

Medical Image Processing (Hieu Trung Huynh)

Problem Set 2 (Transformation)

Solutions should include relevant images and original code of the algorithms developed along with any discussion requested.

1. Consider the geometric transformation given by

$$\begin{aligned}x' &= x \cos\psi + y \sin\psi \\ y' &= -x \sin\psi + y \cos\psi\end{aligned}$$

Apply this transform to the chest image (figure_problem_set_2, 256 x 256 pixels, 2 bytes per pixel) by developing algorithms that perform (a) nearest neighbor interpolation and (b) linear interpolation. Comment on differences between the appearances of the transformed images.

2. Develop an algorithm to construct a "gradient-direction image" based on the Sobel operator. Apply this algorithm to the chest image and comment on the output image. (Hint: Compute the gradient direction and "encode" the result using a direction template consisting of 8 directions. The resulting image will be "octary" (i.e., it will contain only 8 gray levels).