MACHINE PERCEPTION

HOMEWORK – 03

Q5. Description of Algorithm used for finding Depth.

1. Firstly, valid indices are found using the condition of (confidence > threshold) just like how it was implemented in the epipole part of the code.
2. Using this condition, valid x's and valid y's are found.
3. A mesh grid is also made with H and W to get x and y.
4. Valid flow is found using the flow function of valid x's and valid y's.
5. Flow is reshaped by stacking u's v's and 0's to get it to the form [u, v,0].
6. xp is coined by stacking x's y's and 1's to get it to the form [x, y,1].
7. The same is done with valid x's and y's and valid flow vectors.
8. Pixel locations xp are normalized to get projective coordinates by multiplying these pixel locations with inverse of K.
9. The same is also done with epipole and Flow vectors to get normalized epipole and normalized flow vectors.
10. SVD is performed on the cross product of normalized valid xp and normalized valid flow vector.
11. The last row of V transpose gives the epipole. This is stored.
12. Depth is found out by using the formula provided in the lecture slides.

$$\frac{V_z}{Z} = \frac{\|\dot{p}_{\text{trans}}\|}{\|p - F\vec{O}E\|}$$

Where Z gives the depth, p dot is normalized flow, p is normalized pixel locations, and FOE is the normalized epipole.

Hence, depth is as below:

```
depth = (np.linalg.norm((norm_x -  norm_ep),axis=0)/
np.linalg.norm((norm_flow),axis = 0) * ep[2]).flatten()
```

Using a for loop, respective elements of depth has been assigned with the calculated depth.