

# Homework 4 : Due April 15, 2011

CS 578 / 778

April 1, 2011

Image registration using maximization of mutual information. No actual registration will be performed in this homework. However you will demonstrate that MI decreases as images become unaligned with each other.

## 1 Construct the Joint Histogram

Load the sample images `t1.mat`, `t2.mat`. Construct the joint histogram for pair  $(t1, t2)$ . Display the histogram as a grayscale image.

## 2 Compute Mutual Information

Compute the mutual information for the image pair using the equations from the paper "Multimodality Image Registration by Maximization of Mutual Information". State the value in your report.

## 3 Transformation

Graph the mutual information against the transformation parameters described below:

### 3.1 Translation

Let  $t2'(x, y, t_x) = t2(x + t_x, y)$ . Plot  $I(t1, t2')$  against  $t_x \in [-5, 5]$  in 1 pixel increments.

### 3.2 Rotation (If you are in CS 778)

Let  $t2'(x, y, \theta)$  be the image  $t2$  rotated by  $\theta$  degrees about the center of the image (use `imrotate` or another function of your choosing). Plot  $I(t1, t2')$  against  $\theta \in [-10^\circ, 10^\circ]$  in 1 degree increments.