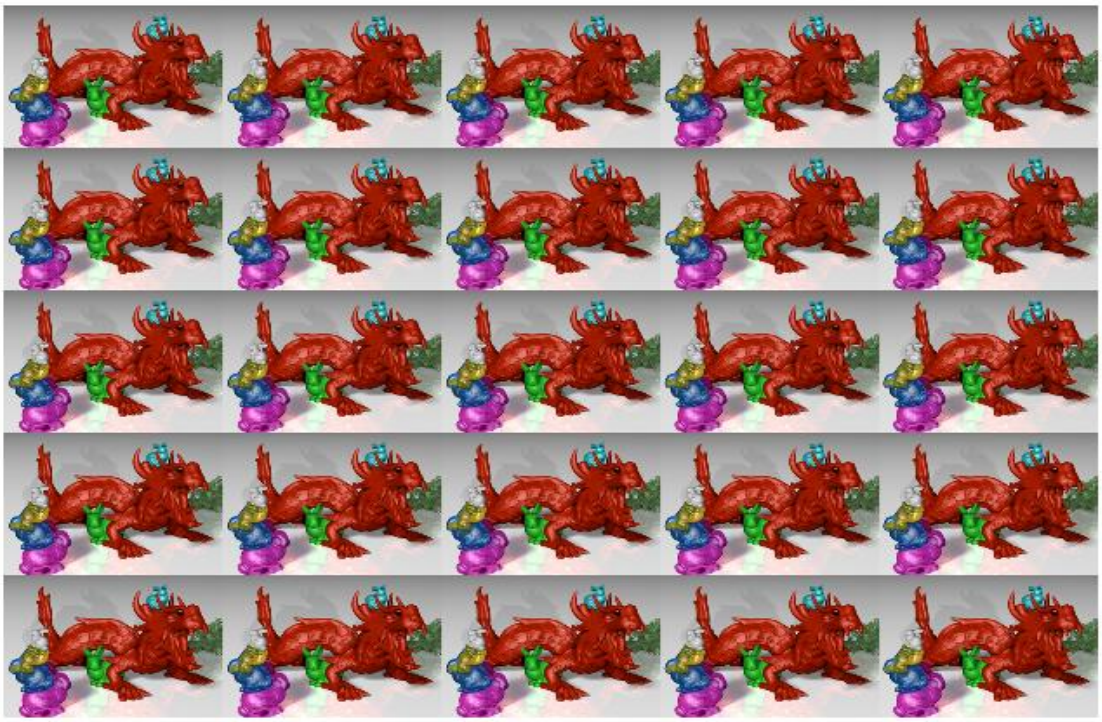
ROLL NO –EE19S042

ASSIGNMENT 3 : LIGHT FIELD PROCESSING

In this assignment we learned about light field data. The image I have taken here is a Synthetic light field image from media.mit .edu whose link is given in the reference . I have implemented the required code to process the light field using matlab.

TASK 1: IMAGE SYNTHESIZE

Our task 1 is to display the single image from the light field data showing different micro grid images in a single image. For this I have used f_ViewLightField.m matlab function to retrieve the synthesized image containting different micro grid images. The result is as shown below :



Fig(1) : Synthesized Image showing different micro grid images

TASK 2 (DIGITAL REFOCUSING)

In this case we have to use digital refocusing algorithm to generate a GIF showing change in focus from foreground to background.I have implemented the refcusing using algorithm of shift and add.The matlab file for the refocusing is given as refocus LightField.m . The GIF showing the digital refocus is as shown below :

Fig(2) -: GIF file of the given dragon image shoeing refocus.(Double Click on the image to see the animation)

TASK 3 : DIGITAL APERATURE MODIFICATION:

A. Display central view of image:

From the decoded data central view image is being created. The code for central view image is given in Central_view folder inside program folder in zip.The central view image is as shown below :

Fig (3) :- Central View image of the Dragon _Bunny light field data.

B. Aperture Modification (Change in Depth of field view)

We can change the depth of field by changing the focal length of main lens or the lens aperture size or chaging the distance between the object and image plane. In this case I have changed the depth of field by changing the object distance from image plane and lens i.e by changing shift value alpha. And the GIF of the changed DOF is as shown below :

Fig(4) -: GIF file of the given dragon image showing large DOF r efocus.(Double Click on the image to see the animation)

TASK 4 (DEPTH ESTIMATION) -:

A. Depth of the scene from light field –
I have estimated the depth of the scene using algorithm based on Depth map estimation in light fields using an stereo-like taxonomy. In order to estimate the depth, in this paper taxonomy is used, similar to the one used in stereo Depth-map algorithms. It consist of the creation of a cost tensor to represent the matching cost between different disparities, then, using a support weight window, aggregate this cost tensor, finally, using a winner-takes-all optimization algorithm, search for the best disparities. The matlab program for depth estimation is given in the folder 'Depth_Estimation_Scene' with a main file as main program.

