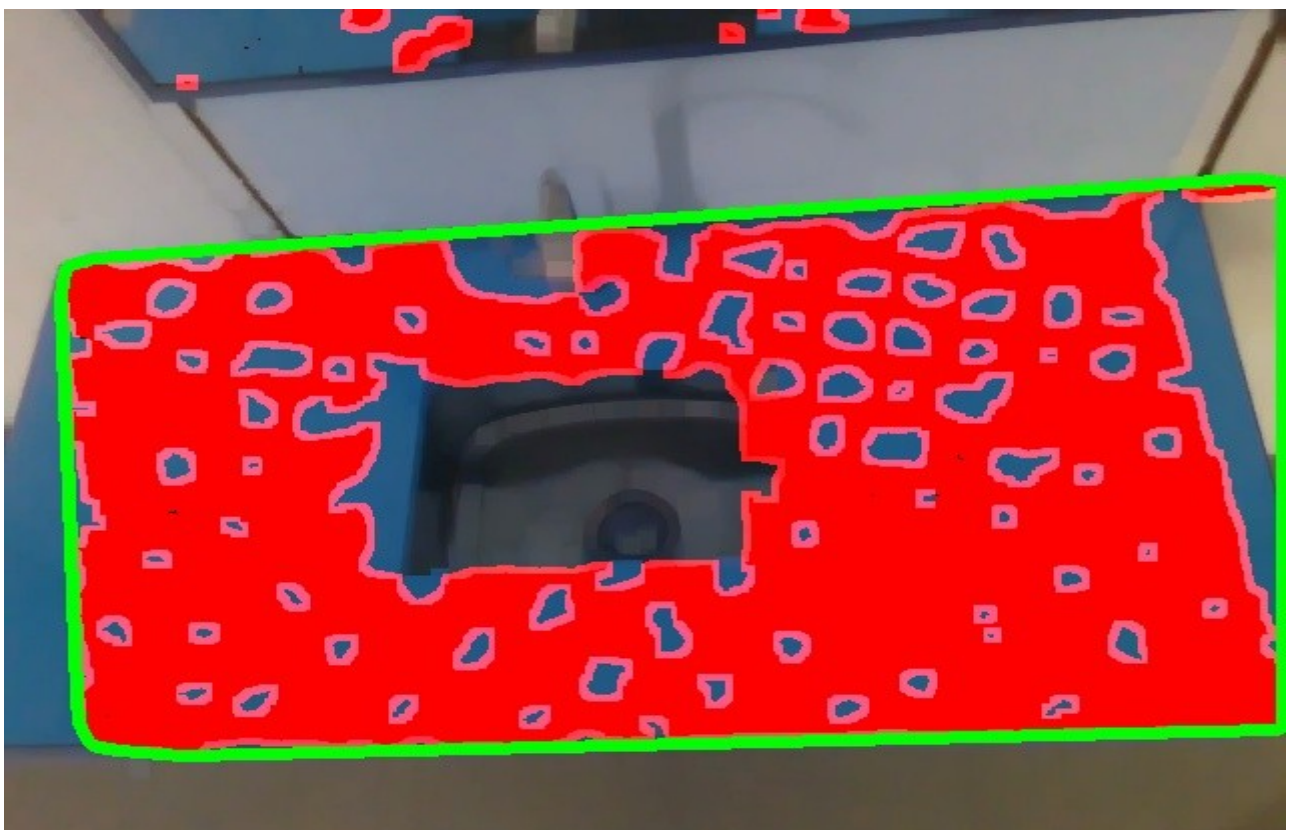
