**CourseName:**Computer Vision Lab **Course Code:** CSP-422

# Experiment:1.4

**Aim:** WAP to evaluate the efficacy of human guided control point selection for image alignment.

**Software Required:** Matlab

## Description:

- **Human-guided control point selection:** Human-guided control point selection is a technique used in image alignment tasks where a human operator manually selects a set of control points to guide the alignment process. These control points are typically landmarks or distinctive features in the images that can be easily identified by a human observer.

  Human-guided control point selection allows the human operator to leverage their visual perception and domain knowledge to guide the alignment process. It is particularly useful when dealing with challenging alignment scenarios or when accurate alignment is critical. However, it can be time-consuming and subjective, as the quality of the alignment heavily relies on the operator's expertise. Therefore, automated techniques such as feature-based matching or deep learning-based approaches can be employed to reduce human involvement or assist in the control point selection process.

## Algorithm:

1. Load the source and target images.
2. Display the source and target images to the user.
3. Prompt the user to select corresponding control points on both images.
4. Store the selected control points for alignment.
5. Perform image alignment using the control points.
6. Display the aligned image to the user.
7. Evaluate the alignment quality using metrics such as mean square error or structural similarity index.
8. Calculate the efficacy of human-guided control point selection by comparing the alignment results with and without user intervention.
9. Output the evaluation results and efficacy metrics.

## Implementation:

- **Human-guided control point selection:**

```
movingImage = imread("Orion1.png");
fixedImage = imread("Orion2.png");
cpselect(movingImage, fixedImage);

tform = estgeotform2d(movingPoints, fixedPoints, "similarity");
```

```
movingImageT = imwarp(movingImage, tform, "OutputView", imref2d(size(fixedImage)));
montage({fixedImage, movingImageT})

% Calculate alignment evaluation metrics
% You can use any suitable metric to compare alignedImageManual and alignedImageAuto
% For example, mean squared error (MSE), structural similarity index (SSIM), etc.

mse = immse(fixedImage, movingImageT);
ssimValue = ssim(fixedImage, movingImageT);

fprintf('MSE between ground truth and automated alignment: %.4f\n', mse);
fprintf('SSIM between ground truth and automated alignment: %.4f\n', ssimValue);
```

