Concordia University
Department of Computer Science & Software Engineering

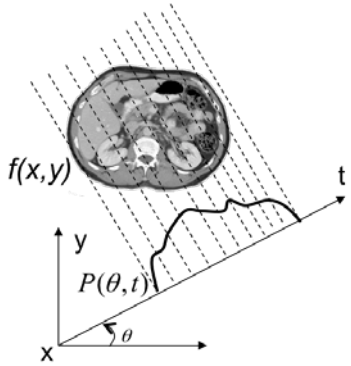
COMP 478/6771 Image Processing
Project
Due date: December 10, 2016

Instructions:

This project has two parts. Students in COMP 6771 must do the project individually and students in COMP 478 are allowed to work in team of at most two members. A zero mark will be given to submissions with either identical writing, explanations or programming codes. A written report must be submitted in hard copy. The programming codes can be submitted via the EAS system.

Part I.

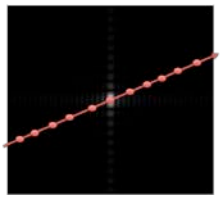
Given an image $f(x,y)$ and its projection $P(\theta,t)$ onto a line *t* that forms an angle θ with the x-axis as follows



1. Download the image $f(x,y)$ from the course webpage.
2. Calculate the projection $P(\theta,t)$ of the image onto the line with $\theta = 30^\circ$ (Hint: you can use the Radon transform in Matlab to project the image).

3. Transform $P(\theta,t)$ obtained in step 2 to the frequency domain by using 1D-DFT and plot its spectrum.

4. Transform the 2D image $f(x,y)$ to the frequency domain using 2D-DFT then extract the values of this Fourier transform along the same line *t* at $\theta = 30^\circ$ with the x-axis (see figure below). Plot the spectrum.



5. Compare the results in steps 3 and 4. Give comments on the results.

6. Perform the inverse FT on the outcomes of steps 3 and 4 and compare the results. Give comments on the results.

7. Implement the complete computed tomography (CT), i.e. calculate the projections at different angles θ and perform 1D-FT on each projection. Use these results to create the 2D-FT of the image $f(x,y)$. Do the proper interpolation then perform inverse FT to recover the original image. Comment on your results.

Part II.

Download *image_1* and *image_2* posted on the course webpage.

Apply histogram matching to match the histogram of *image_1* to the histogram of *image_2*. Show and comment on your results.