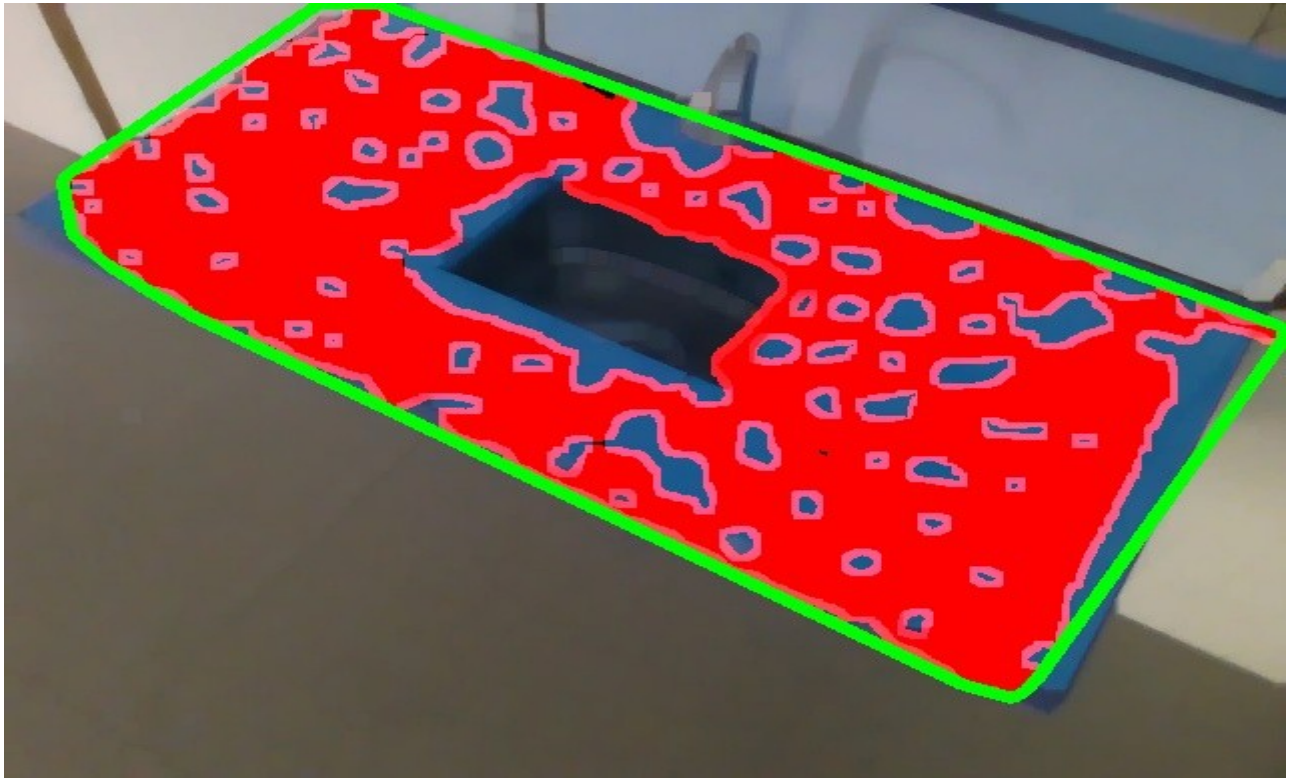
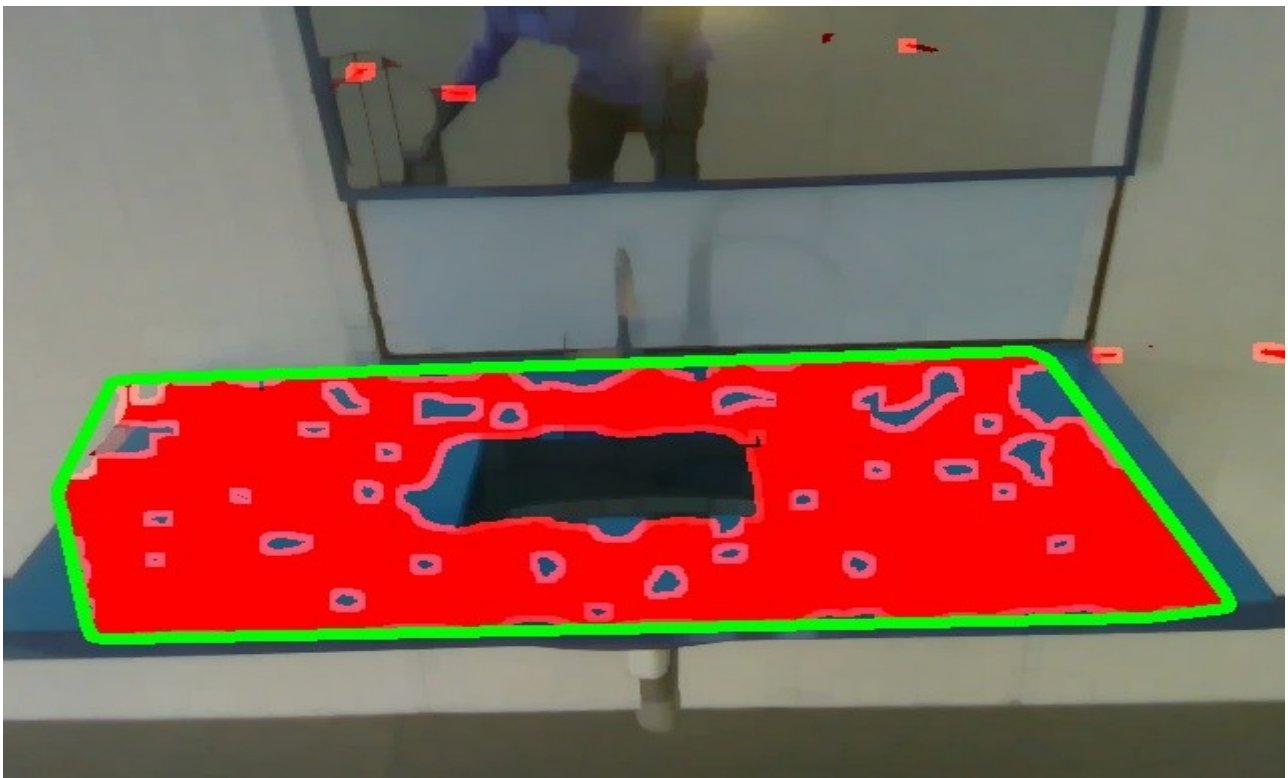