## Output:

- **Human-guided control point selection (Accuracy and Result):**

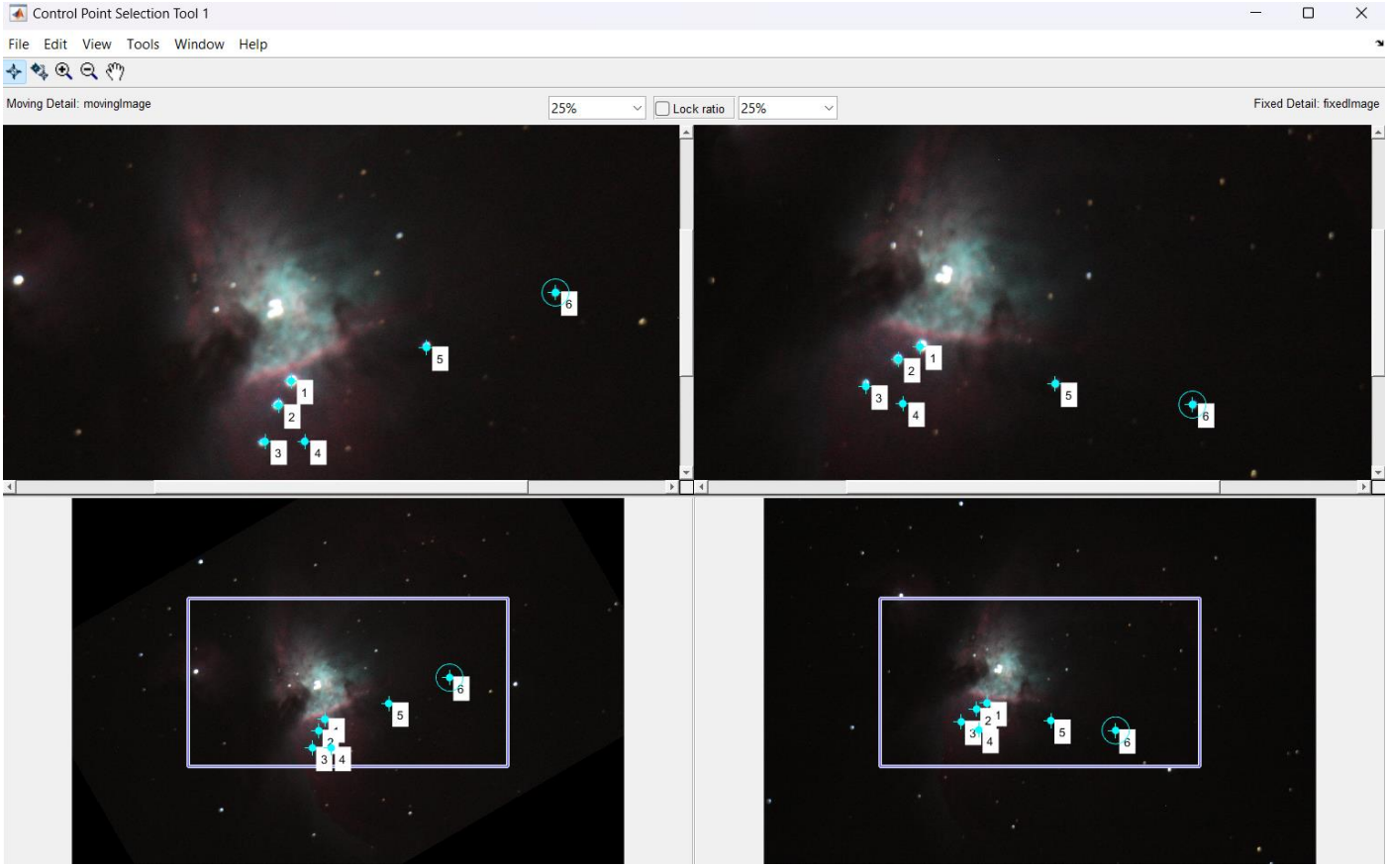


*Figure 4.1 Prompt to select control points*

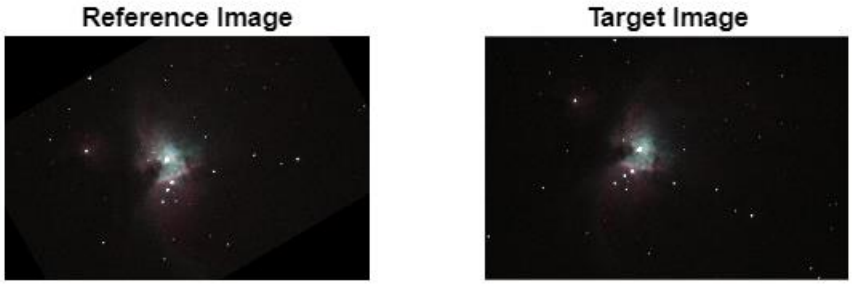


*Figure 4.2 Reference Image and Target Image*

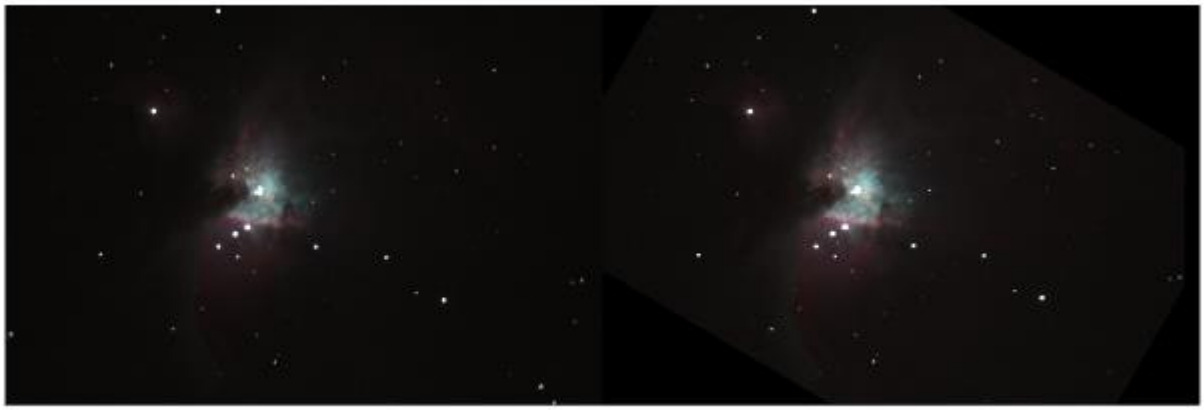

*Figure 4.3 Result: Matched Image*

```
MSE between ground truth and automated alignment: 61.4499
SSIM between ground truth and automated alignment: 0.8402
```

*Figure 4.4 Mean square error(MSE) and structural similarity index measure(SSIM)*