

Important Note: Submit all your codes to SUCourse as a single zip file. Deadline for submission to SUCourse is **15:30**.

Correlation Matching for Finding Correspondences:

- We will use correlation matching to solve the correspondence problem in stereo vision. In order to reduce the computational complexity of a search problem in a 2D window, images are rectified and therefore the problem is reduced to a 1D search problem on the corresponding scan line. We will search for the best *subR* (right sub-image) similar to *subL* (left sub-image) starting from the same pixel location and along a scan line of length ω . In order to achieve this, we need to calculate the similarity between the sub-images for each displacement d in R as follows:

$$C(d) = \sum_{k=-W}^{k=W} \sum_{l=-W}^{l=W} \Psi \left(f(i+k, j+l), g(i+k+d, j+l) \right) \quad (1)$$

where Ψ is the similarity measure such as SSD which can be calculated as follows:

$$\Psi(f, g) = -(f - g)^2 \quad (2)$$

- We will store the displacements ($d = x_r - x_l$) and the similarity values in each row of a matrix called `dist`. We can then use `find` command to retrieve the row index of the maximum similarity value in `dist` matrix as follows:

$$\text{ind} = \text{find} \left(\text{dist}(:, 3) == \max(\text{dist}(:, 3)) \right);$$

- Save your codes as “lab7Stereo.m”.

Your results should look as follows:

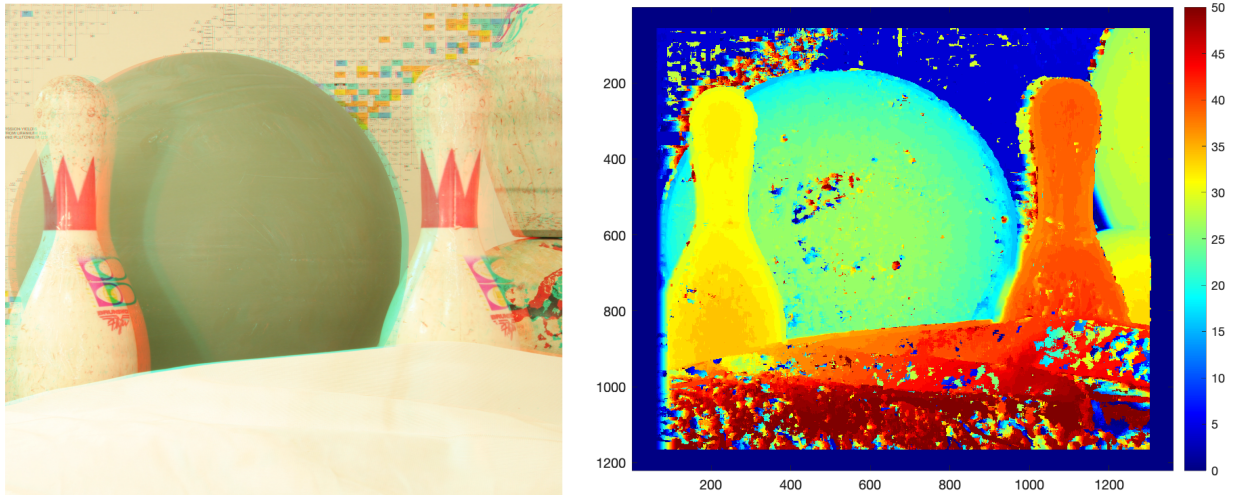


Figure 1: (left) Image pair sample 1 (right) Corresponding disparity map.

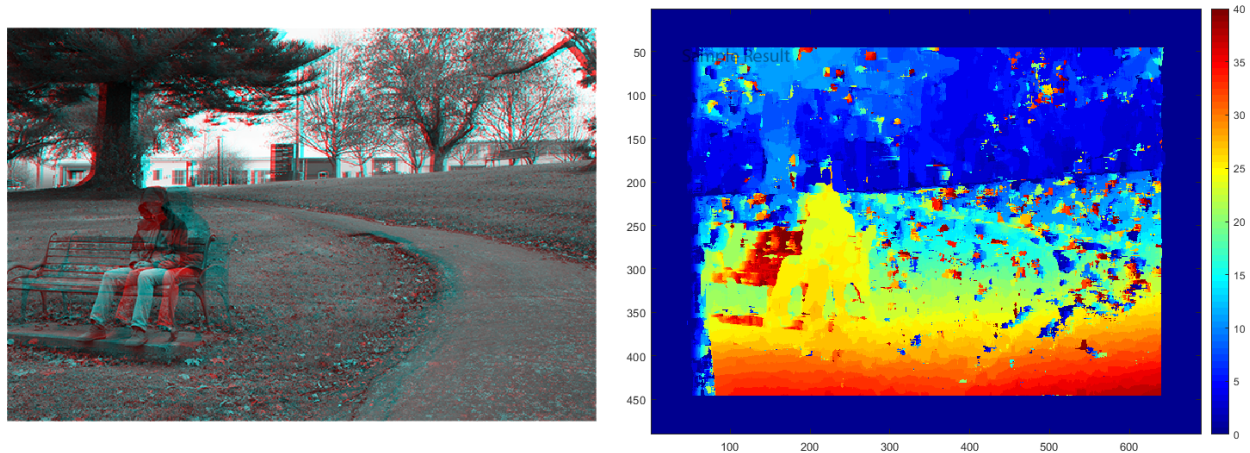


Figure 2: (left) Image pair sample 2 (right) Corresponding disparity map.

Useful codes for this lab: % **Pad the image by offset amount**

```
paddedIm = padarray(Im, [offset offset], 'both');
```

% **Show stereo pair in a red-cyan anaglyph**

```
imshow(stereoAnaglyph(ImLeft, ImRight));
```

% **Show disparity map with colorbar**

```
figure; imagesc(dispar); colormap jet; colorbar
```

Post Lab

Provide resulting images for different window sizes and search areas. Explain all of the procedure that you follow. Comment on how you choose the size of sub-images and the size of search window. Compare your disparity map with the result you obtain by using built-in MATLAB function called 'disparity'. Discuss your results.

Deadline for post lab report submission to SUCourse: **12 December 2022, 23:55.**