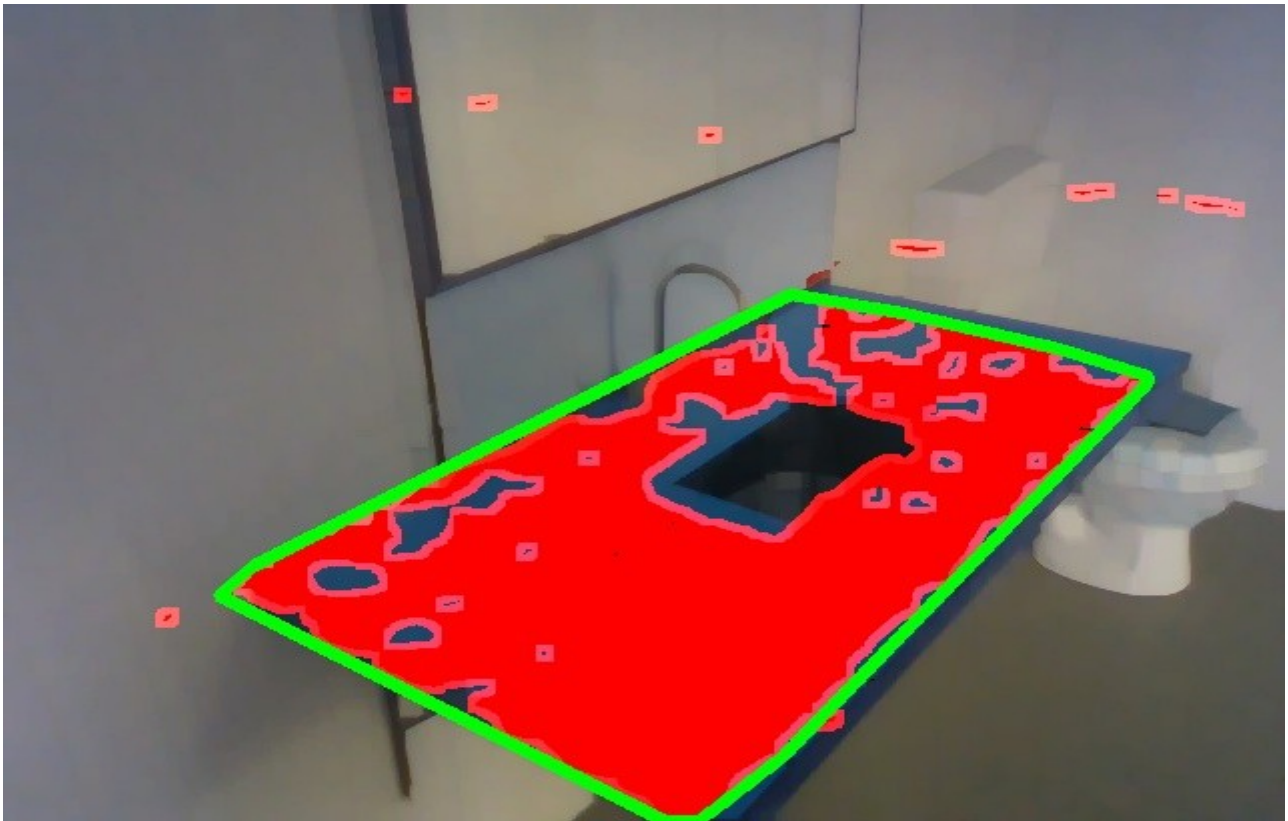


