



**Aim:** To study the Depth Estimation

**Objective:** To Capturing Frames from a depth camera creating a mask from a disparity map  
Masking a copy operation Depth estimation with normal camera.

### Theory:

#### 1. Depth map:

A depth map is an image or image channel that contains information relating to the distance of the surfaces of scene objects from a viewpoint. The term is related to depth buffer, Z-buffer, Z-buffering, and Z-depth. Depth maps have a number of uses like Simulating the effect of uniformly dense semi-transparent media within a scene - such as fog, smoke or large volumes of water, Simulating shallow depths of field, etc.

#### 2. Point cloud map:

A point cloud is a discrete set of data points in space. The points may represent a 3D shape or object. Each point position has its set of Cartesian coordinates (X, Y, Z).[1] Point clouds are generally produced by 3D scanners or by photogrammetry software, which measure many points on the external surfaces of objects around them.

#### 3. Disparity Map:

Disparity map refers to the apparent pixel difference or motion between a pair of stereo images. To experience this, try closing one of your eyes and then rapidly close it while opening the other. Objects that are close to you will appear to jump a significant distance while objects further away will move very little. That motion is the disparity.

#### 4. A valid depth mask:

A valid depth mask is a binary picture that identifies which depth map pixels have accurate depth information is a valid depth mask. The disparity values in the disparity map are



thresholded to produce it. Closer objects typically have smaller differences. In order to prevent inaccurate depth information from being processed further, a suitable depth mask is essential.

### **5. Creating a Mask from a disparity map:**

While creating mask, you need to define a threshold range on the disparity values to pinpoint areas with useful depth information in order to generate a proper depth mask. Higher disparities are potentially inaccurate pixels, whereas pixels with disparities below the threshold are regarded genuine. By using this mask, you may be sure that the depth data you combine with other photos is accurate.

### **6. Masking a Copy Operation:**

Applying the appropriate depth mask to selected areas of the depth map is the process of masking. You move the chosen regions from the depth map to equivalent locations in the regular camera image when you do a copy operation. With this procedure, a composite image is produced that combines depth information with the look of the typical camera image.

### **7. Depth estimation with a normal camera:**

Monocular Depth Estimation is the task of estimating the depth value of each pixel given a single RGB image. Numerous visual clues are used while estimating depth using a standard camera (monocular depth estimate). The size of an object, perspective and texture gradients (dense textures signal proximity) are some examples of these cues.



### Code:

```
import numpy as np
import cv2
from matplotlib import pyplot as plt

imgL = cv2.imread('/content/sample_data/Img1.jpg', 0)
imgR = cv2.imread('/content/sample_data/Img2.jpg', 0)

stereo = cv2.StereoBM_create(numDisparities=16, blockSize=15)
disparity = stereo.compute(imgL, imgR)

normalized_disparity = cv2.normalize(disparity, None, alpha=0, beta=255,
norm_type=cv2.NORM_MINMAX, dtype=cv2.CV_8U)

plt.imshow(normalized_disparity, 'gray')
plt.title('Disparity Map')

plt.colorbar()
plt.show()
print("Disparity Map Shape:", disparity.shape)
```



Vidyavardhini's College of Engineering & Technology

Department of Computer Engineering

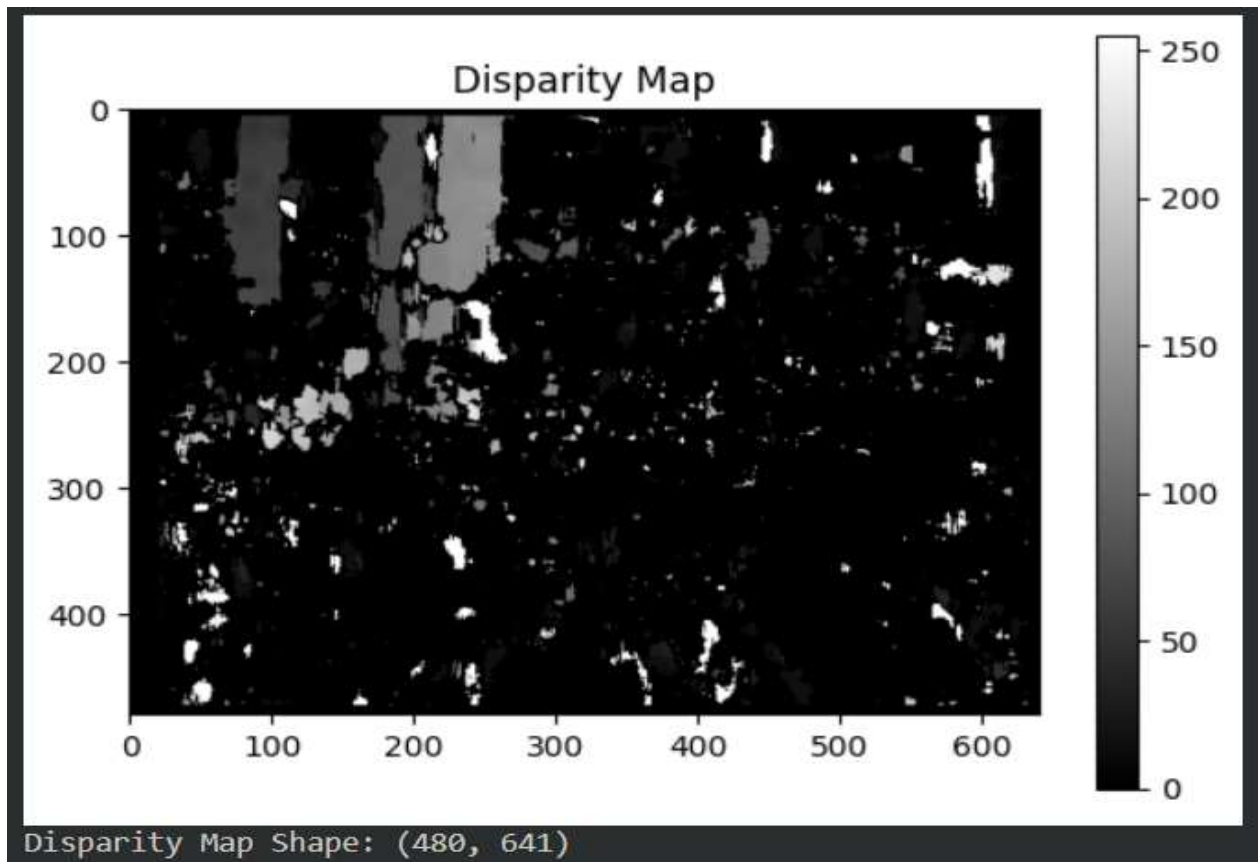
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**Input Images:**





### Output:



### Conclusion:

Depth Estimation is the task of measuring the distance of each pixel relative to the camera. Depth is extracted from either monocular - single or stereo - multiple views of a scene images. Some of the applications of depth estimation include smoothing blurred parts of an image, better rendering of 3D scenes, shadow mapping in 3D computer graphics, etc. In this experiment we successfully implemented the concept of depth estimation using disparity map.