

Important Note: You should complete the lab until the end of the lab hours and submit all your codes to SUCourse as a single zip file. Deadline for in-lab code submission to SUCourse is **17:00**.

Correlation Matching for finding Correspondences:

- We will use correlation matching to solve the correspondence problem in stereo vision. We will search for the best *subR* (right sub-image) similar to *subL* (left sub-image) starting from the same pixel location and along the vicinity of that location (in window $R = \omega \times \omega$). In order to achieve this, we need to calculate the similarity between the sub-images for each displacement $d = [d_1, d_2]^T$ in R as follows:

$$C(d) = \sum_{k=-W}^{k=W} \sum_{l=-W}^{l=W} \Psi \left(f(i+k, j+l), g(i+k-d_1, j+l-d_2) \right) \quad (1)$$

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

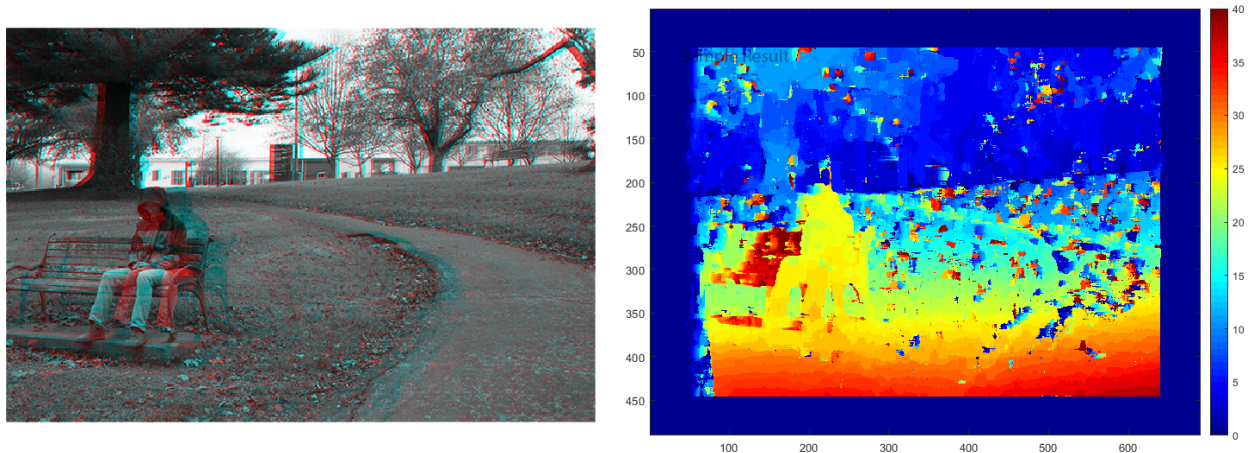
$$SSD = \sum_{k=-W}^{k=W} \sum_{l=-W}^{l=W} [f(i+k, j+l) - g(i+k, j+l)]^2 \quad (2)$$

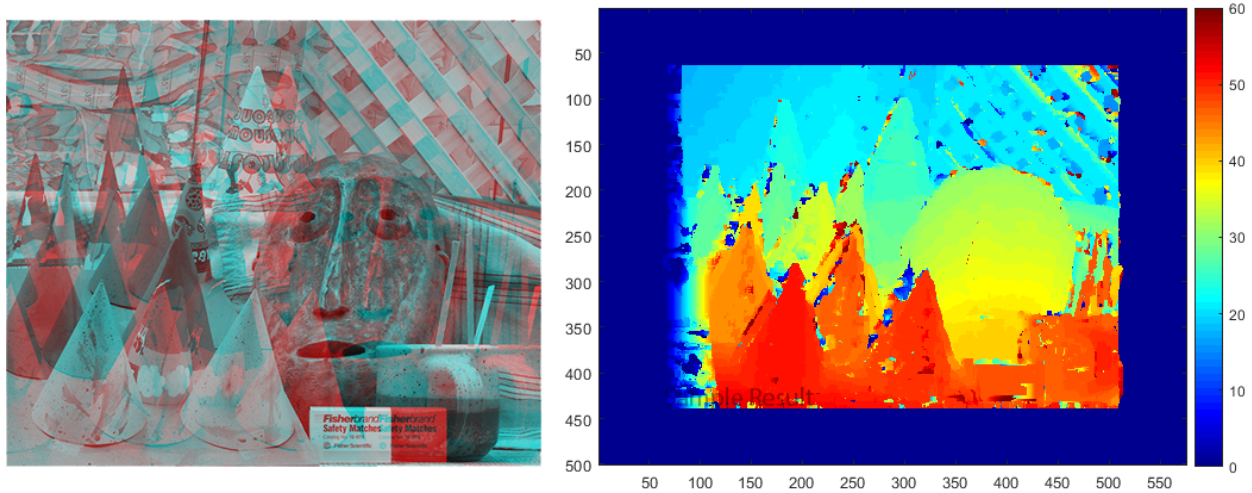
- We will store the displacements (d_1 and d_2) and the similarity values in each row of a matrix called `dist`. We can then use `find` command to retrieve the row index of the minimum similarity value in `dist` matrix as follows:

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

- Note that the corresponding points will be found for every pixel $P = [x, y]^T$ and the disparity map will be calculated from these corresponding pixels of stereo images, i.e., corresponding point $P_{\text{right}} = P_{\text{left}} - d$, where $P_{\text{right}}, P_{\text{left}}, d \in R^2$.
- Save your codes as “lab8.m”.

Your results should look as follows:





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 windows size 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: **14 December 2021, 23:55.**