Part 1 : Repetition of previous experiments after installation of the opaque dark film

A. Countertop Results





INFERENCE :

A substantial increase was seen in the number of inliers after the installation of the opaque film

B) DUSTBIN DISTANCE RESULTS

Comparing the results obtained through homography and through the depth map⁴

Actual Distance	Line 1		Line 2	
	Homography	Depth map	Homography	Depth map
130	130.9	126.7	130.8	126.1
150	151.2	143.5	151	145
170	171.4	161.6	170.1	163.3
190	191.5	189.5	190.5	189.3
210	211.6	203.9	210.9	206.5
230	231.7	224.4	230.4	242.3
250	251.8	242.3	251	246.7
270	272	259.6	269	260.9
290			288.2	289.3
310			308.8	304.9
330			329.3	322.3
350			350.6	339.7
370			369.5	356
RMS error	0.54	2.37	0.25	2.07

Homography avg RMS error : 0.395

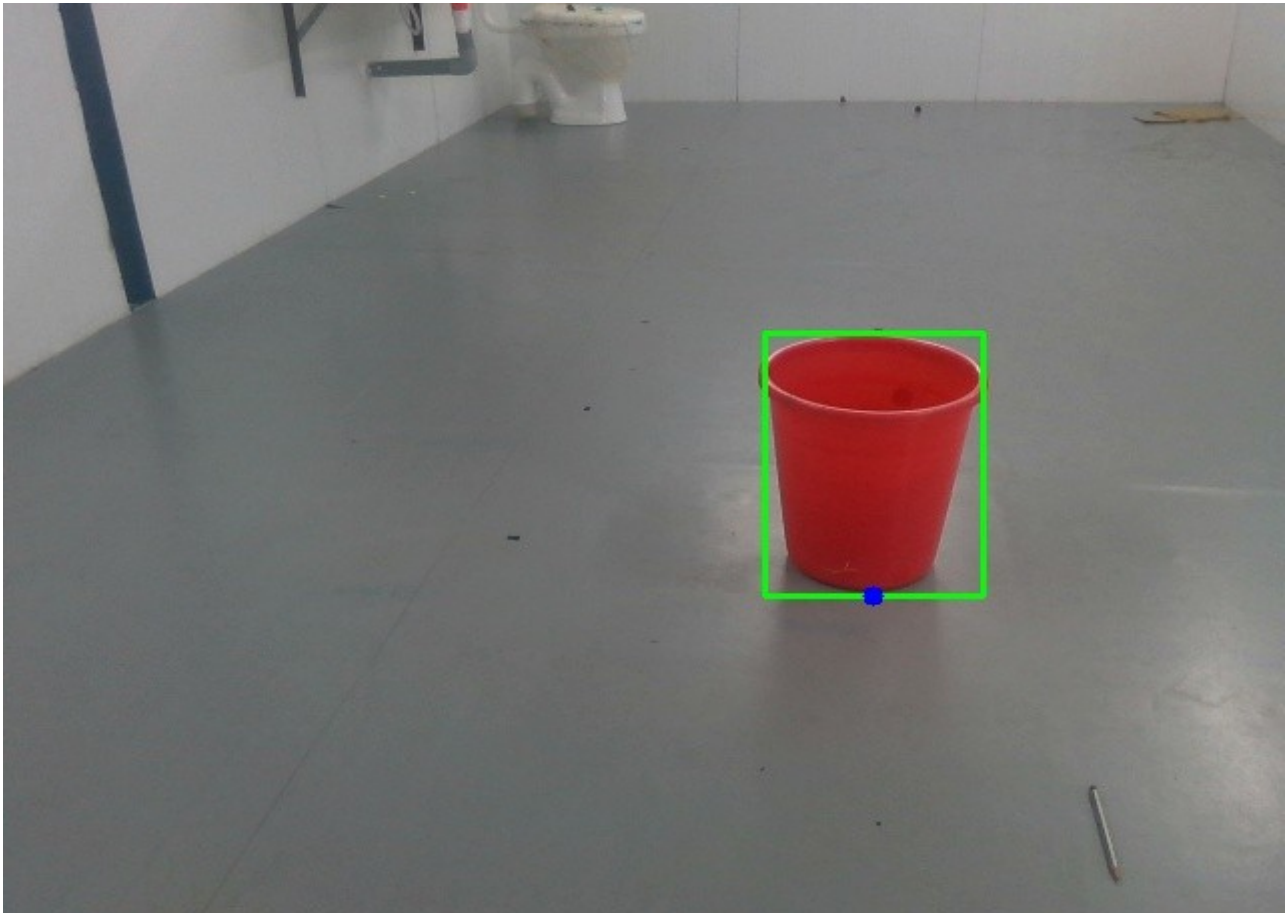
Depth map method avg RMS error : 2.22

Note : Earlier before the dark film was installed the avg RMS error in the Depth map method was 5.26, Now we see a decrease in error to 2.22

Part 2 : Estimation of the centre of the dustbin

A) Using the technique of homography :

The co ordinates of the bottom centre point of the dustbin is estimated using homography and since we know the physical dimensions of the dustbin we calculate the co ordinates of the centre of the dustbin.