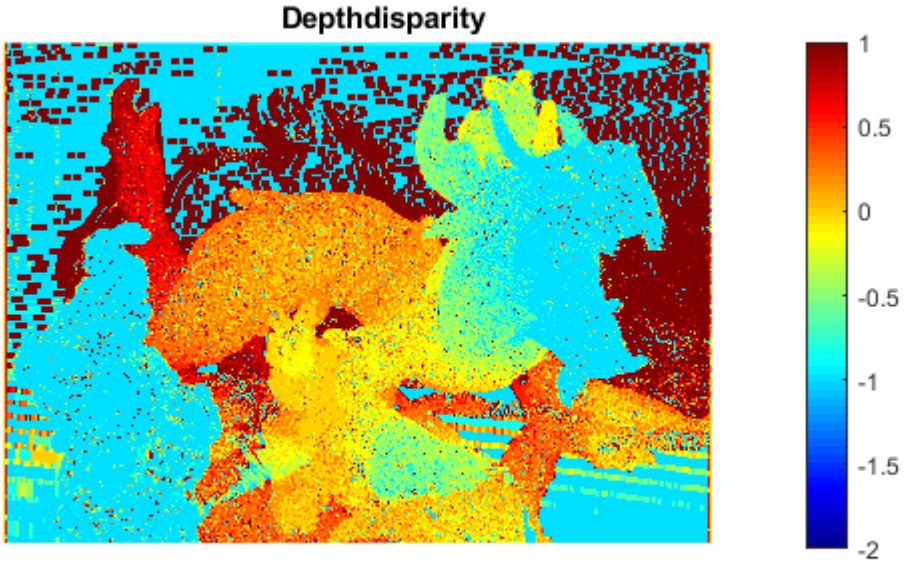


Fig (5(a))-Depth Disparity of light field scene

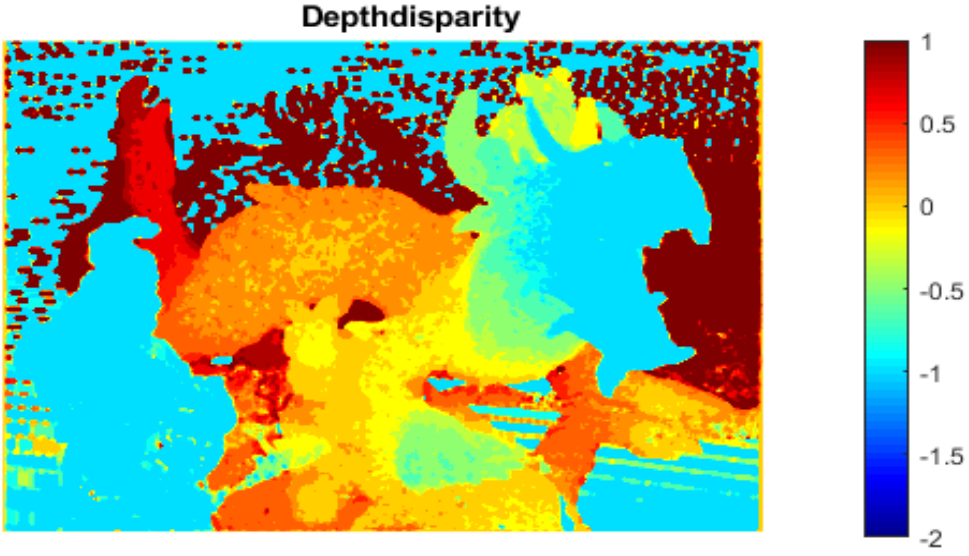


Fig (5(b))-Depth Disparity of light field scene with median filter

B. DEPTH MAP OF THE CENTRAL VIEW IMAGE –

The disparity of central image is being estimated using block matching technique with block size block size 5 and max disparity 40.The depth disparity is as shown below in two color maps

Fig 6(a) –Depth estimation pf cenral image in gray scale map

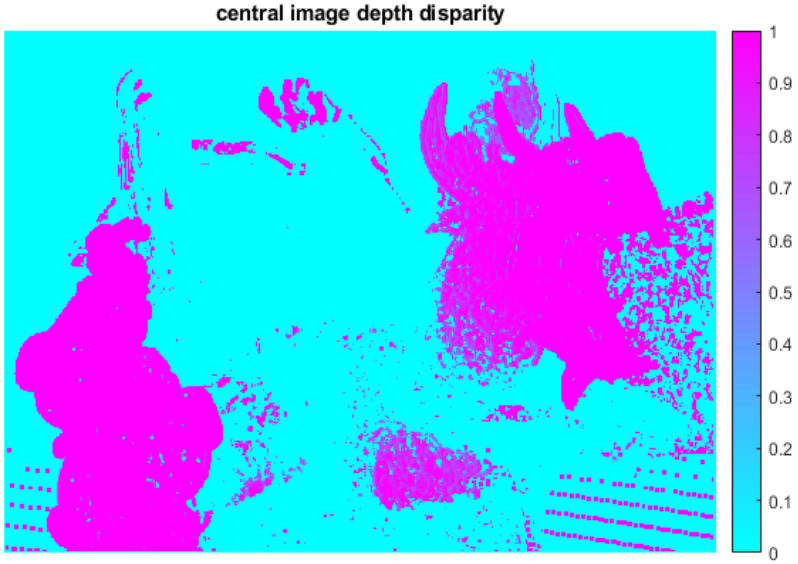


Fig 6(b) –Depth estimation pf central image in cool color map

CONCLUSION :

In the above assignment various processing like refcusing,aperature modification and depth estimation is being done and the results are shown respectively.

REFERENCE -:

1.5D LIGHT FIELD DATA SET - http://web.media.mit.edu/~gordonw/SyntheticLightFields/index.php