

CS663 Assignment 1 Question 3

August 2023

(a) Translation: When you have scanned a document twice with the same scanner but in slightly different positions, the optimal motion model is translation. In this scenario, the only difference between the two images is their spatial position. A translation transformation can perfectly align the images by shifting one image's content to match the position of the other image. Since there is no indication of rotation, scaling, or deformation, a translation model with two parameters (horizontal and vertical shifts) is sufficient.

(b) Translation: When the two images were acquired from two different scanners with different resolutions, but the X and Y resolutions are the same, the optimal motion model is still translation. The differences in resolution only affect the overall image size, and a translation can align the images based on their content regardless of the resolution difference. The scaling factor is uniform in both X and Y directions, so translation alone is enough to address the discrepancy.

(c) Rigid (Translation + Rotation): When dealing with a document with ink bleeding, where portions from the other side are visible, the optimal motion model is rigid transformation, specifically a combination of translation and rotation. Ink bleeding can cause shifts and slight rotations in the visible content from the other side. Therefore, both translation and rotation are necessary to align the images accurately. Since there's no mention of significant scaling or non-rigid deformation, a rigid transformation is appropriate to account for the necessary adjustments in position and orientation.