Known :

1. Height of Camera - 90 cm
2. Radius of Dustbin – 9.5 cm

For example if (x,z) is the co ordinates of the bottom blue point obtained through homography

The coordinates of the centre of the dustbin is given by,

$$x_{\text{centre}} = x$$

$$y_{\text{centre}} = 90 \text{ cm}$$

$$z_{\text{centre}} = z + 9.5$$

B) Using the Depth Frame Data:

The right most and the left most points of the segmented dustbin is calculated and there corresponding depths are calculated.

The centre point joining the line is calculated

Since the centre point is an imaginary line, Its depth is assumed to be the average of the depth at the 2 extreme points.

Using this information the world co ordinates are calculated.



,
The real world co ordinates is calculated by the below formula

- $z = d / \text{depth_scale}$
- $x = (u - cx) * z / fx$
- $y = (v - cy) * z / fy$

Comparison of the two methods is shown below

Actual Co ordinates	Homography	Pointcloud
[50, 90, 150]	[49.2, 90, 151.7]	[-26.0 ,-16.0, 212.0]
[50, 90, 200]	[48.6, 90, 202.5]	[-16.0 ,-49.0, 287.0]
[50, 90, 250]	[49.6, 90, 249.5]	[0.0 ,-76.0, 342.0]
[0, 90, 150]	[-1.2, 90, 148.5]	[31.0, -10.0, 162.0]
[0, 90, 200]	[1.4, 90, 197.5]	[52.0, -43.0, 274.0]
[0, 90, 250]	[-0.6, 90, 247.5]	[53.0, -58.0, 265.0]