Aim: To study the Depth Estimation

Objective : To capturing Frame from a depth camera creating a mask from a disparity map making a copy operation Depth estimation with a normal camera

Theory:

Capturing Frames from a Depth Camera:

Depth estimation is a critical aspect of computer vision, allowing us to perceive the three-dimensional structure of a scene. To perform depth estimation, we need a source of depth information, such as a depth camera. Depth cameras capture the depth information of a scene, often using techniques like stereo vision or structured light. In this experiment, we will capture frames from a depth camera to obtain depth data for further analysis.

Creating a Mask from a Disparity Map:

Depth estimation often involves creating a disparity map, which represents the pixel-wise differences in horizontal positions between corresponding points in stereo images. To refine the depth information, we can create a mask from the disparity map. This mask can help filter out unreliable depth values and focus on the regions of interest, improving the accuracy of depth estimation.

Masking a Copy Operation:

Once we have a mask derived from the disparity map, we can apply it to perform various operations on the original images or depth data. Masking allows us to selectively modify or copy regions of interest, enhancing the quality of depth information or segmenting objects in the scene.

Depth Estimation with a Normal Camera:

Depth estimation is not limited to depth cameras alone. In some cases, we can perform depth estimation using a conventional or "normal" camera. This is achieved by leveraging image features, such as object size, perspective, or known geometrical properties, to estimate the depth of objects in the scene. While not as precise as depth cameras, this technique can be useful in scenarios where depth cameras are not available.

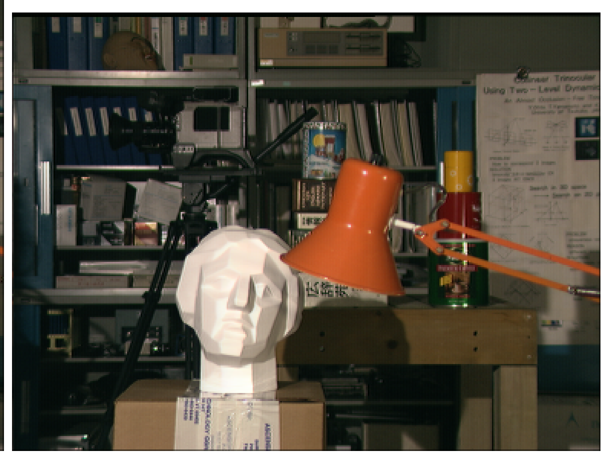
Steps

To create a depth map from the stereo images, you could follow the steps given below −

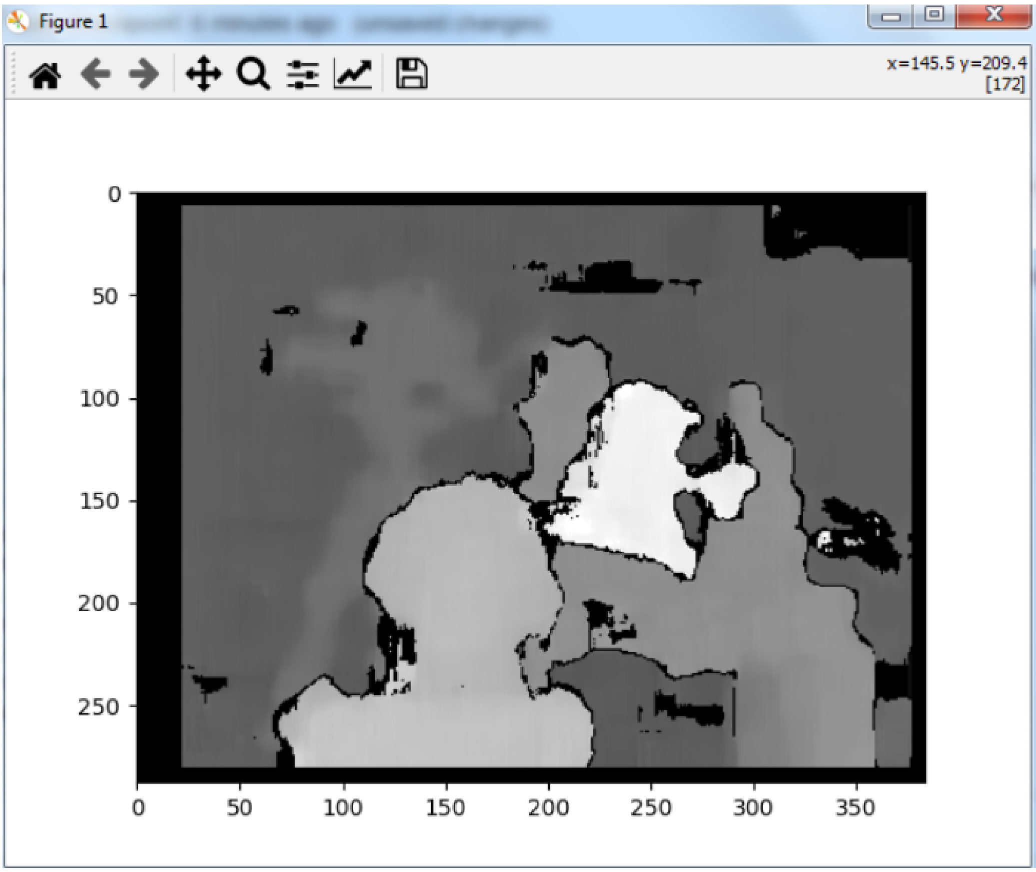
- Import the required libraries **OpenCV, Matplotlib** and **NumPy**. Make sure you have already installed them.
- Read two input images using **cv2.imread()**method as grayscale images. Specify the full path of the image.
- Create a StereoBM object **stereo = cv2.StereoBM_create()** passing the desired **numDisparities** and **blockSize**.
- Compute the disparity map between the input images using **stereo.compute()**.To get a better result you can adjust the values of **numDisparities** and **blockSize**.
- Visualize the disparity map (depth map).

```
# import required libraries
import numpy as np
import cv2
```

```
from matplotlib import pyplot as plt

# read two input images as grayscale images
imgL = cv2.imread('L.png',0)
imgR = cv2.imread('R.png',0)

# Initiate and StereoBM object
stereo = cv2.StereoBM_create(numDisparities=16, blockSize=15)

# compute the disparity map
disparity = stereo.compute(imgL,imgR)
plt.imshow(disparity,'gray')
plt.show()
disparity.shape
```



Output



Conclusion:

In conclusion, this experiment explores depth estimation techniques crucial for understanding the 3D structure of a scene. It covers capturing frames from a depth camera, refining depth information by creating masks from disparity maps, and performing selective operations for improved depth data. Additionally, it highlights the adaptability of depth estimation, which can also be achieved with conventional cameras, offering versatility in various computer vision applications. The provided code snippet demonstrates the process of creating a depth map from stereo images, facilitating a deeper understanding of these concepts and their practical implementation.